U.S. Department of Health and Human Services

NIH National Institutes of Health

2013 Comprehensive Master Plan

NIH Bethesda Campus

Prepared by the Division of Facilities Planning
Office of Research Facilities

06-14-2013

Concept: *A master plan examines current and desired conditions and relationships in a systems-view of constituencies, context, and built environment; the aim is to develop and maintain a roadmap to shape the built environment under consideration in ways that best support the goals of an organization and needs of its people.*

This master plan considers that future research facilities at the National Institutes of Health (NIH) Bethesda Campus must support, among other things, an increasing focus on applying genomics and high-throughput technologies, such as computational biology.

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.

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Errata

Exhibit I Errata Table

Page	Section/Exhibit/ Location	Description (e.g., Title/Change/From/To/Justification)	Issue Date
xi	Exhibit C	*Master Plan Building Directory and Area Summary Plan* Change gross area (in GSF) for NMLP-12 from *420,900* to *267,000*; for NMLP-13 from *420,900* to *267,000*; for NMLP-14 from *420,900* to *327,000.* Justification: Employee parking capped at 9,045 spaces.	10-21-2015
4-23	4.3.4 3rd paragraph	*Parking Resources and Distribution* Delete text: *"In addition, the parking ratio is currently lower than the 0.50 ratio established by the 1992 Memorandum of Understanding between NCPC, M-NCPPC, and NIH." It is anticipated that the NIH campus will continue to maintain the employee-parking ratio to a level at or below the 0.50 parking ratio in the future through the Transportation Management Program (TMP)."* Justification: Employee parking capped at 9,045 spaces.	10-21-2015
4-40	4.3.8.3 5th paragraph	*Employee Parking Ratio Assessment* Add the following text to end of paragraph: *"However, NIH has agreed to maintain parking at its current level of 9,045 employee spaces."* Justification: employee parking is capped at 9,045 spaces	10-21-2015
4-96	4.9.6.3.19, 1st Sentence	*Building-29A* From: "Building-29A is a three-story structure ..." To: "Building-29A *was constructed in 1963. It* is a three-story structure ..." Justification: Clarification.	07-31-2014
4-109	Exhibit 4.10.A	*Existing Campus Amenities.* Remove Medical Services icon from Building 13. Justification: Correction. Building 13 no longer has a Medical Services function.	02-05-2014

Page	Section/Exhibit/ Location	Description (e.g., Title/Change/From/To/Justification)	Issue Date
4-113	Exhibit 4.11.B	*Mission Dependency.* Change designation of Building 12: From: *Mission Dependent* To: *Mission Critical* Justification: Correction.	02-05-2014
4-119	4.11.5, Last Paragraph, Last Sentence	*Building Functional Suitability.* From: "The *larger* structures deemed to be obsolete *are* Buildings …" To: "The *following* structures *are* deemed to be obsolete: Buildings…" Justification: Correction.	07-31-2014
4-121	Exhibit 4.11.G	*Facility Utilization.* Change the designations of Buildings 2, 12A, 18, 30, 45, 46, and 49: From: *Over Utilized* To: *Utilized* Justification: Correction.	07-31-2014
4-131	Exhibit 4.11.K, Building 40	*Current Building Performance Metrics Summary Table.* Update Building 40 information: From: *207 employees; 69,641 NSF; Utilized* To: *228 employees; 35,051 NSF; Over Utilized* Justification: Correction.	02-05-2014
5-6	5.1.3.3 9th bullet	*Zoning and Functional Relationships* Delete text: *"As the employee population grows so will the need for parking at 0.5 spaces/employee in accordance with the 'Trilateral Transportation Management Memorandum of Understanding.'"* Justification: Employee parking capped at 9,045 spaces.	10-21-2015
5-20	5.1.4.2, 1st Paragraph	*Alternative 2 – Redevelopment.* From: "New development would consist of *3,853,499 gsf* of new construction …" To: "New development would consist of *4,430,598 gsf* of new construction …" Justification: Correction.	02-05-2014

Page	Section/Exhibit/ Location	Description (e.g., Title/Change/From/To/Justification)	Issue Date
5-24	5.1.4.3, 1st Paragraph	*Alternative 3 - Maximum Development.* From: "New development will consist of *7,486,199 gsf* of new construction…" To: "New development will consist of *7,063,298 gsf* of new construction …" Justification: Correction.	02-05-2014
5-27	Exhibit 5.1.K, 3rd Row	*Proposed Development Table.* Cafeteria Addition From: *13,000 gsf* To: *26,000 gsf* Justification: Correction.	02-05-2014
5-27	Exhibit 5.1.K, 16th Row	*Proposed Development Table.* Large Animal Facility From: *8,310 gsf* To: *10,391 gsf* Justification: Correction.	02-05-2014
5-27	Exhibit 5.1.K, 21st Row	~~*Proposed Development Table.*~~ ~~Parking Structure~~ ~~From: *420,900 gsf*~~ ~~To: *282,000 gsf*~~ ~~Justification: Change.~~ [Superseded on 10-21-2015.]	07-31-2014
5-27	Exhibit 5.1.K	*Proposed Development Table* Change gross area (in GSF) for first listed "Parking Structure" from *420,900 to 267,000*; for second listed "Parking Structure" from *420,900* to *267,000*; for third listed "Parking Structure" from *282,000* to *327,000.* Justification: Employee parking capped at 9,045 spaces; also, third listed "Parking structure" will include some visitor spaces.	10-21-2015
5-32	Exhibit 5.2.A, 3rd Page Last Row	~~*Master Plan Building Directory and Area Summary Table*~~ ~~NMLP-14~~ ~~From: *420,900*~~ [gsf] ~~To: *282,000*~~ [gsf] ~~Justification: Change.~~ [Superseded on 10-21-2015.]	07-31-2014

Page	Section/Exhibit/ Location	Description (e.g., Title/Change/From/To/Justification)	Issue Date
5-32	Exhibit 5.2.A	*Master Plan Building Directory and Area Summary Table* Change gross area (in GSF) for NMLP-12 from *420,900* to *267,000*; for NMLP-13 from *420,900* to *267,000*; for NMLP-14 from *282,000* to *327,000*. Justification: employee parking is capped at 9,045 spaces; also, NMLP-14 will include some visitor spaces	10-21-2015
5-40	Exhibit 5.2.G	*Site Development Land Capacities Table* Change gross area (in GSF) for NMLP-12 from *420,900* to *267,000*; for NMLP-13 from *420,900* to *267,000*; for NMLP-14 from *420,900* to *327,000*. Justification: employee parking is capped at 9,045 spaces	10-21-2015
5-70	Exhibit 5.2.CC	*Campus Amenities.* Remove Medical Services icon from Building 13. Building 13 no longer has a Medical Services function. Justification: Correction.	02-05-2014
5-81	5.3.2, 1st Paragraph	*Trip Generation Projection* From: "The Campus will contain approximately *11,500* parking spaces …" To: "The Campus will contain approximately *11,000* parking spaces …" Justification: Change.	07-31-2014
5-81	5.3.2 1st paragraph	*Trip Generation Projection* *Delete text: "as a condition of the TMP. The Campus will contain approximately 11,000 parking spaces by 2033."* *Justification: Employee parking capped at 9,045 spaces.*	10-21-2015
5-84	5.3.4, 1st Paragraph	~~*Parking*~~ ~~From: "The NIH Master Plan and the TMP strive to attain a maximum parking ratio of 0.50."~~ ~~To: "The NIH Master Plan and the TMP strive to attain a maximum parking ratio of 0.50 *(or one parking space for every two employees)*."~~ ~~Justification: Clarification.~~ [Superseded on 10-21-2015.]	07-31-2014

Page	Section/Exhibit/ Location	Description (e.g., Title/Change/From/To/Justification)	Issue Date
5-84	5.3.4 2nd paragraph [previously 1st]	*Parking* *From: "The NIH Master Plan and the TMP strive to attain a maximum parking ratio of 0.50 (or one parking space for every two employees). The employee to parking space ratio will be re-evaluated as part of each five-year update to the Master Plan. The need for new parking at NIH is dictated by regional public transportation improvements, federal government mandates and the level of success of the NIH TMP."* *To: "The NIH Master Plan strives to provide adequate parking for employees."* *Justification: Employee parking capped at 9,045 spaces.*	10-21-2015
5-84	5.3.4 4th and 5th paragraphs	*Parking* Delete text: "*To accomplish the goal of an employee to parking ratio of 0.50, the NIH will endeavor, through TMP measures and transportation monitoring, to achieve a steady decrease in the employee-parking ratio from its current level. It should be recognized however, that this decrease in the ratio (and the absolute number of spaces on campus) would be episodic in nature and not a straight-line reduction. This is due to the fact that for much of the Master Plan period, a significant amount of "surge-parking" will need to be maintained on campus which may temporarily exceed the target parking ratio in order to offset future parking losses for the construction of new buildings, construction of MLP structures, on-campus security measures, and the removal of buffer parking.*" From: "*For the population increase of 3,000 people the parking ratio will be one parking space for every three employees. For the current population the parking ratio will remain 0.50.*" To: "*Parking will be set at its current level of 9,045 spaces for employees.*" Justification: Employee parking capped at 9,045 spaces.	10-21-2015

Page	Section/Exhibit/ Location	Description (e.g., Title/Change/From/To/Justification)	Issue Date
5-84	5.3.4, Last Paragraph	~~*Parking*~~ ~~Add following paragraph after last paragraph ending with "… and the removal of buffer parking:"~~ ~~"*For the population increase of 3,000 people the parking ratio will be one parking space for every three employees. For the current population the parking ratio will remain 0.50.*"~~ ~~Justification: Clarification~~. [Superseded on 10-21-2015.]	07-31-2014
5-84	5.3.4 Last paragraph	*Parking* From: "*Parking construction will be phased to correspond to population growth.*" To: "*Parking construction will be phased.*" Justification: employee parking is capped at 9,045 spaces	10-21-2015
5-85	Exhibit 5.3.D	~~*Proposed Parking Distribution*~~ ~~Change parking space count for MLP-14:~~ ~~From: *1,403*~~ ~~To: *940*~~ ~~Justification: Change.~~ [Superseded on 10-21-2015.]	07-31-2014
5-85	Exhibit 5.3.D	*Proposed Parking Distribution* Designate MLP-14 as "Structured Employee & Visitor" parking and change parking space count: From: *940* To: *1,090* Justification: Employee parking capped at 9,045 spaces.	10-21-2015
6-46	6.4.6.1.6, Last Paragraph	*West Research Cluster* From: "A *60,000 gsf* addition to Building-40 is proposed." To: "A *46,200 gsf* addition to Building-40 is proposed." Justification: Correction.	02-05-2014

Page	Section/Exhibit/ Location	Description (e.g., Title/Change/From/To/Justification)	Issue Date
6-75	Exhibit 6.5.B	*Demolition Phasing Plan* For Phase 1: Add leader & text: "*Remove Lot 41*" Delete leader & text: "*Remove four underground fuel oil tanks*" Add graphic of two underground tanks and leader pointing to east of Building 34, along with text: "*Remove two underground oil storage tanks*". Justification: Clarification. Correction.	02-05-2014
6-76	6.5.7.1, 4th Bullet	*Phase-I* From: "Remove the existing fuel storage tanks that are underground to the *southeast of Building-46*. Install in their place a vault with four new fuel oil storage tanks."" To: "Remove existing fuel storage tanks that are underground to the *east of Building-34*. Install in their place a vault with four new fuel oil tanks *southeast of Building-46.*" Justification: Correction.	02-05-2014
6-76	6.5.7.1, 5th Bullet	*Phase-I* Add Bullet: "*Remove parking Lot 41.*" Justification: Clarification.	07-31-2014
6-78	6.5.7.2, 3rd to Last Bullet	*Phase-II* Remove Bullet: "*Renovate Building 30.*" Justification: Correction.	07-31-2014
6-80	6.5.7.3, 5th Bullet	*Phase-III & Phase-IV* Add Bullet: "*Construct new internal road and new government vehicle parking lot & gas station.*" Justification: Correction.	07-31-2014
6-81	Exhibit 6.5.E	*Phase III Site Plan* Add leader pointing along east side of Building-13 and text: "*New Road*". Add leader pointing to space along west side of Building-N12 and text: "*New Government Vehicle Parking Lot & Gas Station*". Justification: Clarification.	07-31-2014

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END OF ERRATA.

Preface

The Master Plan is focused on NIH's scientific mission. It is a vision of where the NIH aspires to be scientifically in the next 20 years at its Bethesda Campus and serves as a tool to achieve that vision.

The Master Plan is aligned with NIH's mission to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce the burdens of illness and disability. As a vision, the Master Plan promotes scientific collaboration by organizing the campus into research clusters which will facilitate:

- Applying high throughput technologies to better understand fundamental biology and uncover the causes of specific diseases; and
- Translating basic science discoveries into new and better treatments; and
- Reinvigorating and empowering the biomedical research community.

The NIH Bethesda Campus is a mature collection of research, administrative and support facilities built on 310 acres of land. Independent assessments have revealed that several of NIH's existing facilities will be incapable of supporting the NIH mission sometime during the 20 year timeframe associated with this Master Plan. The NIH Bethesda Campus Master Plan employs the following elements to evaluate NIH facilities and to develop proposed solutions and improvements:

- The Federal Real Property Council's Performance Measures to evaluate its existing facilities with respect to mission, utilization, operating cost, condition and disposal/remediation;
- The NIH Buildings and Facilities Model to aid in evaluating program impact, functional obsolescence, and facility impact; and
- Sustainability goals and sound stewardship practices, such as adapting and reusing historic buildings.

The Master Plan provides a blueprint to ensure that capital investments, should they be funded, are consistent with a long term vision of the campus and respectful of the region, the community, traffic, pedestrian safety, the environment, historic preservation, sustainability and other key factors.

I extend my sincerest appreciation to everyone who assisted developing this important document.

/s/ D.G. Wheeland

D.G. Wheeland, P.E., M.ASCE
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Executive Summary

Since the day that the NIH Bethesda Campus first opened its doors in 1939 with four buildings, the NIH has grown into a world renowned state-of-the-art biomedical research complex with over 20,000 employees. Today, the campus consists of 90 buildings built on 310 acres of land. Some of the existing facilities have deteriorated with age and wear. These facilities can no longer be economically rehabilitated, thus requiring their replacement. Furthermore, several of the older research facilities can no longer support future state-of-the-art biomedical research. These facilities need to be replaced or adapted for other purposes. The NIH Bethesda Campus Master Plan for the next twenty years does not anticipate significant growth in science programs. However, biomedical research focus and trends are changing to the point where in order to foster greater scientific collaboration and thus expedite scientific discovery, new research facilities will be multi-institutional and flexible. This will facilitate the creation of centers of science, such as the Porter Neuroscience Center and the new Immunology Center to further scientific collaboration. There will be more computational and systems biology laboratories that will have an effect on the way NIH's biomedical research facilities are designed.

The NIH Bethesda Campus has a profound impact on the local and regional economy. Biotechnology is the leading industry in the region which is due, in part, to the NIH. Montgomery County has an economic strategy for developing a world renowned life sciences industry hub. The County has embarked on several initiatives, such as the development of the Great Seneca Science Corridor and the White Oak Science Gateway. Indeed, the State of Maryland has made the growth of the state's biosciences sector a top priority.

Traffic congestion in the region is among the worst in the nation. While NIH employees contribute to the congestion, they also are adversely impacted by the traffic. The region's rapid transit system is limited in the areas that it serves, whereas NIH employees are distributed widely throughout the region. Furthermore, the NIH Bethesda Campus is located adjacent to the Bethesda Central Business District (CBD) and not far from the Friendship Heights CBD. Both are located on the crowded Wisconsin Avenue/Rockville Pike corridor. The Bethesda CBD has grown exponentially over the last 20 years and the Friendship Heights CBD continues to grow as well. The growth of these CBDs has exasperated the traffic congestion around the NIH Bethesda Campus. Through the Transportation Management Plan (TMP), NIH developed and implemented long term and short term strategies that have been successful in mitigating traffic created by NIH employees. The Master Plan supports continuation of the TMP.

ORF's Division of Facilities Planning, Buildings and Space Planning interviews found that the NIH Institutes and Centers do not, on the whole plan growth in scientific programs, personnel or space within the next five to ten years. This affords an opportunity to focus on the performance of existing facilities and to address the changes in biomedical research focus and trends. The Master Plan organizes the campus into five research clusters to facilitate collaboration which will create opportunities for development of centers of science that will be multi-institutional and can address other trends such as computational biology. Also proposed is the clustering of administrative and biomedical research education functions along the more "public" or east side of the campus in close proximity to the Medical Center Metro Station. The consolidation of utility support and service functions in proximity to Building 11 and to the far south end of the campus is another proposal of the Plan.

The creation of the National Center for Advancement of Translational Sciences (NCATS) is an organizational change that the flexibility of this Master Plan will accommodate, along with foreseeable new organizational changes and initiatives as they arise. This Plan proposes to relocate laboratory research programs from older and historic facilities that are functionally obsolete into new state-of-the art biomedical research facilities. The plan also proposes to adapt and reuse some of the older research buildings as administrative space.

The Master Plan proposes bringing all leased laboratories (except quasi-commercial leases) back to the Bethesda Campus because leases are NIH's highest facilities operating cost and to enhance opportunities for scientific exchange. Furthermore, NIH plans to reduce its administrative lease portfolio by returning campus administrative personnel from leased facilities to adaptively reused historic buildings on the Bethesda campus, efforts which strongly support HHS sustainability goals.

Garages are placed within a five minute walking distance to the workplace. Pedestrian conflicts are minimized by grade separations via elevated walkways or tunnels, where possible. These are some ways in which the Plan provides a balanced approach to campus circulation while concurrently enhancing pedestrian safety.

The Plan anticipates a Bethesda campus population growth of approximately 2,614 existing staff relocating from off-campus leased facilities and other NIH sites as well as 651 new personnel. To accommodate such growth, the plan proposes constructing 1.6 million gross square feet (gsf) of research space and 775,000 gsf of administrative and support space.

To enhance the Bethesda Campus physical environment the Master Plan proposes a series of development guidelines regarding: density and bulk, circulation, road standards, parking facilities, service areas, and pedestrian pathways. Building and site performance standards focus on campus way-finding, landscape design, exterior lighting, and open space. Replacing surface parking lots with a combination of green spaces and more space-efficient structured parking will improve pedestrian safety while enhancing the overall campus atmosphere. The Plan includes a comprehensive set of guidelines for environmental and sustainability planning and building characteristics.

The NIH Bethesda Campus Illustrative Master Plan is depicted in Exhibit A, along with a corresponding conceptual rendering in Exhibit B showing a southeast bird's eye view of the campus with developments completed as proposed. Building information is summarized in Exhibit C.

Realization of the Master Plan at any given time will depend on HHS and NIH priorities, governmental policy decisions, as well as budgetary considerations. The Master Plan does not represent the pre-approval of any individual facilities project or the pre-approval of the particular needs of specific programs to be accommodated on the campus. The Master Plan is, therefore, designed as a flexible framework and a guide for the orderly future development of the campus, if and as it occurs.

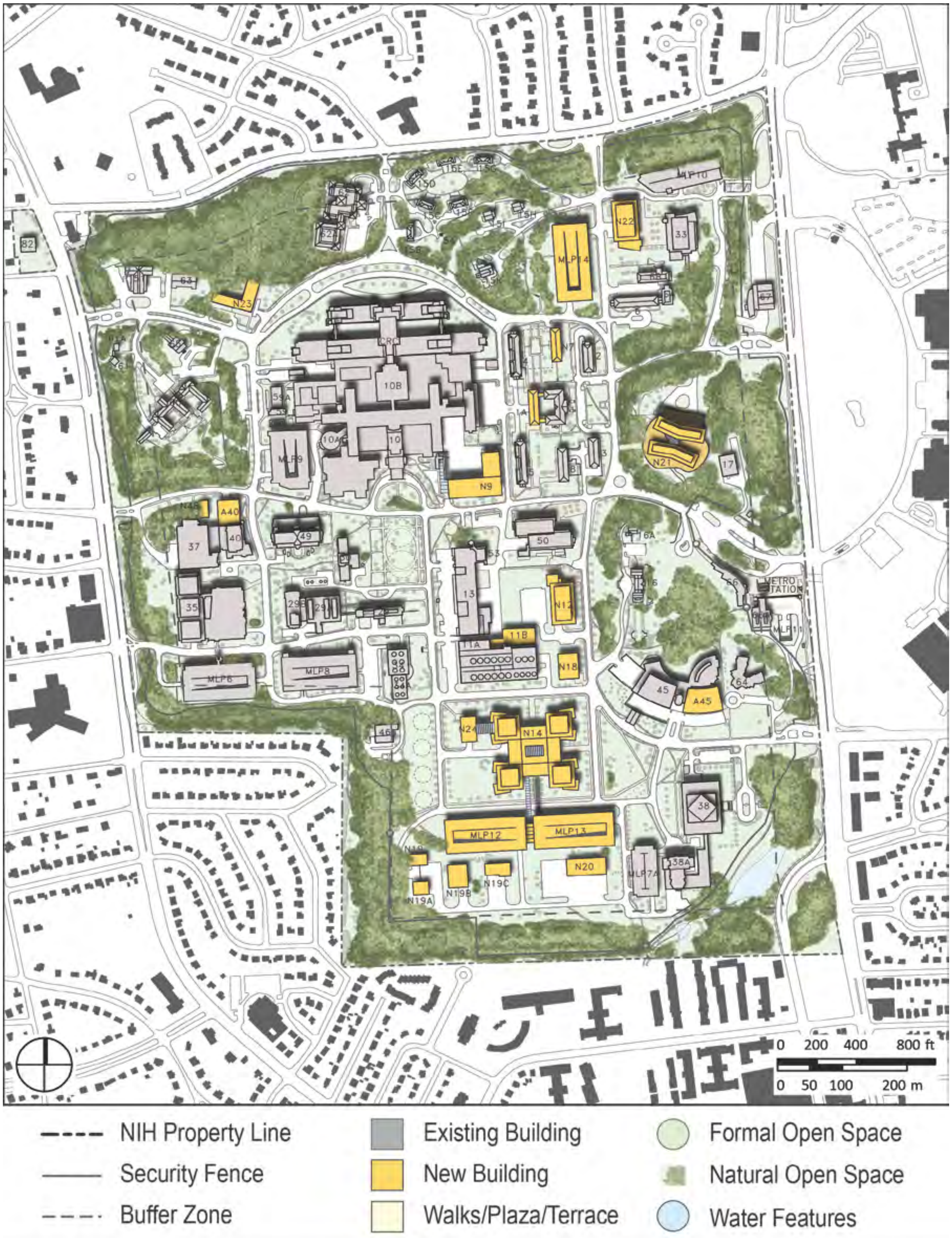

Exhibit A. NIH Bethesda Campus Illustrative Master Plan

Exhibit B. Conceptual Rendering of Illustrative Master Plan

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Exhibit C. Master Plan Building Directory and Area Summary Table

Building #	Gross Area	Primary Use	Remarks
Note	*N/A*	*Building number prefixes*	*(N) New, (A) Addition, and (R) Renovated.*
1	95,948	Administration	NIH Headquarters
A1	26,000	Amenity	Cafeteria and Conference Center
2	45,318	Administration	Adaptive Reuse from laboratory to office
3	49,242	Administration	Adaptive Reuse from laboratory to office
R4	98,103	Administration	Adaptive Reuse from laboratory to office
R5	99,849	Administration	Adaptive Reuse from laboratory to office
6	84,347	Research	
6A	24,641	Research	
6B	58,817	Research	
N7	118,664	Administration	NIH Data Center
R8	99,471	Administration	Adaptive Reuse from laboratory to office
N9	299,891	Animal Research	AKA Building "D"
10	3,142,583	Clinical Research	
10-CRC	1,779,729	Clinical Research	
11 & 11A	290,488	Utility	NIH Central Utility Plant (CUP)
11B	16,700	Utility	Addition to Building 11
N12	256,538	Research	
13	284,994	Support Services	
N14	774,504	Research	
15B1	4,033	Administration	Adaptive Reuse from residential to office
15B2	4,033	Administration	Adaptive Reuse from residential to office
15C1	4,033	Administration	Adaptive Reuse from residential to office
15C2	4,033	Administration	Adaptive Reuse from residential to office
15D1	4,033	Administration	Adaptive Reuse from residential to office
15D2	4,033	Administration	Adaptive Reuse from residential to office
15E1	4,033	Administration	Adaptive Reuse from residential to office
15E2	4,033	Administration	Adaptive Reuse from residential to office
15F1	4,033	Residential	Adaptive Reuse from residential to office
15F2	4,033	Residential	Adaptive Reuse from residential to office
15G1	4,033	Residential	Adaptive Reuse from residential to office
15G2	4,033	Residential	Adaptive Reuse from residential to office
15H	6,010	Residential	
15I	6,010	Residential	
15K	14,839	Residential	Proposed NIH Director's House
16	24,843	Biomedical Education	
16A	4,822	Biomedical Education	
17	7,651	Utility	Electrical Substation
N18	45,000	Public Safety	Police Station
N19	36,123	Support Services	Radiation Safety Offices and Laboratories
N19 A	6,300	Support Services	Chemical Waste Storage
N19 B	2,371	Support Services	Mixed Waste
N19 C	11,700	Support Service	Biomedical Waste and Recycling

Building #	Gross Area	Primary Use	Remarks
N20	22,218	Support Services	Grounds Maintenance
N21	601,039	Administration	New IC Headquarters
N22	287,808	Research	
N23	21,335	Amenity	Northwest Child Care Center
N24	10,391	Large Animal Facility	
N27		Utility	West Satellite Switching Station
R29	89,028	Research	Lab Administration and Computational Biology
R29A	106,694	Research	
29B	117,380	Research	
R30	110,240	Clinical Research	Physicians' Offices; Adaptive Reuse from laboratory to office
33	164,224	Laboratory	
R34	46,680	Utility	Chilled Water Plant
R34A	25,867	Utility	Chilled Water Plant
35	514,355	Research	Porter Neuroscience Center
37	322,677	Research	
38	236,530	Biomedical Research Education	The National Library of Medicine
38A	226,545	Biomedical Research Education	Lister Hill
40	141,398	Research	
A40	46,200	Research	
45	537,014	Biomedical Research Education	Natcher
A45	87,461	Biomedical Research Education	Natcher II
46	11,526	Utility	Electrical Substation
49	274,509	Research	Silvio Conte
50	565,458	Research	Louis Stokes Laboratories
51	21,724	Public Safety	NIH Fire Station
52	689	Utility	Electrical Vault
53	3,968	Utility	Electrical Vault
54	168	Utility	Electrical Vault
59	2,891	Utility	Electrical Vault
60	67,500	Administration	Mary Woodward Lasker Center
61	2,396	Administration	
61A		Administration	
62	70,448	Lodging	Children's Inn
63	8,000	Utility	Electrical Sub Station
64	15,448	Amenity	East Child Care Center
65	26,118	Lodging	Family Lodge
66	12,325	Public Safety	Gateway Center
67	18,110	Public Safety	Commercial Vehicle Inspection Facility

Building #	Gross Area	Primary Use	Remarks
68	782	Public Safety	Patient Screening Facility
MLP-6	280,206	Multi-Level Parking Structure	
MLP-7	137,578	Multi-Level Parking Structure	
MLP-8	465,276	Multi-Level Parking Structure	
MLP-9	351,034	Multi-Level Parking Structure	
MLP-10	375,000	Multi-Level Parking Structure	
MLP-11	118,334	Multi-Level Parking Structure	
NMLP-12	267,000	Multi-Level Parking Structure	
NMLP-13	267,000	Multi-Level Parking Structure	
NMLP-14	327,000	Multi-Level Parking Structure	

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Acknowledgments

We would like to thank Mr. Daniel G. Wheeland, P.E. for his support in developing the Bethesda Campus Master Plan

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- Mr. Marty Haghjou, Civil Engineer Project Officer
- Mr. Wayne Appenzeller, AIA, Project Officer
- Ms. Soussan Afsharfar, RA, Project Officer
- Mr. Reza Jafari, P.E., Program Analyst
- Mr. Frank Kutlak, RA, Project Officer
- Mr. Gias Ahmad, P.E. Project Officer
- Mr. Kyung Kim, P.E. Chief Capital Projects East Branch
- CAPT Jamie Natour, Electrical Engineer

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END OF PREFACE, EXECUTIVE SUMMARY AND CONTENTS.

U.S. Department of Health and Human Services

NIH National Institutes of Health

Chapter 1
Introduction and Program Requirements

Prepared by the Division of Facilities Planning
Office of Research Facilities

06-14-2013

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1 Introduction and Program Requirements

1.1 Introduction

The National Institutes of Health (NIH), an Agency of the United States Department of Health and Human Services (HHS), is the focal point of federal health research and is one of the world's foremost biomedical research institutions. The NIH mission is to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce the burdens of illness and disability. To achieve that mission, more than 80% percent of the NIH budget goes to more than 300,000 research personnel at over 2,500 universities and research institutions. In addition, about 6,000 scientists work in NIH's own Intramural Research laboratories, most of which are on the NIH main campus in Bethesda, Maryland. The main campus is also home to the NIH Clinical Center, the largest hospital in the world totally dedicated to clinical research. Furthermore, the basic research supported by NIH provides the foundation for the nation's pharmaceutical and biotechnology industries. As one measure of the agency's excellence in research, it should be noted that NIH-supported investigators, including five NIH scientists, won over 121 Nobel Prizes from 1939 to 2011.

1.2 Purpose and Scope of the NIH Bethesda Campus Master Plan

The purpose of this Master Plan is to define the real property assets that would support the execution of the programs housed at the NIH Bethesda Campus and to guide new development within the campus, in support of the mission of the National Institutes of Health. Realization of the Master Plan at any given time will depend on HHS and NIH priorities, governmental policy decisions, as well as budgetary considerations. The Master Plan does not represent the pre-approval of any individual facilities project or the pre-approval of the particular needs of specific programs to be accommodated on the campus. The Master Plan is, therefore, designed as a flexible framework and a guide for the orderly future development of the campus, if and as it occurs.

The NIH Bethesda Campus Master Plan is a format for the reasoned and orderly development of the Bethesda campus while valuing and building on existing resources. It corrects existing deficiencies and meets changing needs by replacing obsolescent facilities through new construction or renovation and attempts to set forth implementation priorities as a logical sequence of planned development.

This Master Plan and proposed projects described herein are intended to serve as a guideline for future development only. The term "proposal" is used throughout this document in the context of master planning. Actual execution of individual projects will require future approval, subject to the availability of funds.

1.3 Roles and Responsibilities

1.3.1 The NIH Director

The NIH Director, with a unique and critical perspective on the entire agency, is responsible for providing leadership to the Institutes and for identifying needs and opportunities, especially for efforts that involve multiple Institutes. The NIH Director approves NIH Master Plans.

1.3.2 The NIH Steering Committee

The NIH Steering Committee, established in 2002, is the NIH's overall, non-scientific governing board, composed of ten Institute Center (IC) directors, one chairman (the Director of the NIH) and an ex –officio member. The three largest institutes budget-wise—the National Cancer Institute (NCI), the National Institute of Allergy and Infectious Disease (NIAID), and the National Heart, Lung and Blood Institute (NHLBI) —are permanent members; the other slots rotate in staggered 3-year terms among the remaining ICs. Senior Office of the Director staff also participates by serving on topic-specific fact-finding subcommittee work groups.

1.3.3 The NIH Facilities Working Group

The Facilities Working Group (FWG) has ten voting and one non-voting member. It includes various IC representation of Directors, Scientific Directors and Executive Officers. The FWG advises the NIH Steering Committee, the NIH ICs and the NIH Director on matters pertaining to the planning, acquisition, development, and use of land and facilities for the pursuit of the NIH mission.

The FWG is responsible for evaluating the physical and environmental frameworks defined in NIH master plans and guiding them to best accommodate the NIH research priorities and initiatives. The FWG evaluates NIH's programmatic needs, balances competing priorities, and explores alternative means of meeting NIH's changing needs for capital facilities. The FWG's decisions guide the annual update of the five-year Strategic Facilities Plan, Buildings and Facilities (B&F) Plan, and the Leased Facilities Plan.

The FWG provides advice to the Director of the NIH Office of Research Facilities Development and Operations (ORF) on operating policies and business strategy.

1.3.3.1 The Space Recommendations Board

The Space Recommendation Board (SRB) consists of the Deputy Director for Intramural Research, the Deputy Director for Management, the Director of the Office of Research Facilities Development and Operations and an IC Director, who is the chairperson of the FWG. The Deputy Director for Intramural Research addresses program issues and prioritizes requests for laboratory and clinical research space for the Intramural Research Programs (IRP). Program issues and priorities for administrative space requests for the ICs and the Office of the Director, including Extramural Research Program (ERP), are addressed by the Deputy Director for Management. The Director of the Office of Research Facilities Development and Operations (ORF) addresses the facility and infrastructure implications and technical feasibility of the requests. The Division of Facilities Planning, ORF, provides staff support to the SRB.

1.3.4 Division of Facilities Planning

The Division of Facilities Planning (DFP), proactively provides NIH Leadership, Institutes, and Centers with reliable, impartial, and informed site master plans services, strategic facility and environmental planning services, and facilitates space utilization decisions to support the timely delivery of owned and leased facilities to meet NIH's research mission.

DFP provides this through short, medium, and long-range planning for all NIH sites and facilities. It:

- develops and oversees the implementation of the site master plans;
- develops the NIH Strategic Facilities Plan (SFP) including NIH Lease Space Plan (LSP) and the Buildings & Facilities budget plan (B&F);
- administers the space request process; collects and maintains the NIH census and computerized real estate database system for NIH properties;
- provides expertise in transportation and environmental planning;
- oversees activities that impact the use, appearance and environmental quality of NIH controlled sites; and

- provides technical liaison with other agencies and community organization

1.3.4.1 NIH Architectural Design Review Board

The Architectural Design Review Board (ADRB) was established by ORF in 2003 to preserve and enhance the beauty and order of NIH's campuses. This is accomplished by (1) promoting high quality site planning and architectural designs which are in harmony with surrounding uses, both on and off-campus, (2) reviewing facility design proposals for their consistency with the approved campus master plan and its planning principles, and (3) encouraging project designs that are compatible with the existing campus fabric in terms of architectural style and character, massing, color, materials, and the quality of open space. The NIH design review process encourages reviews of facility projects at the earliest design stages. ADRB recommendations are directed at the planning, design, and/or appearance of NIH projects and are purely advisory to ORF Senior Management which has the final authority to approve, disapprove, or modify the design of a facility project.

1.3.5 Capital Investment Review Board

The HHS Facility Capital Investment Review Board ("the Board," or CIRB) was established on June 9, 2003 to make recommendations for strategic management of HHS real property assets and to advise the Secretary, the Assistant Secretary for Administration (ASA) and the Senior Real Property Officer (SRPO) on major facility capital investment issues. The Board also advises, assists, consults with, and makes recommendations to the ASA, the Secretary, and, when appropriate, the Assistant Secretary for Financial Resources (ASFR), regarding the broad range of responsibilities.

The ASA has delegated oversight authority and provides direction to all HHS Operating Divisions (OPDIVs) with facility acquisition and operation responsibilities and land acquisition authority. OMB Circular A-11, Part 7 identifies a formal capital asset management infrastructure as a best practice. It further states that "An Executive Review Committee, acting for or with the Agency Head, should be responsible for reviewing the agency's entire capital asset portfolio on a periodic basis and making decisions on the proper composition of agency assets needed to achieve strategic goals and objectives within budget limits." This Board implements the responsibilities assigned to the "Executive Review Committee."

The Board provides advice and makes recommendations to the Secretary, the ASAM, the SRPO, and the ASFR on a range of issues, including: 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. [1]

1.3.6 National Capital Planning Commission

As the central planning agency for the federal government in the National Capital Region, the National Capital Planning Commission ("the Commission" or NCPC) is charged with planning for the appropriate and orderly development of the national capital region and the conservation of its important natural and historical features.

The Commission coordinates all federal planning activities in the region, and has several planning functions:

- comprehensive planning
- master planning
- project planning; program review
- multi-year federal capital improvements programming

Commission responsibilities include preparing long-range plans and special studies to ensure the effective functioning of the federal government in the NCR; reviewing plans for federal buildings and installations in the region; reviewing comprehensive plans, area plans, and capital improvement programs proposed by state, regional, and local agencies for their effect on the federal establishment; and monitoring and evaluating capital investment projects proposed by federal agencies in the region.

Section 4(a) of the National Capital Planning Act of 1952 requires that NCPC prepare and adopt a "comprehensive, consistent, and coordinated plan for the National Capital." The Comprehensive Plan for the National Capital includes "Federal Elements", the blueprint for the long-term development of the national capital region and is the decision-making framework for Commission actions on plans and proposals submitted for its review. The Commission's comprehensive planning function involves preparing and adopting the Federal Elements, as well as reviewing the "District of Columbia Elements" for their impact on the federal interest.[2]

1 HHS Facilities Program Manual (Volume 1), Section 1-5, CIRB Revision 14 December 2007
2 NCPC, Comprehensive plan for the National Capital, Federal Elements, August 5, 2004.

1.4 Authorization and Applicability

The 2013 NIH Bethesda Master Plan and accompanying Environmental Impact Statement (EIS) are prepared pursuant to the policies contained in Executive Order 13327 Federal Real Property Asset Management; HHS Facilities Program Manual Volume I Section 3-1 Facilities Master Planning and the National Capital Planning Commission's (NCPC) Master Plan Submission Requirements as approved September 6, 1984; as amended November 7, 1985 and October 27, 1994. The following federal laws and regulations and Departmental policies are applicable to the NIH Bethesda Campus Master Plan:

- HHS Real Property Asset Management Plan (RAMP): The RAMP provides a roadmap for HHS to promote efficient and economical use of federal real property resources that are required to support the Department's missions and strategic goals. It addresses the Department's strategy for implementing these goals through real property management improvement initiatives and strategic planning. The plan also documents how HHS ensures maximum use of its portfolio and identifies who is accountable for maintaining excellence in real property management.

- National Environmental Policy Act: National Environmental Policy Act of 1969, as amended (NEPA) (42 USC 4321et seq.) This law prescribes the consideration that federal agencies must give the impact of their actions on the human environment.

- The Clean Air Act: The Clean Air Act of 1970 (42 USC 7401 et seq.). This Act authorizes EPA to establish national standards for air quality to protect the public health and welfare. It is a comprehensive and complex Federal statue for the prevention and control of air pollution from stationary and mobile sources.

- Clean Air Act Amendments of 1990: Clean Air Act Amendments of 1990 (Pub. L. 101-549, 42 USC 7401-7671q). The amendments accelerate the schedule for pollutant emission reductions from mobile and stationary sources, and set many new requirements for reduction of air toxins by 75%, including reduction of sulfur dioxide emissions, phase out of chlorofluorocarbons, and use of cleaner fuels.

- Clean Water Act: Clean Water Act of 1977, as amended (33 USC 403 et seq., 33 USC 1344 et seq., 33 USC 1413 et seq.). The Maryland Department of the Environment has been authorized by the U.S. Environmental Protection Agency to issue and administer NPDES permits in the state of Maryland.

- The Safe Drinking Water Act: The Safe Drinking Water Act (42 USC 300f-300j-26) authorizes the US EPA to set national health-based standards for drinking water to protect against both naturally-occurring and man-made contaminants that may be found in drinking water.

- National Historic Preservation Act: National Historic Preservation Act of 1966 (and as amended through 2006). This act requires evaluation of the effects that proposed actions will have on historic properties listed or that may be eligible for listing in the National Register of Historic Places. It requires that the Advisory Council on Historic Preservation be notified and given reasonable opportunity to comment with regard to the undertaking.

- Uniform Relocation Assistance and Land Acquisition Policies Act of 1970 (42 USC 4601-4655): Sets forth the policy for fair and equitable treatment of persons displaced as a result of Federal and federally assisted programs.

- Housing and Urban Development Act: Reflects national policies on urban growth.

- Energy Independence & Security Act of 2007 (EISA 2007): Establishes energy management goals and requirements while also amending portions of the National Energy Conservation Policy Act (NECPA). It was signed into law on December 19, 2007.

- Executive Order 11988, “Floodplain Management” prohibits construction or support of incompatible development in floodplains without determining flooding risks, identifying natural floodplain values and impacts, and mitigating those impacts.

- Executive Order 13423: Strengthening Federal Environmental, Energy, and Transportation Management, signed January 26, 2007.

- Executive Order 13514, “Federal Leadership in Environmental, Energy, and Economic Performance,” signed on October 5, 2009: Introduces new greenhouse gas (GHG) emissions management requirements, expands water reduction requirements for federal agencies, and addresses waste diversion, local planning, sustainable buildings, environmental management, and electronics stewardship.

Requires that each Federal agency evaluate agency climate change risks and vulnerabilities to manage both the short and long-term effects of climate change on the agency's mission and operations, and prepare an Agency Strategic Sustainability Performance Plan (and Climate Change Adaptation Plan).

- Comprehensive Environmental Response, Compensation & Liability Act: 42 U.S.C. Section 9601 et seq. Compensation and Liability Act (CERCLA) impose liability for the costs of cleanup on current and former land owners and operators on the land, wherever or whenever there was or is a release or threatened release of a hazardous substance.

- HHS Strategic Sustainability Performance Plan: Sustainability is integral to the HHS mission, which is to protect the health of all Americans and provide essential human services, especially to those who are least able to help themselves. Sustainability has been defined as "the enduring prosperity of all living things." By this measure, sustainability is directly linked to the health of humans, the health of the environment, and the health of economic systems that support and promote our well-being. This triple health bottom line – human health, environmental health and economic health– is integral to HHS's mission and the sustainability mandates of Executive Order (EO) 13514.

- HHS Climate Change Adaptation Plan: Prepared in response to E.O. 13514, this document outlines the challenges posed by climate change to the HHS mission, programs, and operations, and identifies specific actions in FY 2013 and beyond to better understand and address those challenges.

- HHS Sustainability Building Plan: The HHS Sustainable Buildings Plan (SBP) is a collection of policy, procedures, guidance and tools designed to summarize and record the Department's program to incorporate sustainable measures into building assets. The SBP supplements the HHS Strategic Sustainability Performance Plan (SSPP), which is now the framework for the Department's overall sustainability program.

- Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings (Guiding Principles): All new construction, major renovation, or repair and alteration of Federal buildings must comply with Guiding Principles.

- **Principles for Sustainable Location Decision:** On October 5, 2009, President Obama signed Executive Order (E.O.) 13514, "Federal Leadership in Environmental, Energy and Economic Performance." The E.O. states that "It is the policy of the United States that Federal agencies shall…design, construct, maintain, and operate high performance sustainable buildings in sustainable locations, and strengthen the vitality and livability of the communities in which Federal facilities are located." The Executive Order directs agencies to "advance regional and local integrated planning by...participating in regional transportation planning and recognizing existing community transportation infrastructure; ...ensuring that planning for new Federal facilities or new leases includes consideration of sites that are pedestrian friendly, near existing employment centers, and accessible to public transit, and emphasizes existing central cities and (rural) town centers.

1.5 Historic Overview and Background

1.5.1 Early Public Health Initiatives

The origins of the NIH, and the United States government's involvement in public health issues, can be traced to the mid-nineteenth century. Today, the NIH, located on a 310-acre campus in Bethesda, Maryland, continues to serve the nation by providing state-of-the-art research and patient care facilities.

Because little was known about medicine or scientific methods in the eighteenth century, the Constitution includes no provisions for federal government involvement in public health. Although government provisions were made for marines and U.S. Navy officers and seamen in 1798-99, the health issues of the public were largely ignored. From the time the nation was founded through the early nineteenth century, illness was considered to be primarily an individual concern. When epidemics struck communities, local leaders would often form temporary committees to deal with the crises. By the mid-nineteenth century, as immigrants poured into America, slum conditions in major cities were thought to be the cause of many diseases and conditions. Squalid conditions encountered by troops and their effects on the soldiers' health during the Civil War also contributed to what was at the time termed "sanitary science."[3]

In 1872, various interested parties formed the American Public Health Association. Members hoped to assist the federal government in establishing a national bureau that would promote knowledge of the most recent advances in sanitary science. Other organizations, such as the American Medical Association, were also promoting a similar idea, citing the need for a central agency that could coordinate public health programs and provide funding and broad dissemination of knowledge.[4]

1.5.2 Establishment of the National Institutes of Health

Following the devastating yellow fever epidemic in the Mississippi Valley in 1878, Congress established a National Board of Health, which was the first government institution to award grants for medical research. However, the Board was short-lived, lasting only until 1883, when its appropriation expired. After a lapse of several years, the Marine Hospital Service (later renamed the Public Health and Marine Hospital Service) established the Hygienic Laboratory in 1887 in Staten Island, New York, with the express purpose of studying bacteriological disorders such as cholera. While the focus of the initial research was on disorders affecting seamen, the Laboratory assumed a large responsibility in 1890 for common ailments among the immigrant population.[5]

After four years, in 1891, the Hygienic Laboratory needed additional space for research and moved to Washington, D.C., in offices across from the U.S. Capitol. However, in 1895, once again more space was needed and the Laboratory moved to the Old Naval Observatory at 25th and E Streets, NW, a five-acre parcel that provided space to keep research animals. During this time, the Laboratory work focused on infectious diseases because of their powerful threat to public health.

In 1912, the governing agency of the Hygienic Laboratory, the Public Health and Marine Hospital Service, was renamed the Public Health Service, indicating that the primary concern of the agency was the public's health and well-being. Throughout World War I,

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3 Victoria A. Harden, *Inventing the NIH*: Federal Biomedical Research Policy 1887 -1937 Baltimore and London: The Johns Hopkins University Press. 1984, pp9-10
4 Ibid. p 11
5 Ibid pp. 12-13

research concentrated on the needs of military troops, but the public benefit of the research was also a goal.

Realizing the importance of the work of the Hygienic Laboratory, Congress passed the Ransdell Act in 1930 which designated the Hygienic Laboratory as the National Institute of Health (NIH). Authorized to construct research facilities and create a system of research fellowships, the program at the NIH expanded rapidly, and space for conducting experiments as well as additional facilities to house experimental animals was needed.

The historic development of the NIH Bethesda campus is detailed in the following pages and in Chapter 4; it is graphically summarized in Exhibit 1.5.A at the end of Section 1.5.

1.5.3 NIH Moves to Bethesda

The philanthropy of Luke and Helen Woodward Wilson, who made a series of land donations to the federal government between 1935 and 1948, proved the catalyst for the NIH's move to Bethesda, Maryland, and its subsequent development into one of the world's leading biomedical research institutions.

During the Depression, in the mid-1930s, the Wilsons expressed an interest in donating a portion of their estate to the federal government, if a worthy use could be found. The Wilsons were directed to the National Institute of Health, which was then searching for a farm site on which to raise animals for research purposes. Initially, the new campus at Bethesda was meant to be simply a one-animal unit building, leaving the main research functions in Washington, D.C.[6]

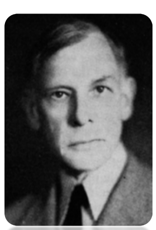
The Bethesda community was almost unanimous in its opposition, concerned that the facility would compromise the prestige of the area. During August 1935, after considering the impact of the proposal on their remaining property and the region, the Wilsons donated 45 acres of land, the southern portion of their estate, to the United States of

[6] Dorothy Pugh, "The National Institutes of Health," excerpted from *The Montgomery County Story 1987,* p3

America.[7]

A few days later the Social Security Act was signed into effect. It provided, among other things, $2 million per year for the "investigation of disease and problems of sanitation." Since the Wilsons' original offer, senior officials at the Public Health Service had held the idea of moving the entire operation of the National Institute of Health to the suburbs of Bethesda from its limited facilities in Washington, D.C. With the newly expanded emphasis on research supported by the Social Security Act and the enthusiasm of the new Surgeon General, Dr. Thomas Parran, approval was gained for a major building program on the new Bethesda campus. As a result, the strategy and plan for the NIH campus was expanded before a single building had been erected.

The Public Health Service estimated that it would cost approximately $2,500,000 to construct an administration building, laboratory buildings, field offices, quarters for officers and attendants, a sewage disposal plant, road construction and necessary landscaping. On June 22, 1936, a total of $1,363,000 was appropriated for the construction of three buildings for the National Institute of Health at Bethesda. The funds were appropriated by the Emergency Construction of Buildings Act of June 22, 1936. Initial architectural sketches and space requirements for the expanded research center were begun within a month, and ground was broken for the new campus in February 1938. The first three buildings included the Administration Building (Building 1), an Industrial Hygiene Laboratory (Building 2) and a Public Health Methods and Animal Unit Building (Building 3). The buildings were occupied by the National Institute of Health by December 1938.



The leading architect for this project was Louis Adolph Simon[8], at that time acting as Supervising Architect of the United States Treasury Department, an organization with which he was associated from 1896 to 1944. He was known for his Colonial Revival-style structures.

Given the community protest over the nonresidential nature of the site, the National Capital Park and Planning Commission (now NCPC) became involved with the design of the buildings. Frederic Delano, Chairman of the NCPC, sent a letter in December 1936 to the Supervising Architect of the Treasury requesting that the Treasury Department employ a "high-grade consulting architect" to be in charge of this highly visible and important commission. The Supervising Architect hired John Winthrop Wolcott, who was a Consulting Architect with the United States Treasury Department from 1933 to 1937. Mr.

[7] Land Records of Montgomery County
[8] Lois Craig and the staff of Federal Architecture Project, "Louis A. Simon Photo." *The Federal Presence*: 1977

Wolcott later joined the noted architectural firm of Skidmore, Owings & Merrill in 1944, and from 1947 to 1955 managed his own practice, Finney, Wolcott & Associates in Baltimore, Maryland.

On January 4, 1937, Mr. Delano wrote that, "…in addition to the architectural problems involved there are difficulties in designing the approaches and fitting the buildings to the topography, which in this locality is quite rough."[9] He requested further assistance of notable landscape architect, Alfred Geiffert, of the Landscape Architecture firm of Vitale and Geiffert. Mr. Geiffert was described as "one of eminent and national consultant capacity,"[10] and apparently was used often by the Supervising Architect of the Treasury.

1.5.4 Construction of Early Buildings

The Surgeon General of the Public Health Service, Thomas Parran, was heavily involved in the concept and design of the first buildings at NIH. Very early in the process, he reflected on the anticipated use of NIH and the space needed. Initially, there were no plans for a separate administration facility. Instead, each Institute would have a set amount of laboratory and office space. Included in this estimate were Building 1, the Industrial Hygiene Laboratory (with most space planned for labs); Building 2, housing Child Hygiene, Dental Studies, Heart Disease, Malaria, Milk and Dermatoses units, along with laboratory and office space comparable to Building 1; and finally, Building 3, necessary for Epidemiology, Public Health Methods and the Statistics Division, which had a unique need for consolidated "tabulating space."[11]

The Officers' Quarters were sited in a wooded area with gently sloping topography and abundant foliage. The houses fronted a common green, or park area, linked by paths, with the service road to the rear. The open area was filled with mature trees and some playground equipment. Modest size street lamps were also located on the inside of the circular walkway. The total site composition clearly illustrated the innovative suburban design concept, the "Radburn Principle". This concept became very popular in the late 1930s and 1940s.

[9] Letter from Frederic Delano to Wayne C. Taylor, dated January 4, 1937
[10] Notes by H.M Boulder, Dated February 13, 1937
[11] Letter from Thomas Parran to the Supervising Architect, dated July 14, 1936

Radburn, New Jersey (1928) brought Ebenezer Howard's[12] "Garden City" concepts to the U.S. and opened a new era in American planning. Based on Howard's ideas, Architect/Planner Clarence Stein and Planner Henry Wright developed a plan in which people could live peacefully with the automobile in Radburn. The plan utilizes "superblocks" instead of the conventional rectangular block. The roads are planned specifically for a single use. Service lanes are intended for direct access to buildings while secondary collector roads around the superblocks connect to main through roads, and express highways. There is a complete separation of pedestrians and automobiles. Large open spaces in the center of the super-blocks, on which the houses face, are joined together by pathways to form a continuous park. Though the Radburn development ran into financial difficulties and could not be completed, it remains the most influential prototype of modern town planning.[13]

During the 1930's and 1940's, federal architects embraced the Radburn principle and used it in several federally sponsored housing programs including the Officers' Quarters at NIH.

The design scheme for the Quarters prompted protests by homeowners on the adjacent Cedar Lane. Spurred by the novelty of the design, a radical departure from the typical house fronting the street, the neighbors demanded that the architects reposition the houses. They objected to the homes fronting the common area with some rear entrances of the homes actually facing Cedar Lane.

In response to the protest, Irving C. Root of the Maryland Park and Planning Commission enlisted the help of Frederic Delano, Chairman of the National Capital Park and Planning Commission. Root and Delano agreed that the Quarters should be provided with an additional setback of twenty feet from Cedar Lane which would provide enough space for future widening efforts, and also shield the backs of the houses from the neighbors. Additionally, T.C. Jeffers, the landscape architect for NCPC, recommended that extra plantings be utilized to screen the homes from the residents on Cedar Lane. Jeffers also advocated changing the public walk that runs along the perimeter of the common, by making it wider and adding a separate entrance walkway to each residence. This, he hoped, would "do away with the institutionalized semicircular common walk." All of these recommendations were made to the final design.

[12] Joseph DeChira/Lee Koopelman. Urban Planning and Design Criteria. Ebenezer Howard put forth his garden city concept in a book titled Tomorrow: A Peaceful Path to Real Reform in 1898. The basic goal was to combine the advantages of town life with that of the country.

[13] The American Institutes of Architects. New Towns in America The Design and Development Process. Edited by James Baily.

Over time, the homes appear to have been oriented more towards the road, as is typical with other Radburn-type houses. Utility functions are located on the park side of the homes (front elevation) while extra road side landscaping (rear elevation). As mentioned before, this is a common occurrence in Radburn houses, since the residents typically pay more attention to the most used entrance.

Building 6 was authorized as a separate appropriation in August 1937, when legislation was passed commissioning the construction of the National Cancer Institute (NCI). Using land donated by Helen Wilson, construction on Building 6 begun soon after the funds were approved. The NCI building was occupied by NIH staff in 1939 and until recently, continued to support activities of the NCI.

In June 1938, just six months into the first phase of construction at NIH, legislation was passed authorizing the construction of two additional buildings and the Officers' Quarters at NIH. Buildings 4 and 5 were completed in 1941, just in time for intensive research into the diseases which plague soldiers during wartime. Building 4 initially housed the research activities of the predecessors to the National Institute of Arthritis and Metabolic Diseases, while Building 5 housed the divisions which would later become the National Institute of Allergy and Infectious Diseases.

Building 8, completed in December 1946, was erected to house the expansion of the NCI staff. Over the years it has served as overflow space for multiple Institutes at the Bethesda campus.

Each of these buildings has the same very distinct design of institutional, brick, Georgian Revival architecture. Buildings 2 and 3 are identical brick structures. Buildings 4 and 5 were also identical, and mimicked the design of Building 6 to expedite the construction contracting process.

1.5.5 Research and Growth at NIH

Much of the new medical research and information disseminated during World Wars I and II was connected with NIH, which was given bureau status within the Public Health Service in 1943. Although NIH was still responsible for much of the research relating to infectious diseases, its scope was enlarged to include fundamental medical research into cancers, heart conditions, stroke, and mental illness.[14] To reflect the diversity of NIH research, it was

[14] J.E. Rall, Epilogue, "in *NIH, An Account of Research in its Laboratories*, London: Academic Press 1984, p 537

renamed the National Institutes (plural) of Health in 1948.[15] The Rocky Mountain Laboratory in Hamilton, Montana and the Biologics Control Laboratory, formed in 1902, merged with NIH's Division of Infectious Diseases and the Division of Tropical Diseases in 1948 to form the National Microbiological Institute; this has since been succeeded by the National Institute of Allergy and Infectious Diseases (NIAID). The Rocky Mountain Laboratories remain an active NIH/NIAID facility. It is one of the NIH facilities conducting bio-defense research.

Over the second half of the twentieth century, NIH continued to expand, with new Institutes and programs established in response to public health demands. In 1953, the Clinical Center, NIH's research hospital was dedicated in 1953, the same year the Public Health Service became part of the newly established Department of Health, Education, and Welfare. The Bethesda campus continued to expand, with land acquisitions eventually reaching its current 310 acres.

The 1960s was a decade of unprecedented growth for NIH. In 1962, the prestigious Library of Medicine moved to the NIH campus. Furthermore, land was acquired in Baltimore and Poolesville, Maryland, and in Research Triangle Park, North Carolina, for additional research and animal holding space.[16]

Expansion within the Bethesda campus continued with the construction of new medical research and support facilities and the incorporation of pre-existing buildings such as the Wilson Estate, the George Freeland Peter Estate, and the Convent of the Sisters of the Visitation. Current construction continues to provide accommodations for patients, researchers, medical professionals, and support staff.

Each new building established on the Bethesda site represents a further commitment to medical research and national involvement in the health field. NIH is now part of the Department of Health and Human Services, and the campus currently houses 27 medical research Institutes and Centers, each with its own mission.

[15] *National Institutes of Health 1995 Master Plan*, Chapter 2, p.6
[16] Ibid

1.5.6 The Clinical Center Complex

1.5.6.1 The Warren Grant Magnuson Clinical Center

The Clinical Center, Building 10, was authorized by Congress on July 1, 1944, and construction funds were appropriated in 1948.

Dr. Jack Masur, Director of the Clinical Center from 1948 to 1951, who participated in the planning and construction of the building, explained its concepts in an article for the Journal for the American Hospital Association:

In the basic planning the Public Health Service and the Public Buildings Administration sought to design a laboratory-hospital building which would provide twice as much space for research laboratories as for direct care of patients; afford proximity of scientific investigators and clinicians for free interchange of ideas and knowledge; localize the basic science and clinical research laboratories and nursing units for one disease category on each floor for a coordinated team approach.

Building 10 originally comprised 1.2 million gross square feet of space and housed all patient care and clinical research functions. It was originally distinguished by the double-"Lorraine"-cross floor plan. A curved solarium bay element protrudes from the center at the southern elevation to vertically bisect the building. It provides a distinct image toward the southern portion of the campus.

Although Dr. Masur explained, "The most desired elements were utility and flexibility to meet the ever-changing requirements of laboratory research, patient care and administrative practices," the tremendous advances in technology and biomedical research put pressures on the building which could not have been forecasted. There have been major additions such as Building 10A, built in 1959 to house surgery and now the central vivarium, the Ambulatory Care Research Facility (ACRF), built in 1980 along with an underground parking structure for approximately 1,555 cars, and countless interior modifications have attempted to adapt the building to new demands. The Clinical Center Complex comprises a total of 2,385,000 gross square feet (gsf) (not including 560,000 gsf of garage).

Associated with the construction of the original Clinical Center were Buildings 11 (Power Plant), 12 (Logistics Garage), 13 (Warehouse and Laundry), and 14A-G (Animal Facilities).

1.5.6.2 Mark O. Hatfield Clinical Research Center

At the request of Congress, the National Institutes of Health (NIH) convened an external advisory committee to conduct an in-depth review of NIH's intramural science research program. That committee strongly endorsed the research program and recommended the immediate revitalization of the Clinical Center through construction of a new 242-bed hospital, followed by the phased renovation of the existing Clinical Center.

A new hospital was deemed necessary to replace the aging original facility, whose infrastructure was no longer adequate for cutting-edge research and patient care. The proposed Clinical Research Center would continue to promote translational research (transforming laboratory research into applications for the benefit of patient health and medical care). Congress authorized the design of the new hospital in 1996 and the actual construction in 1997. The CRC was named in honor of former Senator Mark O. Hatfield of Oregon, who supported medical research throughout his Congressional career. The CRC has seven stories with a total of 870,000 gsf (620,000 gsf of hospital space and 250,000 gsf of laboratory and vivarium space). The CRC consist of 242 inpatient beds and 90 day beds. Construction was completed August 2004. The entire Clinical Center Complex consists of 3,255,000 gsf.

The NIH is currently pursuing a multi-stage renovation of vacated and/or obsolete areas in Building 10. The Clinical Center Complex continues to be the focus of intramural clinical research at the NIH.

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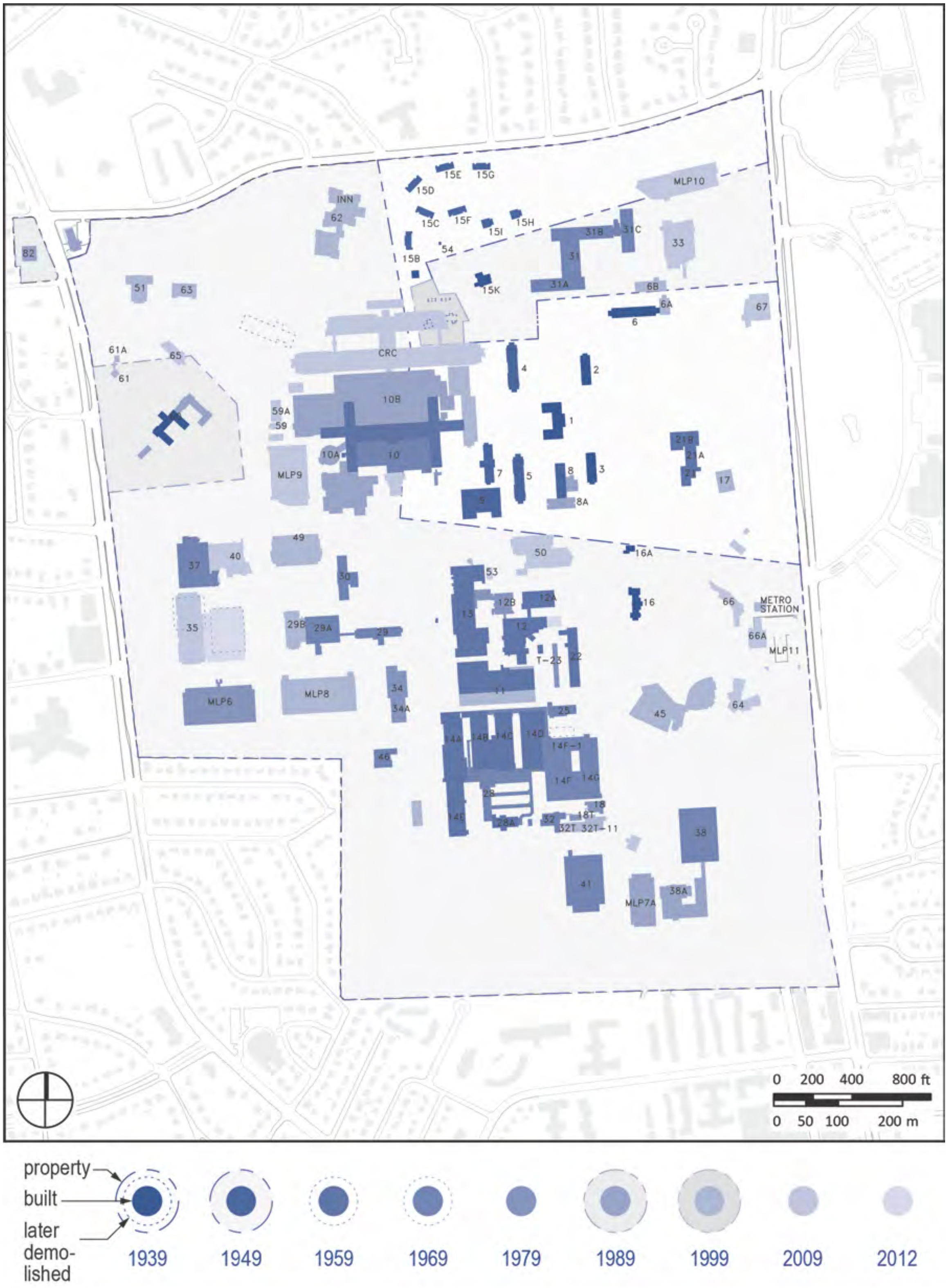

Exhibit 1.5.A. NIH Bethesda Campus Historic Development

1.6 The NIH Organization

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

1.6.1 The Office of the Director (OD)

The Office of the Director is the central office at NIH. The OD is responsible for setting policy for NIH and for planning, managing, and coordinating the programs and activities of all the NIH components. The NIH Director provides overall leadership to NIH activities in both scientific and administrative matters. Although each institute within the NIH has a separate mission, the NIH Director plays an active role in shaping the agency's research agenda and outlook. With a unique and critical perspective on the mission of the entire NIH, the Director is responsible for providing leadership to the institutes for identifying needs and opportunities, especially for efforts that involve several institutes. The NIH Director is assisted by the Principal Deputy Director, who shares in the overall direction of the agency's activities. In carrying out these responsibilities, the NIH Director stays informed about program priorities and accomplishments through regular staff meetings, discussions, and briefing sessions with OD and institute staff. The Director also receives input from:

- the extramural scientific community, including both individual researchers and scientific organizations
- patient advocacy and voluntary health groups that deal directly with NIH or indirectly through Congress and the media
- Congress, the Administration, and the Council of Public Representatives, which brings public views to NIH.

1.6.1.1 The Office of the Chief Information Officer (OCIO)

The Office of the Chief Financial Officer (OCIO) advises the NIH Director on the strategic direction and management of the NIH Information and Information Technology (I&IT) program. It provides leadership for the implementation of these technologies to create the information foundation for efficient and effective scientific research, business operations and management of NIH. The Office also represents NIH on matters of I&IT to external agencies.

1.6.1.2 The Office of Extramural Research (OER)

On behalf of the Director, the Office of Extramural Research provides guidance to institutes in research and training programs conducted through extramural (grant, contract, cooperative agreement) programs.

1.6.1.3 The Office of Intramural Research (OIR)

On behalf of the Director, the Office of Intramural Research coordinates research conducted directly by NIH personnel through intramural programs.

1.6.1.4 The Office of Management (OM)

The Office of Management is located within the NIH Office of the Director and has responsibility for management and financial functions of the NIH.

1.6.1.5 The Office of Administration (OA)

The Office of Administration advises the NIH Director and staff on administration and management; develops and implements policies, and provides oversight in the areas of information resources management, management assessment, grant administration and contract management, procurement, and logistics.

1.6.1.6 The Office of AIDS Research (OAR)

The Office of AIDS research formulates scientific policy for, and recommends allocation of research resources for AIDS research at NIH.

1.6.1.7 The Office of Behavioral and Social Sciences Research (OBSSR)

The Office of Behavioral and Social Sciences Research advises the NIH Director and other key officials on matters relating to research on the role of human behavior in the development of health, prevention of disease, and therapeutic intervention.

1.6.1.8 The Office of Science Policy (OSP)

The Office of Science Policy (OSP) advises the NIH Director on science policy issues affecting the medical research community and participates in the development of new policy and program initiatives. In addition to monitoring and coordinating agency planning and evaluation activities, OSP also plans and implements a comprehensive science education program. OSP is also responsible for developing and implementing NIH policies and procedures for the safe conduct of recombinant DNA and other biotechnology activities.

1.6.1.9 The Office of Communications and Public Liaison (OCPL)

The Office of Communications and Public Liaison (OCPL) is responsible for communicating information on NIH programs and activities to the public, the media, the scientific and medical communities, and public advocacy groups.

1.6.1.10 The Office of Community Liaison (OCL)

The Office of Community Liaison advises the Director, plans, directs and oversees activities to promote collaboration between NIH and its community, and ensures effective communication on policy and programs involving the community.

1.6.1.11 The Office of Disease Prevention (ODP)

The Office of Disease Prevention coordinates NIH activities regarding the application of research to disease prevention, nutrition and medical practice.

1.6.1.12 The Office of Intramural Training and Education (OITE)

The Office of Intramural Training and Education provides a comprehensive guide to postdoctoral training opportunities available at the NIH.

1.6.1.13 The Office of Equal Opportunity and Diversity Management (OEODM)

The Office of Equal Opportunity advises the Director and NIH staff on matters related to equal employment opportunity programs and policies.

1.6.1.14 The Office of Financial Management (OFM)

The Office of Financial Management advises the NIH Director and staff and provides leadership and direction for NIH financial management activities; develops policies and instructions for budget preparation and presentation, administers allocations of funds, and manages a system of fund and budgetary controls.

1.6.1.15 The Office of Human Resources (OHR)

The Office of Human Resources advises the NIH Director and staff on human resource management; directs central human resource management services; and provides NIH leadership and planning on human resource program development.

1.6.1.16 The Office of Research Services (ORS)

The Office of Research Services plans and directs service programs for public safety and security operations, scientific and regulatory support programs, and a wide variety of other program and employee services. The ORS advises the NIH Deputy Director for Management and other NIH senior staff on the management and delivery of technical and administrative services in support of the NIH research mission.

1.6.1.17 The Office of Research Facilities (ORF)

The NIH Office of Research Facilities supports the NIH mission by providing, maintaining, and operating safe, healthy, and attractive facilities. ORF operates as a "Central Service" and reports directly to the Office of Management in the Office of the Director.

1.6.1.18 The Office of Technology Transfer (OTT)

The Office of Technology Transfer evaluates, protects, licenses, monitors, and manages the wide range of NIH and FDA intramural discoveries and inventions. OTT also serves as the lead office for the development of intramural and extramural technology transfer policy for NIH.

1.6.1.19 The Office of Legislative Policy and Analysis (OLPA)

The Office of Legislative Policy and Analysis (OLPA) serves as the principal office within the Office of the Director (OD), NIH, for providing legislative analysis, policy development, and liaison with the Congress. OLPA facilitates and enhances the relationship between NIH and the Congress; advances NIH legislative priorities; and ensures that the NIH community receives essential information, advice, and guidance regarding developments in the Congress that affect NIH.

1.6.1.20 The Office of Research on Women's Health (ORWH)

The Office of Research on Women's Health (ORWH) serves as a focal point for women's health research at the NIH. The ORWH promotes, stimulates, and supports efforts to improve the health of women through biomedical and behavioral research. ORWH works in partnership with the NIH institutes and centers to ensure that women's health research is part of the scientific framework at NIH and throughout the scientific community.

1.6.1.21 Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI)

In implementing the requirements of the NIH Health Reform Act of 2006, the NIH formally establish the Division of Program Coordination, Planning, and Strategic Initiatives (DPCPSI) within the Office of the Director (OD). Activities directed by DPCPSI include:

- Identifying emerging scientific opportunities, rising public health challenges, or scientific knowledge gaps that merit further research
- Developing and applying resources (databases, analytic tools, and methodologies) and producing specifications for new resources in support of portfolio analyses and priority setting in scientific areas across NIH
- Assisting the NIH to address areas of emerging scientific opportunities and public health challenges effectively
- Planning, supporting, and providing technical assistance in the development of program evaluations comprising:
    - NIH-wide program and project evaluations
    - Planning and reporting required by the Government Performance and Results Act (GPRA) and other government-wide performance efforts.

The Division also coordinates research and activities related to research on AIDS, behavioral and social sciences, women's health, disease prevention, dietary supplements, and research infrastructure. DPCPSI incorporates all of the functions of the former Office of Portfolio Analysis and Strategic Initiatives (OPASI) and the OD Program Offices, and includes a new office on strategic coordination.

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1.6.2 NIH Institutes

1.6.2.1 National Cancer Institute (NCI)

(Est. 1937) NCI leads a national effort to eliminate the suffering and death due to cancer. Through basic and clinical biomedical research and training, NCI conducts and supports research that will lead to a future in which we can prevent cancer before it starts, identify cancers that do develop at the earliest stage, eliminate cancers through innovative treatment interventions, and biologically control those cancers that we cannot eliminate so they become manageable, chronic diseases.

1.6.2.2 National Eye Institute (NEI)

(Est. 1968) NEI conducts and supports research that helps prevent and treat eye diseases and other disorders of vision. This research leads to sight-saving treatments, reduces visual impairment and blindness, and improves the quality of life for people of all ages. NEI-supported research has advanced our knowledge of how the eye functions in health and disease.

1.6.2.3 National Heart, Lung, and Blood Institute (NHLBI)

(Est. 1948) NHLBI provides leadership for a national program in diseases of the heart, blood vessels, lung, and blood; blood resources; and sleep disorders. Since October 1997, the NHLBI has also had administrative responsibility for the NIH Woman's Health Initiative. The Institute plans, conducts, fosters, and supports an integrated and coordinated program of basic research, clinical investigations and trials, observational studies, and demonstration and education projects.

1.6.2.4 National Human Genome Research Institute (NHGRI)

(Est. 1989) NHGRI is devoted to advancing health through genome research. The Institute led NIH's contribution to the Human Genome Project, which was successfully completed in 2003 ahead of schedule and under budget. Building on the foundation laid by the sequencing of the human genome, NHGRI's work now encompasses a broad range of research aimed at expanding understanding of human biology and improving human health. In addition, a critical part of NHGRI's mission continues to be the study of the ethical, legal and social implications of genome research.

1.6.2.5 National Institute on Aging (NIA)

(Est. 1974) NIA leads a national program of research on the biomedical, social, and behavioral aspects of the aging process; the prevention of age-related diseases and disabilities; and the promotion of a better quality of life for all older Americans.

1.6.2.6 National Institute on Alcohol Abuse and Alcoholism (NIAAA)

(Est. 1970) NIAAA conducts research focused on improving the treatment and prevention of alcoholism and alcohol-related problems to reduce the enormous health, social, and economic consequences of this disease.

1.6.2.7 National Institute of Allergy and Infectious Diseases (NIAID)

(Est. 1948) NIAID research strives to understand, treat, and ultimately prevent the myriad infectious, immunologic, and allergic diseases that threaten millions of human lives.

1.6.2.8 National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)

(Est. 1986) NIAMS supports research into the causes, treatment, and prevention of arthritis and musculoskeletal and skin diseases, the training of basic and clinical scientists to carry out this research, and the dissemination of information on research progress in these diseases.

1.6.2.9 National Institute of Biomedical Imaging and Bioengineering (NIBIB)

(Est. 2000) NIBIB improves health by promoting fundamental discoveries, design and development, and translation and assessment of technological capabilities in biomedical imaging and bioengineering, enabled by relevant areas of information science, physics, chemistry, mathematics, materials science, and computer sciences.

1.6.2.10 Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD)

(Est. 1962) NICHD research on fertility, pregnancy, growth, development, and medical rehabilitation strives to ensure that every child is born healthy and wanted and grows up free from disease and disability.

1.6.2.11 National Institute on Deafness and Other Communication Disorders (NIDCD)

(Est. 1988) NIDCD conducts and supports biomedical research and research training on normal mechanisms as well as diseases and disorders of hearing, balance, smell, taste, voice, speech, and language that affect 46 million Americans.

1.6.2.12 National Institute of Dental and Craniofacial Research (NIDCR)

(Est. 1948) NIDCR provides leadership for a national research program designed to understand, treat, and ultimately prevent the infectious and inherited craniofacial-oral-dental diseases and disorders that compromise millions of human lives.

1.6.2.13 National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)

(Est. 1950) NIDDK conducts and supports basic and applied research and provides leadership for a national program in diabetes, endocrinology, and metabolic diseases; digestive diseases and nutrition; and kidney, urologic, and hematologic diseases. Several of these diseases are among the leading causes of disability and death; all seriously affect the quality of life of those who have them.

1.6.2.14 National Institute on Drug Abuse (NIDA)

(Est. 1973) NIDA leads the nation in bringing the power of science to bear on drug abuse and addiction through support and conduct of research across a broad range of disciplines and rapid and effective dissemination of results of that research to improve drug abuse and addiction prevention, treatment, and policy.

1.6.2.15 National Institute of Environmental Health Sciences (NIEHS)

(Est. 1969) NIEHS reduces the burden of human illness and dysfunction from environmental causes by, defining how environmental exposures, genetic susceptibility, and age interact to affect an individual's health.

1.6.2.16 National Institute of General Medical Sciences (NIGMS)

(Est. 1962) NIGMS supports basic biomedical research that is not targeted to specific diseases. NIGMS funds studies on genes, proteins, and cells, as well as on fundamental processes like communication within and between cells, how our bodies use energy, and how we respond to medicines. The results of this research increase our understanding of life and lay the foundation for advances in disease diagnosis, treatment, and prevention. NIGMS also supports research training programs that produce the next generation of biomedical scientists, and it has special programs to encourage underrepresented minorities to pursue biomedical research careers.

1.6.2.17 National Institute of Mental Health (NIMH)

(Est. 1949) NIMH provides national leadership dedicated to understanding, treating, and preventing mental illnesses through basic research on the brain and behavior, and through clinical, epidemiological, and services research.

1.6.2.18 National Institute on Minority Health and Health Disparities (NIMHD)

(Est. in 2010) The mission of NIMHD is to promote minority health and to lead, coordinate, support, and assess the NIH effort to reduce and ultimately eliminate health disparities. In this effort NIMHD will conduct and support basic, clinical, social, and behavioral research, promote research infrastructure and training, foster emerging programs, disseminate information, and reach out to minority and other health disparity communities.

1.6.2.19 National Institute of Neurological Disorders and Stroke (NINDS)

(Est. 1950) The mission of the NINDS is to reduce the burden of neurological diseases, a burden borne by every age group, every segment of society, and people all over the world. To accomplish this goal the NINDS supports and conducts research, both basic and clinical, on the normal and diseased nervous system, fosters the training of investigators in the basic and clinical neurosciences, and seeks better understanding, diagnosis, treatment, and prevention of neurological disorders.

1.6.2.20 National Institute of Nursing Research (NINR)

(Est. 1986) NINR supports clinical and basic research to establish a scientific basis for the care of individuals across the life span--from the management of patients during illness and recovery to the reduction of risks for disease and disability; the promotion of healthy lifestyles; the promotion of quality of life in those with chronic illness; and the care for individuals at the end of life. This research may also include families within a community context, and it also focuses on the special needs of at-risk and under-served populations, with an emphasis on health disparities.

1.6.2.21 National Library of Medicine (NLM)

(Est. 1956) NLM collects, organizes, and makes available biomedical science information to scientists, health professionals, and the public. The Library's Web-based databases, including PubMed/Medline and MedlinePlus, are used extensively around the world. NLM conducts and supports research in biomedical communications; creates information resources for molecular biology, biotechnology, toxicology, and environmental health; and provides grant and contract support for training, medical library resources, and biomedical informatics and communications research.

1.6.3 NIH Centers

1.6.3.1 Center for Information Technology (CIT)

(Est. 1964) CIT incorporates the power of modern computers into the biomedical programs and administrative procedures of the NIH by focusing on three primary activities: conducting-computational biosciences research, developing computer systems, and providing computer facilities. The CIT combines the functions of the formerly separate DCRT, OIRM, and TCB).

1.6.3.2 Center for Scientific Review (CSR)

(Est. 1946) CSR is the focal point at NIH for initial peer reviews, the foundation of the NIH grant and award process. The Center carries out peer review of the majority of research and research training applications submitted to the NIH. In addition, the Center serves as the central receipt point for all such Public Health Service (PHS) applications and makes referrals to scientific review groups for scientific and technical merit review of applications and to funding components for potential award. To this end, the Center develops and implements innovative, flexible ways to conduct referral and review for all aspects of science.

1.6.3.3 John E. Fogarty International Center for Advanced Study in the Health Sciences (FIC)

(Est. 1968) FIC promotes and supports scientific research and training internationally to reduce disparities in global health.

1.6.3.4 National Center for Complementary and Alternative Medicine (NCCAM)

(Est. 1999) NCCAM is dedicated to exploring complementary and alternative medical (CAM) practices in the context of rigorous science; training CAM researchers and disseminating authoritative information.

1.6.3.5 National Center for Advancing Translational Science (NCATS)

(Est. 2012) The National Center for Advancing Translational Sciences will bridge the gap between scientific research and usable drugs or medical devices.

1.6.3.6 NIH Clinical Center (CC)

(Est. 1953) CC is the clinical research facility of the National Institutes of Health. As a national resource, it provides the patient care, services, and environment needed to initiate and support the highest quality conduct of and training in clinical research.

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1.7 The Master Plan Goals and Objectives

The 2013 Comprehensive NIH Bethesda Campus Master Plan, like the 2003 Update, maintains the 1995 Master Plan goals to provide a realistic and orderly phased development of the Bethesda campus in furtherance of the mission of the NIH. - *Science in pursuit of knowledge to improve human health.* This means pursuing science to expand fundamental knowledge about the nature and behavior of living systems; to apply that knowledge to improve health and extend human lives; and to reduce the burdens resulting from disease and disability.

1.7.1 Goals and Objectives

The NIH seeks to accomplish its mission by:

- fostering fundamental discoveries, innovative research, and their applications in order to advance the nation's capacity to protect and improve health;
- developing, maintaining, and renewing the human and physical resources that are vital to ensure the nation's capability to prevent disease, improve health, and enhance quality of life;
- expanding the knowledge base in biomedical and associated sciences in order to enhance America's economic well-being and ensure a continued high return on the public investment in research; and
- exemplifying and promoting the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science.

The Master Plan supports these mission implementation strategies with the following planning goals and objectives:

1.7.1.1 GOAL 1

Foster innovative research to improve the nation's health.

- Establish a comprehensive and coordinated approach to physical development of NIH that is based on cost-effective, incremental options for growth while ensuring orderly development of the campus.
- Stimulate interaction and communications among

scientists and staff to enhance quality of research and opportunities for interdisciplinary collaboration through adjacency of uses and creation of formal and informal meeting and gathering spaces on campus.

- Create a flexible development plan that will allow for changing program needs in the future.
- Organize campus into research clusters which will aide in applying high throughput technologies to understand fundamental biology, to uncover the causes of specific diseases; translating basic science discoveries into new and better treatments; and reinvigorating and empowering the biomedical research community.
- New research buildings proposed in the master plan will be multi-institute and flexible to facilitate the creation of centers of science such as the Porter Neuroscience Center and new Immunology Center to further scientific collaboration.
- Consider potential impacts of changes in technology and advances in research processes.

1.7.1.2 GOAL 2

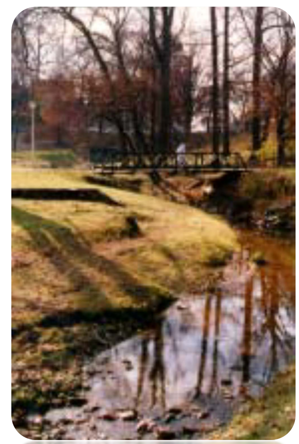
Support the evolving requirements for biomedical research and education.

- Establish a comprehensive and coordinated approach to physical development at NIH that will ensure the orderly growth of NIH facilities.
- Develop building sites, open space, and transportation and circulation systems that will ensure appropriate campus facility utilization, functional land use and efficient accommodation of future program requirements.
- Identify short, mid, and long-term opportunities for phasing and implementation of the proposed policies and plans.
- Enhance campus function, efficiency and character through better definition of land use and functional relationships.
- Establish a coordinated land use strategy for the campus integrating plans for functions at off-campus sites.
- Define overall development capacity.
- Identify patterns of existing development and factors which potentially limit future development.
- Define an achievable development strategy.

1.7.1.3 GOAL 3

Provide a secure and supportive environment for the people involved in NIH activities, including scientists, professional/administrative staff, patients, visitors and residents.

- Provide appropriate campus amenities such as child care, recreational resources, fitness facilities, convenience retail, etc.
- 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, site lighting, security and mitigating vulnerabilities through campus and building design.
- Enhance the quality of the research and work environment and overall campus quality.
- Preserve and build upon the character of the NIH campus.
- Provide guidelines for improving the quality of landscaping, open space, and architectural compatibility at NIH.
- Provide barrier free accessibility to campus facilities for persons with disabilities.
- Improve and enhance the pedestrian environment and linkages, and create a pedestrian scale within the larger site.



- Preserve and enhance structures with established historic and cultural value, and protect and document important archeological finds.
- Increase the ease of orientation and direction-finding around the campus.
- Improve pedestrian and bicycle movement on campus.
- Define and communicate building character and scale to achieve a perceivable and attractive identity.

1.7.1.4 GOAL 4

Respect the stability and integrity of the surrounding residential community.

- Conserve the campus perimeter buffer zones, especially bordering the residential areas.
- Coordinate with and respond to various regulatory and review agencies.
- Engage the NIH, local agencies, and the community in an active dialogue concerning Master Plan premises and concepts. Establish the scale and height of future NIH facilities so that they have no adverse impact on adjoining neighborhoods or cultural resources.

- Minimize intrusion of NIH traffic, parking, noise, and light into adjoining neighborhoods.
- Endeavor to ensure that the NIH and its activities do not contribute to security or safety issues in adjoining neighborhoods.
- Foster effective transportation solutions to minimize traffic and parking problems both external and internal.

1.7.1.5 GOAL 5

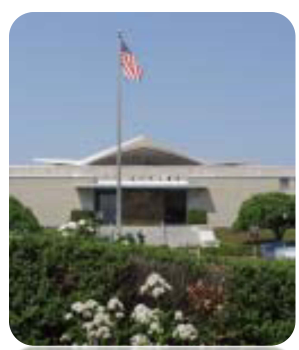
Protect the environment of the NIH campus and the region.

- Promote Federal, HHS and NIH sustainability goals
- Identify and build upon the unique environmental qualities of the campus and enhance existing landscaping and vegetation.
- Encourage the use of public transportation and shared transportation, and reduce the use of the single occupancy vehicle.
- 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.
- Promote energy efficiency.
- Improve management of storm water runoff quality and quantity.
- Improve facilities for storage and handling of hazardous materials.
- Encourage environmentally sound development.

1.7.1.6 GOAL 6

Foster communication about NIH goals and policies.

- Encourage active dialogue among NIH management, the scientific community and the NIH staff, to foster a better understanding of the ramifications of proposed policies and plans.
- Continue active dialogue among NIH and the surrounding community as well as local, state, and federal agencies to work together on issues that affect the community and region.



1.7.1.7 GOAL 7

Meet the Federal Real Property Council's Performance Measures.

- Mission Dependency
- Condition Index
- Facility Utilization
- Operations and Maintenance Costs
- Disposal of Unneeded Assets

1.8 Planning Premises

1.8.1 Building and Land Use

1.8.1.1 Research Facilities

Research facilities fall into three major categories: biomedical research laboratories, animal research facilities and clinical research facilities. In order to reduce its lease portfolio and reduce high operating cost for lease research facilities NIH seeks to dispose of leased research space except quasi commercial laboratories and construct new biomedical research laboratories and animal research facilities on the Bethesda campus.

1.8.1.2 Administrative Facilities

Administrative facilities are a significant component of the Bethesda campus. There are a large number of administrative personnel in the Office of the Director for NIH and its institutes that supports NIH intramural and extramural programs. Administrative facilities are personnel intensive.

However, some of the historic laboratory buildings on the NIH Campus cannot be renovated into modern laboratories due to limited floor to floor heights and constructed floor plates. The logical reuse for these structures is administrative use. The recently completed Building 3 ARRA project is a good example of this adaptive reuse. It was a laboratory facility and was renovated into administrative space. When adaptive reuse sites become available, NIH will construct new administrative space through adaptive reuse of historic structures. These spaces will comply with the HHS mandated utilization rate and will bring some administrative staff to campus from surrounding lease facilities.

Replacement of existing administrative buildings on campus should not increase existing space except, in the rare situation, when an institute does not currently have core staff on the Bethesda campus. Replacement of existing administrative buildings and tightening the utilization rate of administrative space, as dictated by HHS mandate, should offset the need for new administrative leases.

1.8.1.3 Biomedical Research Education Facilities

Located at the NIH Bethesda campus are the National Library of Medicine (NLM) and John E. Fogarty International Center for Advanced Study in the Health Sciences (FIC). FIC promotes and supports scientific research and training internationally to reduce disparities in global health. NIH is currently renovating building 16-A for FIC.

1.8.1.4 Residential Facilities

Residential use consists of low-density quarters including the Surgeon General's house. There are two medium density residential (hotel) facilities: the Children's Inn and the Family Lodge. These facilities accommodate Clinical Center patients and their families while they are on the Bethesda Campus. Residential facilities are not expected to grow.

1.8.1.5 Amenities

Amenities are for the convenience of NIH employees, on-site contractors, visitors and patients. Amenities such as cafeterias, recreation and welfare (R & W), NIH federal credit unions (NIHCU), and child care centers are scattered throughout the campus. Some are in standalone facilities (i.e. childcare centers and a fitness center) others are housed in laboratory, clinical and administrative buildings (i.e. NIHCU, R & W, and cafeterias). Amenities are expected to grow in proportion to the employee population and will be included as part of planning renovations and new buildings.

1.8.1.6 Support Facilities

Support facilities consist of mixed-waste facilities, storage facilities, and crafts shops. Some of the support facilities need to be replaced due to their location or their poor condition.

1.8.1.7 Public Safety Facilities

Public safety facilities include the NIH fire station, police station and other physical security facilities. The NIH police are located in Building 31. The FWG has approved the eventual demolition of Building 31. Therefore, a new location for the NIH police station will be necessary.

1.8.1.8 Utility Facilities

NIH is the size of a small city and it has its own central utilities. NIH generates steam and chilled water through district heating and cooling plants. It has a co-generation plant that supplements NIH's electrical power needs. This master plan proposes constructing biomedical research laboratories and animal research facilities on the Bethesda Campus to replace expensive leased facilities. These proposed facilities are energy intensive. As a result, NIH may need to expand its steam, chilled water and electrical generation capacity.

NIH engineers continue to explore ways to improve the campus's Continuity of Operations and to improve sustainability. One concept that has been studied and is incorporated into this Master Plan is underground potable and chilled water storage tanks. See section 5.4 for additional information.

Furthermore, the Administration is requiring agencies to consolidate their data centers. Consolidation may have an impact on the development of the Bethesda campus and require a utility expansion.

1.8.1.9 Parking

One of the planning premises of this master plan is to consolidate surface parking in favor of structured parking, which should be at the periphery of the campus. There are several reasons for these premises:

- Security: After the Oklahoma bombing, the DOJ started to survey federal facilities for security concerns. One result was a HHS OIG report from 2002 that made significant changes to NIH's security program (Office of Inspector General April, 2002, Review of the Physical Security at the NIH, Bethesda, MD.). Another was the Interagency Security Committee's (ISC) report and their standpoint on parking. The context for parking from the ISC is to reduce parking in close proximity to buildings, control it through entry control point screening and controlled parking facilities. Additional structured parking assists in NIH's continued effort to move surface parking away from our buildings for security concerns and to increase public safety/pedestrian safety in the core of the campus.

- Buildable sites: The other rationale, for a portion of the structured parking, is to clear buildable sites for new facilities. For example, Lot 10 (south of Building 10) is an ideal location for a pedestrian mall, with two underground tanks beneath it. Relocation of this surface parking would create an ideal site due to its proximity to the Central Utility Plant and the lack of utilities underneath it.

- **Transportation management:** As the employee population grows so will the need for structured parking at the ratio of 0.5 spaces per employee in accordance with the NIH Transportation Management Plan (TMP).[17]

1.8.1.9.1 NIH 1991 Transportation Management Plan (TMP)

The TMP is supported by a 1992 Memorandum of Understanding ((MOU) by and among NCPC, the Montgomery County Planning Board, and NIH. NIH has implemented every short term strategy and every long term strategy contained in the TMP; and has met and exceeded all of the TMP goals. The applicable NCPC Comprehensive Plan goal - “suburban areas within 2,000 feet of Metrorail” – would normally apply to the NIH-Bethesda Campus, which is the 1:3/0.33 employee parking ratio; however, a less stringent, 0.50 spaces per employee standard has historically been applied to NIH-Bethesda Campus under a 1992 MOU between NIH, NCPC, and M-NCPPC.

The NIH Transportation Management Plan has three stated goals:

(1) improve the availability of parking spaces on campus for NIH personnel and visitors;
(2) mitigate the traffic impacts of further campus development on the roadways serving the NIH campus such that the level of congestion along the roadways serving NIH is made no worse than if such development did not occur;
(3) maintain a "good neighbor" relationship with the surrounding community

NIH results are unmistakable:

(1) NIH has conducted biannual traffic counts at all of campus access points which demonstrate that NIH has decreased, by 30 percent or more, the number of NIH-generated vehicles on the roads that surround Bethesda campus below the 1991 baseline numbers, even though campus population has increased;
(2) NIH has maintained a good neighbor policy by implementing a Community Liaison Council (CLC) which provides a forum for community concerns to be heard and addressed expeditiously;
(3) the availability of parking on Bethesda campus is generally satisfactory.

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[17] Transportation Management Plan for the National Institutes of Health Bethesda Campus, April 1991.

Parking space allocation on campus for NIH employees will continue to be integrated with the TMP to reduce the use of the single occupancy vehicle as a transportation mode to and from the campus. Employee parking will favor multi-occupant vehicles and disabled drivers, and provide for NIH employees traveling from other NIH sites not served by shuttle bus.

1.8.2 Open Space

The open space premises of the 2003 Bethesda Master Plan Update are affirmed and enhance in the 2013 Bethesda Master Plan.

- A continuous open space system will continue to be developed to enhance the sense of unity, order and scale on the campus. A central mall area will be created for informal as well as organized outdoor activities.
- The buffer zone around the periphery will be retained at a width of 250 feet from the NIH property line.
- Landscaped elements of special value will be preserved and additional landscaping, signage, and street furniture will be developed to enhance the working environment.
- Historic resources and their environmental settings will be respected.
- Where there are opportunities to develop large sites NIH will cluster facilities around pedestrian oriented entrance plazas or vest pocket parks to restrict vehicle access.

1.8.3 Architectural Image

The architecture image of buildings shall be of the highest aesthetic quality to preserve and enhance the beauty and order of the NIH Bethesda campus. This is accomplished by promoting high quality site planning and architectural designs which are in harmony with surrounding uses on the campus and encouraging architectural designs that are compatible with the existing campus fabric in terms of architectural style and character, massing, color, materials, and the quality of open space.[18]

1.8.4 Adaptive Reuse and Renovation of Existing Buildings

Employ adaptive reuse of older and historic structures where practical to extend the useful life of existing structures. Over time there are changes in technology, codes and standards or procedures that will render a facility functionally obsolete. Functional obsolescence does not mean that the structure cannot be used for other purposes. Adaptive reuse allows NIH

[18] NIH Architectural Design Review Board Charter

to maintain significant historic structures and meet sustainability goals. Some historic laboratory and shop buildings on the Bethesda Campus such as Building 2, 3, and 13 have been adapted to new administrative uses in the last decade.

1.8.5 Transportation/Vehicular Circulation

Placement of buildings and design of pedestrian pathways and bicycle routes that will favor the Metrorail/Metrobus/Ride-On Medical Center Metro Station will be done in a way that encourages use of mass-transit as much as possible. A well-defined road system with a primary distributor network carrying the bulk of vehicular traffic and a network of secondary roads providing service accessibility will be established to increase efficiency, orient the visitor, and protect both open space and pedestrian corridors.

Traffic impacts of future campus development will be mitigated on the surrounding roadways serving the NIH campus to the maximum extent possible. Shuttle bus service will be improved to both on-campus and off-campus sites.

1.8.6 Pedestrian Circulation

The planning intent is to provide for orderly, efficient and safe pedestrian pathways between buildings and transportation nodes. The pedestrian character of the campus of the campus is important as many employees walk between buildings throughout the day and evening. Where possible, separating pedestrian circulation from vehicular circulation is a goal of the master plan.

1.8.7 Operating Cost Reduction

NIH plans to reduce operating costs by replacing leased space with government owned space while disposing of unneeded assets. NIH will adapt and reuse older laboratory facilities with less energy intensive uses such as administrative functions. Construction of new sustainable research facilities to replace older, outdated, non-sustainable research facilities will be sought as resources permit.

1.8.8 Population Growth

The primary growth on the Bethesda campus is expected to be in intramural research personnel. The 2003 NIH Bethesda Campus master plan update projected for a total population of 22,000 by 2020.

Currently, federal agencies are pressured to reduce operating cost and NIH's highest operating cost is leased space. The logical solution is to move leased functions to campus. At the same time, the current Administration is requiring federal agencies to reduce their real property footprint and greenhouse gas emission (carbon footprint). These factors were all considered to determine the optimal population and program for the Bethesda Campus.

1.8.9 Improve Building Performance

NIH will improve building energy usage performance in accordance with the Federal Real Property Council's "Performance Measures". The Federal Real Property Councils Performance Measures includes: mission dependency (right mission), utilization (right size), condition (right condition) operating cost (right cost); and disposal of unneeded real property assets.

In support of the National Institutes of Health's mission to apply knowledge to "extend healthy life", the Master Plan for Bethesda campus seeks to create a healthy human environment that is restorative to the health of the natural world. The Master Plan goes beyond the minimum standard of limiting the impacts on the site and the environment and seeks to create a sustainable campus. The NIH Bethesda Master Plan integrates sustainability policies outlined by HHS.

1.9 Program Premises

1.9.1 Five Key Research Themes for the National Institutes of Health

Dr. Francis Collins, the NIH Director, has outlined five key themes for NIH[19] in the Biennial Report of the Director of the National Institutes of Health Fiscal Years 2008 & 2009:

(1) Applying Genomics and Other High Throughput Technologies;
(2) Translating Basic Science Discoveries into New and Better Treatments;
(3) Using Science to Enable Health Care Reform;
(4) Focus on Global Health; and
(5) Reinvigorating and Empowering the Biomedical Research Community.

[19] Biennial Report of the Director, National Institutes of Health Fiscal Years 2008 & 2009

Emphasizing collaboration, new technologies, and biomedical education, these themes serve as the program premises for the Master Plan. The Master Plan will seek to cluster research facilities that foster "Centers of Science" to promote these themes, described in more detail below:

(1) Applying Genomics and Other High Throughput Technologies.
In the past, many basic biomedical science projects were limited in scope to some aspect of genetics, cell biology, or physiology. The revolution now sweeping the field is the ability to be comprehensive. For example, to define all of the genes of the human, model organisms or the human micro biota, all of the human proteins and their structures, or all of the major pathways for signal transduction in the cell. Technologies contributing to these advances, many of which became practical at scale only in the last few years, include DNA sequencing, microarray technology, nanotechnology, small molecule screening capabilities, new imaging modalities, and computational biology. These comprehensive approaches coupled with systems-level integration, analysis and mining of large datasets now hold the promise of major advances in the understanding of the mechanisms of diseases.

(2) Translating Basic Science Discoveries into New and Better Treatments.
Armed with a wealth of basic science discoveries and an understanding of the pathophysiology of various diseases, we are embarking on the next frontier in designing new diagnostic and therapeutic strategies. Molecular and cellular insights into a disease can be developed into screening assays on hundreds of thousands of compounds, and tested in disease models to identify the most promising leads that can sustain the drug development pipeline and attract public-private partnerships for further pursuits. Additional pathways to therapeutics from gene therapy, biologics, and stem cells (including IPS cells) are also showing great promise. The opportunity is here for translational science to develop small molecule-based, gene-based, protein/peptide-based and cell-based therapies for common as well as rare diseases.

(3) Using Science to Enable Health Care Reform.
Quality, affordable health care for all Americans cannot occur without significant advances in the underlying science that will enable effective and efficient disease prevention and diagnosis, as well as better and cheaper treatments to be identified. Clinical research targeted toward health disparities, social and behavioral factors, large-scale prospective population cohort analysis, comparative effectiveness, cost-effective prevention and personalized medicine, and pharmacogenomics will allow

us to assess and mitigate disease risks, predict outcome and optimize treatment. Health services research that includes health information technology and health research economics will enhance the safety, quality and efficiency of the health care delivery system, as well as facilitate health promotion.

(4) Focus on Global Health.
The NIH has a long tradition of supporting the discovery phase of solutions to major global health challenges, and recent scientific advances in genomics, small molecule screening technologies, and vaccine development portend the possibility of further major impacts on some of the most challenging and harmful diseases worldwide. This theme encourages a greater focus on global health and new emphasis on formulating prevention and intervention strategies to tackle a number of infectious and parasitic diseases, chronic non-communicable diseases and injuries, and other neglected diseases striking the developing world, with the goal to reduce morbidity and mortality associated with these diseases worldwide.

(5) Reinvigorating and Empowering the Biomedical Research Community.
The lifeblood of biomedical research in the United States rests upon the talent and dedication of its scientists and the support of innovative research. This theme encourages investigators to cultivate new collaborations and to assemble multidisciplinary or interdisciplinary teams in conducting innovative research on the most challenging biomedical and behavioral areas. The goal is to strengthen our research capacity, to broaden our research base and to enhance cross-fertilization of disciplines by recruiting new investigators and new expertise into the research community, and by developing and retaining these talents in a collaborative environment that fosters creativity and exploration.

1.9.2 Campus and Lease Space Realignment

The construction of Porter Neuroscience Research Center II and the US Food and Drug Administration moving their research programs to White Oak will make available a substantial amount of research space on campus in the near term. This major increase in the Director’s Reserve space provides opportunities for NIH to better align its research space within its existing facilities.

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END OF CHAPTER 1.

U.S. Department of Health and Human Services

National Institutes of Health

Chapter 2
NIH Bethesda Campus and its Region

Prepared by the Division of Facilities Planning
Office of Research Facilities

06-14-2013

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2 NIH Bethesda Campus and its Region

2.1 Geography and Jurisdiction

2.1.1 General: Baltimore Washington Consolidated Metropolitan Statistical Area

The NIH main campus is located in Montgomery County, Maryland, one of the largest jurisdictions in the Baltimore Washington Consolidated Metropolitan Statistical Area (CMSA).

This CMSA encompasses both the Baltimore and Washington Statistical Metropolitan Areas, embracing an area of nearly 9,600 square miles circumscribed by a 75-mile radius around downtown Washington, D.C. It includes communities from the Pennsylvania border to Calvert and Charles Counties in southern Maryland, and southward in Virginia to Fredericksburg and Spotsylvania Counties (nearly to the edge of metropolitan Richmond). From Queen Anne's County, Maryland, on the eastern shore of the Chesapeake Bay, the CMSA extends westward beyond the City of Hagerstown and Washington County in western Maryland to Berkeley and Jefferson Counties in West Virginia.

The area is expanding at a rapid rate - with a 2000 Census population of 7,608,070 - with communities and employment spreading over an ever-widening geographic area. This spread can also be seen in the residential location patterns of NIH employees and the broad area benefitting from NIH's procurement of goods and services. It is the most highly educated highest-income, and fourth largest Combined Statistical Area in the United States.[1]. See Exhibit 2.1.A.

[1] CSA Media household income

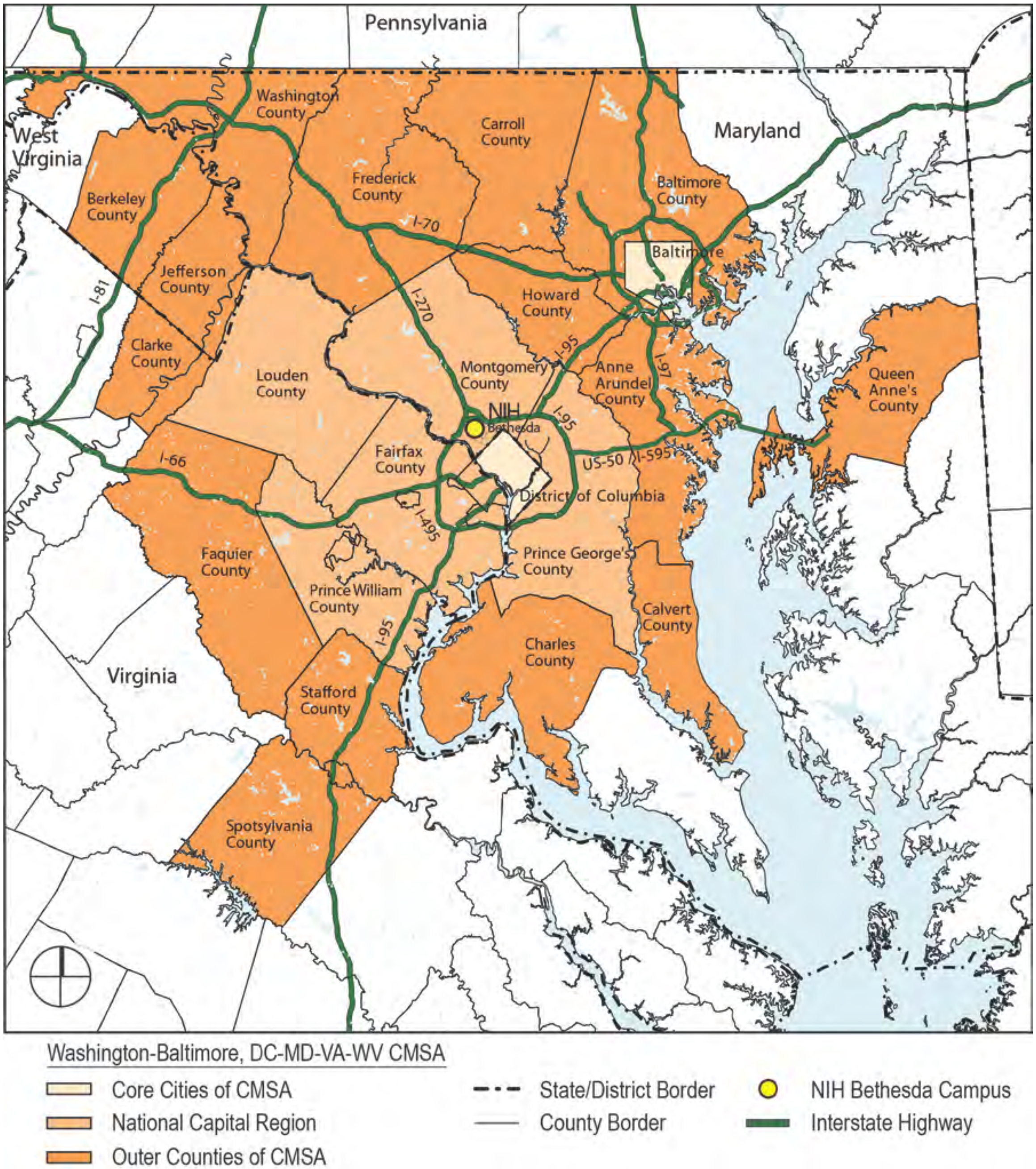

Exhibit 2.1.A. Consolidated Metropolitan Statistical Area Map

2.1.2 Other NIH Facilities in the Region

2.1.2.1 Johns Hopkins Bayview Campus, Baltimore, Maryland

NIH Bayview Research Center (BRC) is the home of the National Institute on Aging (NIA) and the National Institute on Drug Abuse (NIDA). Located on Johns Hopkins' Bayview campus in east Baltimore, it is a lease-construction project, commonly referred to as "build-to-suit" adopting the industry's best practices. NIH also leases space in the "Triad Building" on the Bayview campus.

2.1.2.2 Frederick Cancer Research and Development Center

The Frederick Cancer Research and Development Center (FCRDC) is located at Fort Detrick, MD. This center consists of 102 buildings located on 68.61 acres in Frederick. The primary Institutes located there are the National Cancer Institute (NCI), the National Institute of Allergy and Infectious Diseases (NIAID) and the National Institute of Neurological Disorders and Stroke (NINDS).

2.1.2.3 National Institutes of Health Animal Center, Dickerson, Maryland

The Division of Veterinary Resources (DVR) operates a specialized laboratory animal center situated on 513 acres of farm land located eight miles southwest of Poolesville, MD, near the Potomac River. The land was purchased in 1960. A construction program to provide permanent buildings and facilities began in 1962.

The NIHAC is a major extension of the animal holding and production facilities at Bethesda. The size and character of the animal population varies in response to changes in research programs. NIHAC has facilities that can accommodate non-human primates, rodents, dogs, sheep, swine, goat, horses and cattle.

The NIHAC is in a rural and remote area it is an excellent location for animal research facilities. On the other hand, because it is rural and remote it is inconvenient for researchers to get to and from the facility. For this reason, NIHAC is generally used for long term animal studies, quarantine, large animals and animals not currently involved in higher research interactive studies.

2.1.3 The National Capital Region

The NIH Bethesda Campus is also within the National Capital Region (NCR), as defined in the National Capital Planning Act of 1952, as amended. The jurisdictions within the NCR are shown in Exhibit 2.1.B and include:

- The District of Columbia;
- Montgomery and Prince George's Counties in Maryland;
- Arlington, Fairfax, Loudoun, and Prince William Counties in Virginia;
- All cities now or hereafter existing in Maryland or Virginia within the geographic areas bounded by the outer boundaries of the combined areas of said counties. (40 U.S.C. 71(b))

The campus is located in southern Montgomery County, Maryland and at the southern end of the highly developed Washington, D.C./Rockville, Maryland Corridor following I-270 and MD Route 355 (Rockville Pike).

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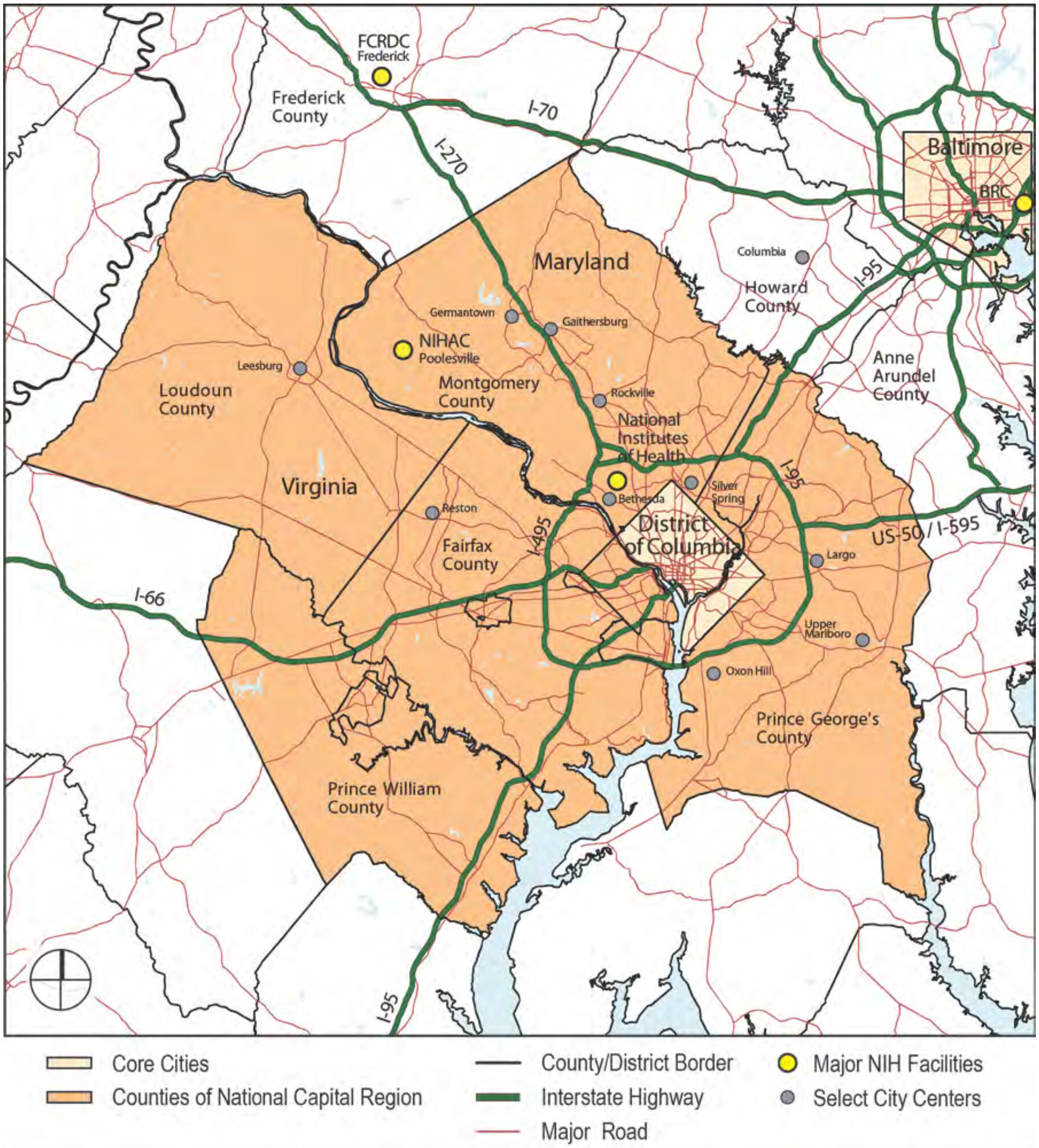

Exhibit 2.1.B. National Capital Region Map

2.2 Demographics

2.2.1 Educational Attainment and Affluence

The Washington Metropolitan Area has ranked as the highest-educated metropolitan area in the nation for four decades[2]. As of the 2006–2008 American Community Survey, the three most educated places with 200,000 people or more in Washington–Arlington–Alexandria by bachelor's degree attainment (population 25 and over) are Arlington, Virginia (68.0 percent), Fairfax County, Virginia (58.8 percent), and Montgomery County, Maryland (56.4 percent).[3] Forbes magazine stated in its 2008 "America's Best- And Worst-Educated Cities" report: "The D.C. area is less than half the size of L.A., but both cities have around 100,000 Ph.D.'s."[4]

In recent years the Washington Metropolitan Area has overtaken the San Francisco Bay Area as the highest-income metropolitan area in the nation.[5] The median household income of the region is $72,800. The two highest median household income counties in the nation – Loudoun and Fairfax County, Virginia – are components of the MSA (#3 is Howard County, officially in Baltimore's sphere but strongly connected with Washington, Alexandria ranks 10th among municipalities in the region (11th if Howard County is included) and 23rd in the entire United States. 12.2 percent of Northern Virginia's 881,136 households, 8.5 percent of suburban Maryland's 799,300 households, and 8.2 percent of Washington's 249,805 households have an annual income in excess of $200,000, compared to 3.7 percent nationally.[6]

2.2.2 The NIH Employee Distribution

NIH has 32,397 workers in Montgomery County, Maryland The people working at the Bethesda campus and at Montgomery County leased sites live in every jurisdiction of the Baltimore-Washington CMSA and beyond in Pennsylvania, and West Virginia.

The 2011 population of 20,594 workers at the Bethesda campus consist of 10,472 full time employees; 4,288 contractors[7]; 2,903 fellowship appointments; 582 tenants, and 2,349

[2] Daniel de Vise, "Washington region ranks as the best educated in the country", The Washington Post, July 15,2010
[3] 2006–2008 American Community Survey 3-Year Estimates
[4] America's Best- And Worst-Educated Cities
[5] Reuters, "Washington area richest, most educated in US: report", Washington Post, June 8, 2008
[6] ACS 2005-2007
[7] Contractor who have an office or work station

auxiliary. There are over 10,000 NIH workers in leased space in the general vicinity of the NIH Bethesda Campus

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).

The number of NIH employees per city is shown in Exhibit 2.2.A, the largest number of employees per local Zip Code is shown in Exhibit 2.2.B, and workforce distribution across the region is depicted in Exhibit 2.2.C.

The people working at the Bethesda campus, locally leased sites and at Dickerson, 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.

In Maryland there are 28 Zip Codes that are home to 95 or more NIH employees. These 10,203 employees comprise 53 percent of the NIH Bethesda campus population. There are 17 Zip Codes that are home to 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.

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Exhibit 2.2.A. Employee Distribution Table

State	City/County	# of employees

DC	City/County	#
DC	DC Total	1,531

MD	City/County	#
	Anne Arundel	229
	Baltimore City	358
	Baltimore	358
	Calvert	28
	Carroll	53
	Cecil	3
	Charles	80
	Dorchester	2
	Frederick	515
	Garrett	1
	Harford	17
	Howard	521
	Kent	2
	Montgomery	10,110
	Prince George's	1,250
	Queen Anne's	6
	St. Mary's	9
	Talbot	3
	Washington	90
	Wicomico	2
	Worchester	5
MD	MD Total	13,640

PA	City/County	#
	Adams	14
	Allegheny	16
	Bedford	2
	Berks	1
	Blair	1
	Bucks	4
	Butler	2
	Centre	3
	Chester	8
	Cumberland	4
	Dauphin	1
	Delaware	12
	Franklin	6
	Huntington	1
	Lancaster	3
	Lawrence	1
	Mercer	1
	Montgomery	10
	Northampton	1
	Philadelphia	18
	Somerset	1
	Westmoreland	2
	York	10
PA	PA Total	122

VA	City/County	#
	Accomack	1
	Albemarle	12
	Alexandria	81
	Arlington	197
	Bedford	2
	Caroline	1
	Chesterfield	1
	Clarke	5
	Culpeper	1
	Dinwiddie	1
	Fairfax	800
	Frederick	4
	Fredericksburg	1
	Goochland	1
	Hanover	1
	Henrico	5
	James City	1
	Lancaster	1
	Loudoun	153
	Manassas	11
	Montgomery	3
	Nelson	1
	New Kent	1
	Norfolk	2
	Prince George	1
	Powhatan	1
	Prince William	72
	Richmond	3
	Rockingham	1
	Spotsylvania	7
	Stafford	11
	Virginia Beach	2
	Warren	4
	Winchester	1
	Wise	1
	York	2
VA	VA Total	1,393

WV	City/County	#
	Berkeley	20
	Cabell	1
	Hampshire	1
	Hardy	2
	Jefferson	53
	Kanawha	1
	Monongalia	2
	Tucker	1
	Wood	1
WV	WV Total	82

Exhibit 2.2.B. NIH Employee Distribution Table (Local Zip Code with Over 500 Employees)

Zip Code	Community	#
20852	Rockville	1,655
20814	Central Bethesda	1,122
20817	Mid-Bethesda	670
20850	Rockville	663
20878	Gaithersburg	660
20854	Potomac	579

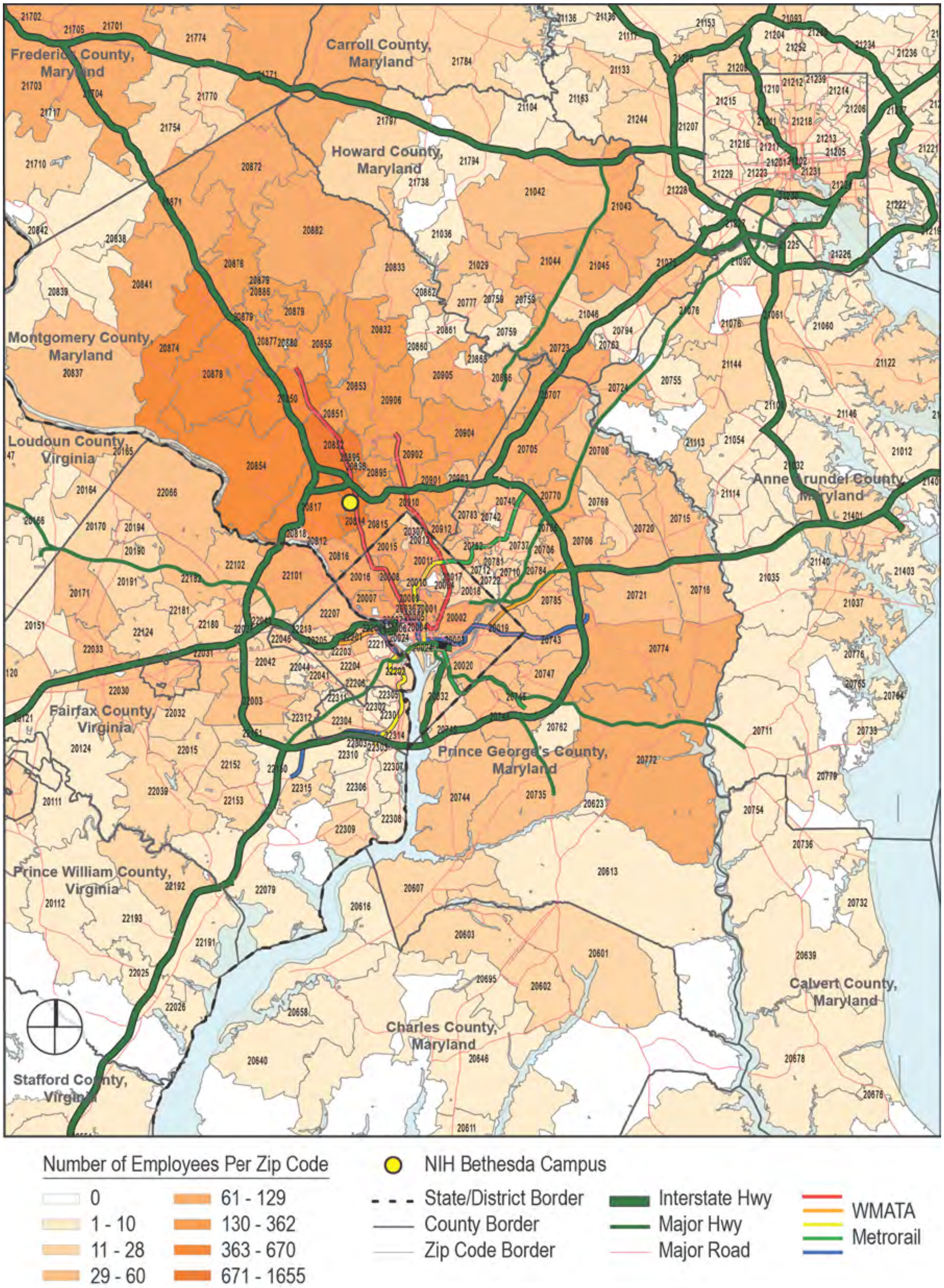

Exhibit 2.2.C. Workforce Distribution by Zip Code Map

2.3 Economy

The various agencies of the Federal Government employ over 140,000 professionals in the Washington D.C. area. A sizable number work for defense and civilian contracting companies that conduct business directly with the Federal Government. As a result, the Federal Government provides the underlying basis of the economy in the region. However, the Washington D.C. area is increasingly home to a diverse segment of businesses not directly related to the Federal Government.

Citing data from U.S. Census Bureau, the Bureau of Labor Statistics, Claritas Inc. and other sources the Washington, D.C. area has the largest science and engineering work force of any metropolitan area in the nation. At 324,530 persons it is ahead of the combined San Francisco Bay Area work force (214,500) and the Chicago metropolitan area (203,090).[8]

In a statistical analysis of the top 100 Metropolitan areas in the United States by American City Business Journals in May 2009, the Washington, D.C. area was ranked as the second High-Tech Center behind the Silicon Valley and ahead of the Boston metropolitan area.[9] Fueling the metropolitan area's ranking was the reported 241,264 tech jobs in the region. The Washington, DC area also has the highest masters and/or doctorial attainment among the 100 ranked metropolitan areas

Notably the Washington D.C. Area is home to several major research universities, hundreds of think tanks and non-profit organizations. Additionally, Washington D.C. is a top tourism destination. Moreover, the Washington D.C. area attracts dozens of major conferences & conventions each year which also significantly contribute to the region's economy.

[8] 2006–2008 American Community Survey 3-Year Estimates
[9] "The top 100 tech centers" Bizjournals, Retrieved May 11, 2009

2.3.1 Primary Industries

2.3.1.1 Biotechnology

Maryland's Washington suburbs are a major center for biotechnology. Prominent local biotech companies include MedImmune, The Institute for Genomic Research, Human Genome Sciences, and the Howard Hughes Medical Institute.

2.3.1.2 Biosciences Strategy

Montgomery County has developed a strategy for developing a world-renowned life sciences industry. [10]

The life sciences are a key component of Montgomery County's economy. In 2008, the County's biosciences industry generated combined revenues of $2.36 billion[11]. It directly employed more than 9,200[12] workers in the private sector and an estimated 49,000 in federal government agencies[13]. The average private sector biotech salary was $92,945, double the County-wide average.

In the 1980s and 1990s, the County government made strategic investments to attract and grow this life sciences cluster, including the donation of land and buildings to help the University System of Maryland (USM) and Johns Hopkins University (JHU) establish an academic presence in Montgomery County. County leaders recognized the quality of life dividend and multiple benefits these investments would bring to Montgomery County: such as well-paying jobs,; an increased tax base to bolster the County's nationally regarded public services, an excellent education system and infrastructure; and enhanced health care for County residents.

Maryland Governor Martin O'Malley has made the growth of the state's biosciences sector a top priority for his administration. The recently released Life Sciences Advisory Board's "BioMaryland 2020" strategic plan[14] lays out a series of priority strategies and actions for the state to realize its vision of making Maryland a nationally and globally recognized leader in the biosciences.

[10] Bioscience Strategy, Montgomery County Maryland, Department of Economic Development December 2009
[11] Maryland- National Capital Park and Planning Commission
[12] Ibid
[13] Ibid
[14] "BioMaryland 2020",MD Life Science Advisory Board , May 2009

Montgomery County is the epicenter of Maryland's bioscience industry and will be a critical partner in achieving BioMaryland 2020's ambitious objectives. The County is home to over 250 of the state's 380 plus bioscience companies, and key federal research and regulatory institutions including the National Institutes of Health, the Food and Drug Administration, the National Institute of Standards and Technology and the Walter Reed Army Institute for Research. As noted above, Montgomery County also hosts satellite campuses of top academic research institutions JHU and the USM (including its Center for Advanced Research in Biotechnology), as well as Montgomery College, a nationally renowned community college.

2.3.1.3 Defense Contracting

Many defense contractors are based in the region in order to be close to the Pentagon in Arlington, VA. Local defense contractors include Lockheed Martin, the largest, as well as Raytheon, General Dynamics, BAE Systems, Computer Sciences Corporation (CSC), Science Applications International Corporation (SAIC), CACI, and Orbital Sciences Corporation. Northrop Grumman will move its headquarters to the region by the summer of 2011.[15]

2.3.1.4 Notable Company Headquarters in the Region

Companies headquartered in the Washington Metropolitan Area with revenues in excess of $5 billion, including companies that are in the process of relocating to the area and excluding those that are leaving, are listed in Exhibit 2.3.A. Seven of the companies are located in Tyson's Corner and use McLean addresses.

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[15] Censer, Marjorie (July 30, 2010). "Defense firm Northrop Grumman's second-quarter profit rose nearly 81 percent". The Washington Post. http://www.washingtonpost.com/wp-dyn/content/article/2010/07/29/AR2010072905681.html.

Exhibit 2.3.A. Notable Company Headquarters Table

Company	Region	Revenue (billions)	Employees (worldwide)
AES Corporation	Northern Virginia (Arlington)	$14.7	28,000
Booz Allen Hamilton	Northern Virginia (McLean)	$5.1	23,000
Coventry Health Care	Suburban Maryland (Bethesda)	$14.0	10,250
Capital One	Northern Virginia (McLean)	$16.0	31,800
Computer Sciences Corporation	Northern Virginia (Falls Church)	$16.7	94,000
Danaher Corporation	District of Columbia	$11.2	50,300
Fannie Mae	District of Columbia	$29.1	5,800
Freddie Mac	Northern Virginia (McLean)	$37.6	5,281
Gannett Company	Northern Virginia (McLean)	$5.6	49,675
General Dynamics	Northern Virginia (Falls Church)	$32.0	91,200
Hilton Worldwide	Northern Virginia (McLean)	$7.5	130,000
Lockheed Martin	Suburban Maryland (Bethesda)	$45.2	140,000
Marriott International	Suburban Maryland (Bethesda)	$11.0	151,000
Mars, Incorporated	Northern Virginia (McLean)	$28.0	65,000
Northrop Grumman	Northern Virginia (Falls Church)	$35.6	120,000
Pepco Holdings	District of Columbia	$9.3	5,592
SAIC	Northern Virginia (McLean)	$10.8	46,000
(Total)	District of Columbia	$49.6	61,692
(Total)	Suburban Maryland	$70.2	301,250
(Total)	Northern Virginia	$209.6	683,956

2.3.2 Impact of the Federal Government on Maryland's Economy

Given its proximity to Washington, DC and the many federal agencies and military installations in Maryland (as listed in Exhibit 2.3.B and Exhibit 2.3.C, respectively), the federal government contributes substantially to the State's economy[16]. In federal fiscal year (FFY) 2007, the federal government expended $70.6 billion in Maryland, or $12,569 as measured on a per capita basis. This amount was about 50 percent greater than the national per capital average of $8,339, ranking Maryland third highest overall after Virginia and Alaska. Changes in federal government expenditures will likely have a disproportionate influence on the State's economy.

[16] Department of Legislative Services, Office of Policy Analysis, Annapolis, Maryland, January 2010

Exhibit 2.3.B. Federal Agency Locations in Maryland Table

Federal Agency	Location
Census Bureau	Suitland
Centers for Medicare and Medicaid Services (CMS)	Woodlawn
Consumer Product Safety Commission (CPSC)	Bethesda
Department of Energy (DOE)	Germantown
Environmental Protection Agency (EPA)	Fort Meade
Food and Drug Administration (FDA)	Silver Spring
Internal Revenue Service (IRS)	Woodlawn
National Archives and Records Administration (NARA)	College Park
NASA Goddard Space Flight Center	Greenbelt
National Geospatial-Intelligence Agency (NGA)	Bethesda
National Institute of Standards and Technology (NIST)	Gaithersburg
National Institutes of Health (NIH)	Bethesda
National Oceanic and Atmospheric Administration (NOAA)	Silver Spring
Nuclear Regulatory Commission (NRC)	North Bethesda
National Security Agency (NSA)	Fort Meade
Smithsonian Environmental Research Center (SERC)	Edgewater
Social Security Administration (SSA)	Woodlawn
Substance Abuse and Mental Health Services Administration	Bethesda

Exhibit 2.3.C. Federal Military Installations in Maryland Table

Military Installation	Location
Aberdeen Proving Ground	Aberdeen
Andrews Air Force Base	Morningside
Army Research Laboratory	Adelphi
Camp David	Thurmont
Fort Meade	Fort Meade
Fort Detrick	Frederick
Indian Head Naval Surface Weapons Center	Indian Head
National Naval Medical Center	Bethesda
Naval Air Station Patuxent River	St. Mary's County
United States Naval Academy	Annapolis

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2.4 Transportation

2.4.1 Regional Interstate Vehicular Access to NIH

The Washington metropolitan area is notorious for traffic gridlock. The heavy congestion is a function of suburban sprawl, tourists, limited Potomac River crossings, and East Coast megalopolis traffic. This section will discuss limited access roads[17] that are primarily used or will be used by NIH employees. According to the INRIX National Scorecard 2010 Annual Report the Washington Metro Area is ranked fourth in the nation for traffic congestion. The report is based on data feed by GPS devices caught in traffic. The results are graphically summarized in Exhibit 2.4.A.

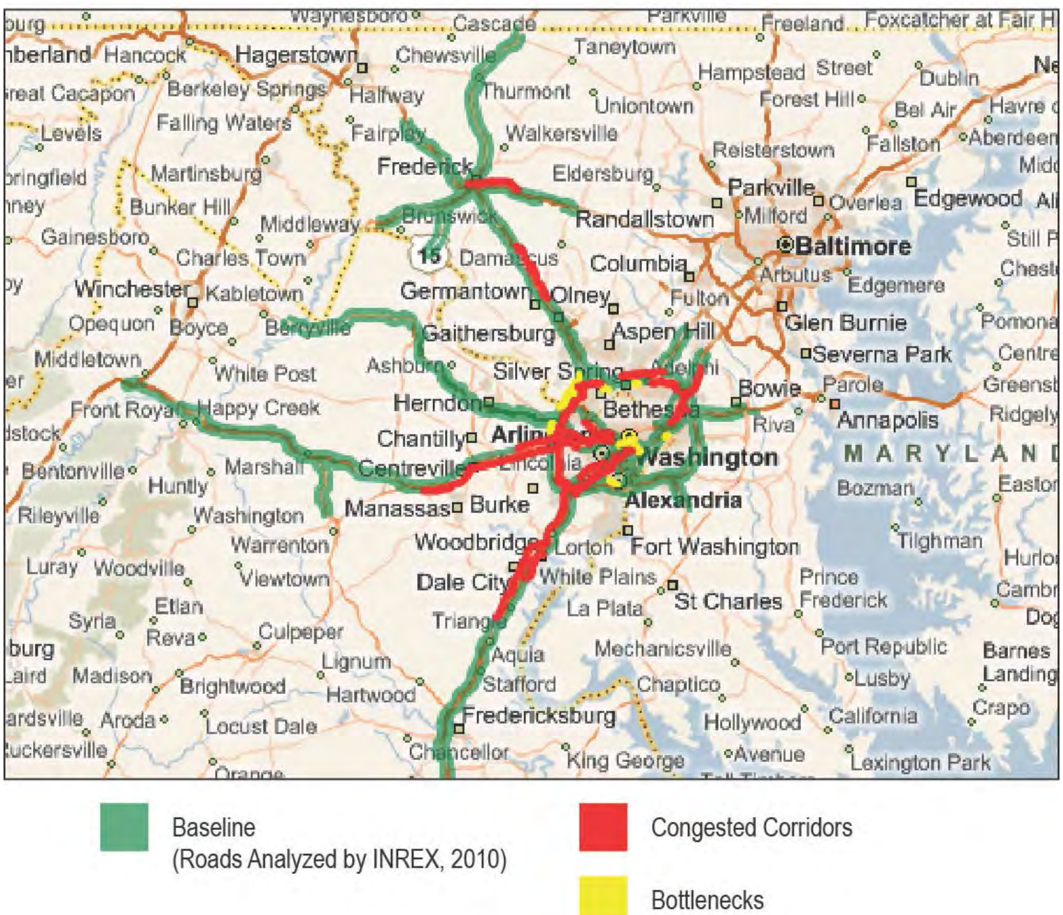

Exhibit 2.4.A. Vehicular Congestion in the Washington Metropolitan Area Map

[17] Limited access roads mean roads with no traffic control signals or stop signs

2.4.1.1 Capital Beltway

Interstate-495/95 (abbreviated I-495/95) is a 64-mile Interstate Highway that surrounds Washington, D.C. and its inner suburbs in Maryland and Virginia. I-495 is widely known as "the Capital Beltway" I-95 utilizes the southern and eastern half of the Capital Beltway to circumnavigate Washington, D.C., and is cosigned with I-495 along that route.

The circumferential roadway is located in the states of Virginia, Maryland, and crosses briefly through the District of Columbia. The Beltway passes through Prince George's County and Montgomery County, Maryland, Virginia's Fairfax County, and the City of Alexandria.

I-495/95 is a major thoroughfare for NIH employees. The quarter of the Beltway between Maryland's I-95 and Northern Virginia's I-66 is the most beleaguered stretch of Beltway in its circumference. This section includes the I-95 junction, the I-270 split, the American Legion Bridge, the Dulles Airport exits, Tyson's Corner, and the I-66 bottleneck. Currently, there are no alternatives routes to avoid the Montgomery/Fairfax Capital Beltway congestion. Only the Capital Beltway spans the western portion of the Potomac at the American Legion Bridge.

2.4.1.2 U.S. Route 50

Within the District, US-50 freeway extends from Constitution Avenue along the north side of the National Mall to the northeast as New York Avenue. Upon crossing into Maryland, it passes the south end of the Baltimore-Washington Parkway and becomes the John Hanson Highway leading to Annapolis. The portion of this highway east of the Capital Beltway is also designated as Interstate-595/U.S. Route-301 at Bowie, MD. The freeway continues beyond Annapolis as the Blue Star Memorial Highway, passing over the Chesapeake Bay to Queenstown, MD. There the "Blue Star Highway" continues northeast with US-301, while US-50 turns south past Easton to Cambridge and east around Salisbury to Ocean City as the four-lane divided "Ocean Gateway".

US-50 serves NIH employees who live in Annapolis, Bowie, Mitchellville, and Lanham areas. In the early 1990's US-50 between I-495 and I-97 was upgraded to interstate standards with a new interchange at the Capital Beltway. US-50 features a high-occupancy-vehicle (HOV) lane promoting carpooling and helping to reduce traffic congestion.

2.4.1.3 The Baltimore Washington Parkway

The Baltimore-Washington Parkway (also referred to as the "B-W Parkway" or MD-295) is a four to six-lane highway traversing southwest from Baltimore to Washington, D.C. The road begins at an interchange with U.S. Route-50 and Maryland Route-201 near Cheverly, MD in Prince George's County. It continues northeast as a parkway maintained by the National Park Service (NPS) to Maryland Route-175 near Fort Meade. Commercial vehicles, including trucks, are prohibited within the NPS maintained portion of the parkway. The B-W Parkway serves NIH employees living in Greenbelt, Anne Arundel County, Baltimore County, and the city of Baltimore.

2.4.1.4 Interstate-95

In Virginia, Interstate-95 passes through its state capital, Richmond, before entering into Northern Virginia and then crossing the Potomac River east of Washington, DC on the Woodrow Wilson Bridge into Maryland.

I-95 in Virginia serves NIH employees who live in Spotsylvania, Fredericksburg, Stafford, Prince William, Manassas, Woodbridge, Lorton, and Springfield. I-95 features two reversible dedicated HOV 3 lanes that promote carpooling to help reduce traffic congestion.

Interstate 95 enters Maryland on the Woodrow Wilson Bridge, where a small, approximately 0.07-mile portion of the highway passes through the southernmost corner of the District of Columbia. In Maryland, I-95 follows the Capital Beltway around the east side of Washington, D.C. Once leaving the Beltway north of the city, I-95 travels northeast through the middle of the state and through Baltimore. I-95 in Maryland serves NIH employees who live in Baltimore, Columbia, Laurel, and Beltsville.

2.4.1.5 Interstate-270

Interstate 270 (I-270) is a 34.70-mile auxiliary interstate highway that links the Capital Beltway (north of Bethesda, Maryland) to I-70 (south of the city of Frederick, MD). I-270 is known as the Dwight D. Eisenhower Memorial Highway as well as the Washington National Pike. Many biotech firms in Montgomery County are located near the southern portion of I-270. This portion of I-270 is as much as 16-

lanes wide and consists of local and express lane configurations including high-occupancy vehicle lanes that are in operation during peak travel times. North of the Gaithersburg area, the road continues through the northern part of Montgomery County, passing Germantown and Clarksburg as a six- to eight-lane highway with a HOV lane in the northbound direction only. North of Clarksburg, I-270 continues through rural areas into Frederick County, toward the city of Frederick as a four-lane freeway.

I-270 serves NIH employees who live in Frederick, Germantown, Gaithersburg, and Rockville. I-270 is the 5th most congested road in the area. The fundamental congestion issues arise from the fact that I-270 traffic is squeezed into 4-lanes at its northern end in Frederick County and is terminated into the most congested sections of the I-495 Capital Beltway at its southern end. I-270 passes Maryland's "Technology Corridor" while collecting commuter traffic from Germantown, Damascus, Gaithersburg, and Rockville to the District. This critical roadway is often congested in both directions during peak hours to accommodate workers moving into and out of the area.[18]

2.4.1.6 Interstate-66

Interstate 66 (I-66) is an interstate highway. Its western terminus is at an intersection with Interstate 81 near Middletown, Virginia and its eastern terminus is in Washington, D.C., at the intersection with U.S. Route 29. Because I-66 is the only Interstate Highway running west from D.C. into Northern Virginia and due to its limited road bed, traffic on the road is often congested. In an attempt to reduce congestion for people commuting away from D.C., the Virginia Department of Transportation (VDOT) is studying the prospect of implementing a one-lane-plus-shoulder extension on westbound I-66 within the Beltway.[19]

I-66 serves NIH employees who live in Fairfax, Vienna, and Fall Church. The highway collects traffic from Front Royal, Gainesville, and Fairfax into Arlington County and downtown Washington via the Theodore Roosevelt Bridge.

2.4.1.7 Maryland Route 200 "The Intercounty Connector"

The Intercounty Connector (MD-200, or the "ICC") links existing and proposed development areas between the I-270/I-370 and I-95/US-1 corridors within central and eastern Montgomery County and northwestern Prince George's County. It is an 18-mile long multi-modal east-west limited-access toll road that begins at I-270/I-370 in Montgomery County,

[18] Kofi Bofah, Washington, D.C. Traffic: The Top-5 Most Congested Roads in the D.C. Area, yahoo, August 11, 2009
[19] Shaffer, Ron (October 21, 2005). "Dr. Gridlock". Washington Post.

MD and ends at US1 in Prince George's County, MD. As a limited-access highway, the ICC has eight full interchanges, one partial interchange (entrance only), and one intersection.

The ICC serves NIH employees who live in the Norbeck, Aspen Hill, Colesville, Burtonsville, Calverton, and points north of Laurel on the I-95 corridor. These employees are able to bypass the Capital Beltway (2nd worst congest road in the area) by taking the ICC to I-270 (5th worst road in the area) and exiting onto Old Georgetown Road.

2.4.2 Regional Interstate Mass Transit Access to NIH

The Washington Metropolitan Area Transit Authority (WMATA) is an inter-jurisdictional government agency created by an interstate compact authorized by Congress that operates transit service (including the Washington Metro and Metrobus) in the said area. WMATA is jointly funded by the District of Columbia, Maryland, and Virginia.

2.4.2.1 Rapid Rail

WMATA's "Metrorail" (or "Metro") is the rapid rail transit system in Washington, D.C and its surrounding suburbs. In Maryland, Metro provides service to Montgomery County and Prince George's County. In Virginia, Metro provides service to Fairfax County, Arlington County, and the City of Alexandria. Since opening in 1976, the Metrorail network has grown to five lines, 86 stations, and 106.3 miles of track. Metro is the second-busiest rapid transit system in the United States in number of passenger trips, after the New York City Subway. There were 215.3 million trips on Metrorail in fiscal year 2008 or 727,684 trips per weekday.

The rail network is designed as a radial distribution system, with rail lines traversing between downtown Washington and its nearby suburbs. The system makes extensive use of "interlining "– running more than one service on the same track. Currently, there are five operating lines and one line under construction. There are 40 stations in the District of Columbia, 15 in Prince George's County, 11 in Montgomery County, 11 in Arlington County, six in Fairfax County, and three in the City of Alexandria. A map[20] of the Metrorail lines as of 2012 is depicted in Exhibit 2.4.B, along with corresponding details[21] in Exhibit 2.4.C.

[20] http://wmata.com/rail/maps/print_map.cfm (color map). Accessed on 28 June, 2012.
[21] Dulles Metrorail Map and Station Information. http://www.dullesmetro.com/stations/ . Accessed 28 June, 2012.

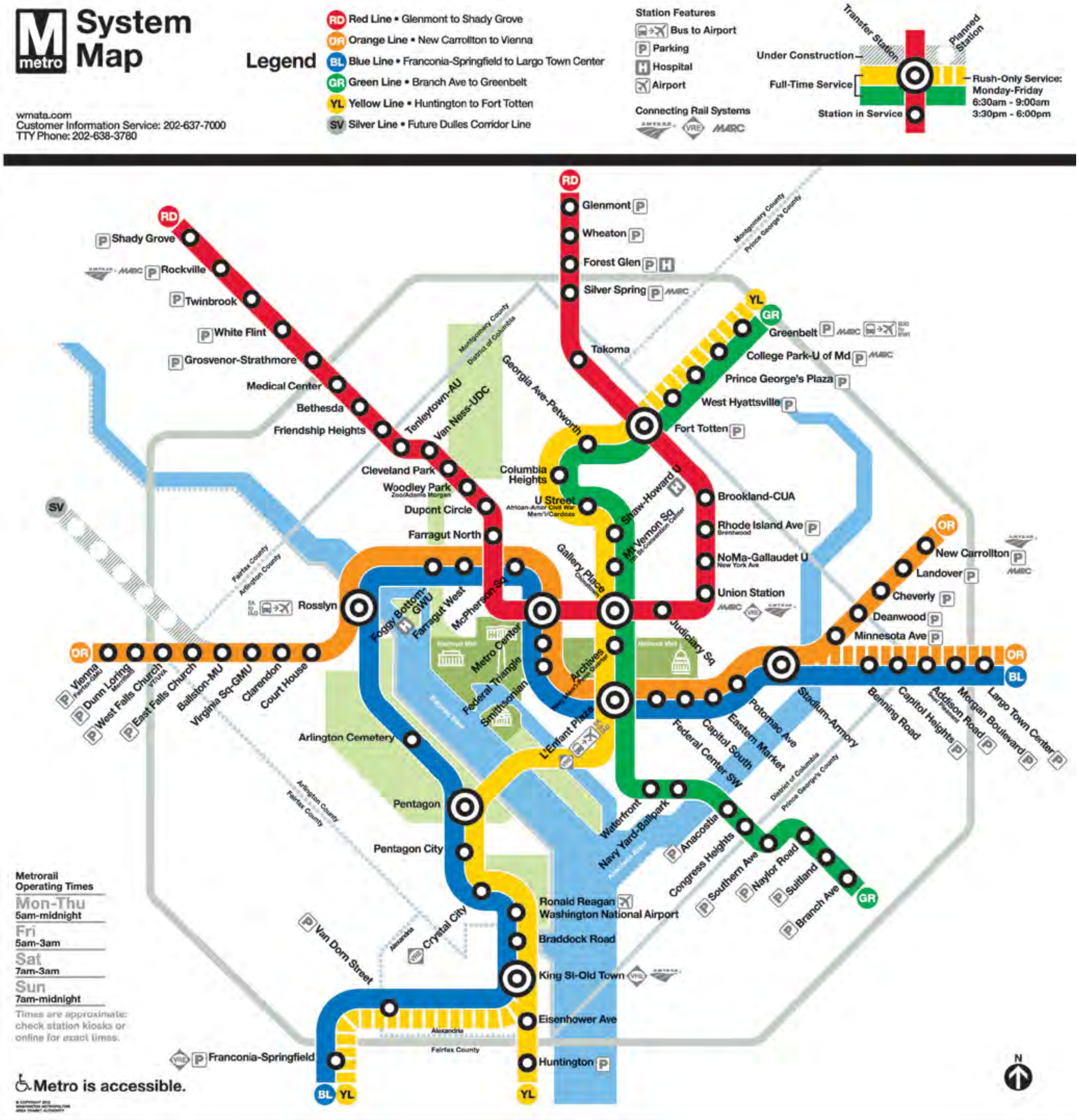

Exhibit 2.4.B. Metrorail System Map

Exhibit 2.4.C. Metrorail Lines Table

Line Name	Opened	Stations	Termini (Parentheticals are rush hour only.)
Red Line	1976	27	Shady Grove - Glenmont
Orange Line	1978	26	Vienna/Fairfax–GMU - New Carrollton (/Largo Town Center)
Blue Line	1977	27	Franconia–Springfield - Largo Town Center
Yellow Line	1983	17	(Franconia–Springfield/) Huntington - Fort Totten (Greenbelt)
Green Line	1991	21	Branch Avenue - Greenbelt
Silver Line	2016 planned	11 new planned	Route 772 - Stadium-Armory

The system is not centered on any single station, but Metro Center is at the intersection of the Red, Orange and Blue Lines, the three busiest lines.[22] Metro has designated five other "core stations" that have high passenger volume, including:[23] Gallery Place/Chinatown, transfer station for the Red, Green and Yellow Lines; L'Enfant Plaza, transfer station for the Orange, Blue, Green and Yellow Lines and; Union Station, the busiest station by passenger boardings[24] due to its proximity to MARC and VRE commuter lines. In order to deal with the high number of passengers in transfer stations, Metro is studying the possibility of building pedestrian connections between nearby core transfer stations. For example, a 750-foot passage between Metro Center and Gallery Place stations would allow passengers to transfer between the Orange/Blue and Yellow/Green Lines without going one stop on the Red Line. Another tunnel between Farragut West and Farragut North stations would allow transfers between the Red and Orange/Blue lines (and future silver line), decreasing transfer demand at Metro Center by an estimated 11 percent.[25]

Metrorail is extremely important to the NIH (located at the Red Line's "Medical Center" stop) as well as a region as a whole. The region's road systems are very congested. Unfortunately, Metrorail is limited with respect to the geographical areas that it serves, its system design and its track configuration. The Metrorail system is designed as a radial system with all rail lines going to or going through the Central Business District of

[22] "Media Guide 2008". WMATA.
[23] Core Stations Capacity Enhancements". WMATA. October 21, 2008.
[24] "Media Guide 2008". WMATA
[25] "Core Stations Capacity Enhancements". WMATA. October 21, 2008. http://www.wmata.com/pdfs/planning/Demand_Passenger percent20Facilities.pdf.

Washington, DC. The system is exclusively a two track system with no provision for express service such would be found with a four track system. Metrorail depends on Metrobus feeding into Metrorail stations for cross-town connections.

2.4.3 Regional Mass Transit Initiatives

WMATA expects an average of one million riders daily by 2030. The need to increase capacity has renewed plans to add 220 cars to the system and reroute trains to alleviate congestion at the busiest stations.[26] Population growth in the region has also revived efforts to extend service, build new stations, and construct additional lines.

2.4.3.1 Dulles Corridor Metrorail Project (Silver Line)

The most prominent expansion is the Silver Line, a 23.5-mile extension from the Orange Line into Loudoun County, Virginia by way of Tyson's Corner and Washington Dulles International Airport. Rail access to the Dulles Airport has been discussed prior to 1962 when the airport opened and revisited since the Metrorail system opened in 1976. The current Silver Line project was formally proposed in 2002 and initially approved by the Federal Transit Administration in 2004.[27] After several delays, federal funding for the Silver Line was secured in December 2008[28] and construction began in March 2009.[29] The line will be constructed in two phases: to Wiehle Avenue in Reston, Virginia in 2013, and to Virginia Route 772, beyond Dulles Airport, in 2015.[30] The Silver Line will split from the Orange Line between East Falls Church and West Falls Church Metrorail Stations. It will feature 11 new stations located at Tysons East, Tysons Central at Route 123, Tysons Central at Route 7, Tysons West, Wiehle Avenue, Reston Parkway, Herndon-Monroe, Route 28, Dulles Airport, Route 606 and Route 772/Ryan Road. The Silver Line will service NIH employees who live in Western Fairfax and Loudon County.

2.4.3.2 Purple Line

A number of light rail and urban streetcar projects have been proposed to extend or supplement service provided by Metro. Like the Silver Line in Virginia, the proposed Purple Line has been in planning since the 1980s.[31] The project was originally envisioned as a

[26] "Metro details improvements to meet future capacity needs". WMATA. April 18, 2008
[27] "Dulles Metrorail is Coming", Dulles Corridor Metrorail Project, April 2008
[28] Gardner, Amy (2008-12-04). "Silver Line To Dulles Wins Crucial Federal Okay". The Washington Post: p. A1
[29] Project Timeline", Metropolitan Washington Airports Authority
[30] "Metro details improvements to meet future capacity needs". WMATA. April 18, 2008
[31] Shaver, Katherine January 23, 2009; "Leggett Endorses Light-Rail Plan". The Washington Post: p. B3.

circular heavy rail line connecting the outer stations on each branch of Metrorail system, in a pattern roughly mirroring the Capital Beltway. The current proposal would create a light rail system in Maryland between the Bethesda and New Carrollton stations by way of Silver Spring and College Park. Such a plan would connect both branches of the Red Line to the Green and Orange Lines, and would decrease the travel time between suburban Metro stations.[32] The project is still undergoing regulatory approval but received significant backing from local officials and Maryland lawmakers in January 2009. The planned rail or rapid bus line would connect the existing Metro, MARC commuter rail, and Amtrak stations at:[33] Bethesda (Metro Red Line); Silver Spring (Metro Red Line), MARC Brunswick Line; College Park (Metro Green Line), MARC Camden Line; New Carrollton (Metro Orange Line), MARC Penn Line and, Amtrak Northeast Corridor (Northeast Regional, Vermonter).

The following stations are part of the "Locally Preferred Alternative" route approved by Maryland Governor Martin O'Malley on August 9, 2009:[34] and depicted in Exhibit 2.4.D [35]: Bethesda, Connecticut Avenue/Chevy Chase Lake, Lyttonsville, Woodside, •Silver Spring Transit Center, Silver Spring Library, Dale Drive (future station), Manchester Place, Long Branch, Piney Branch Road, Takoma/Langley Transit Center, Riggs Road, West Campus, UM Campus Center, East Campus, College Park, River Road, Riverdale Park/MD 201 & MD 410, Riverdale Road/Beacon Heights, Annapolis Road and New Carrollton.

Although the majority of discussions about the Purple Line describe the project as a 16-mile east-west line between Bethesda and New Carrollton,[36] there have been several proposals to expand the line further into Maryland mirroring the Capital Beltway as a loop around the entire Washington, D.C. metropolitan area. The Sierra Club has argued for a Purple Line which would "encircle Washington, D.C." and "connect existing suburban metro lines."[37]

The Purple Line could greatly benefit NIH and its employees who reside east of NIH in Silver Spring, eastern Montgomery County, and northern Prince Georges County. The Purple Line provides an alternative to the Capital Beltway which is the second worst congested road in the region.

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[32] "Overview – The Purple Line". Maryland Transit Administration. http://www.purplelinemd.com/overview.
[33] "Purple Line Facts".
[34] Purple Line Conceptual Plans: Project Area Map MTA Maryland
[35] "Purple Line Study Area Map". Maryland Transit Administration. Accessed November 22, 2011. http://www.purplelinemd.com/maps-graphics
[36] "Purple Line Facts".
[37] Purple Line". Sierra Club.

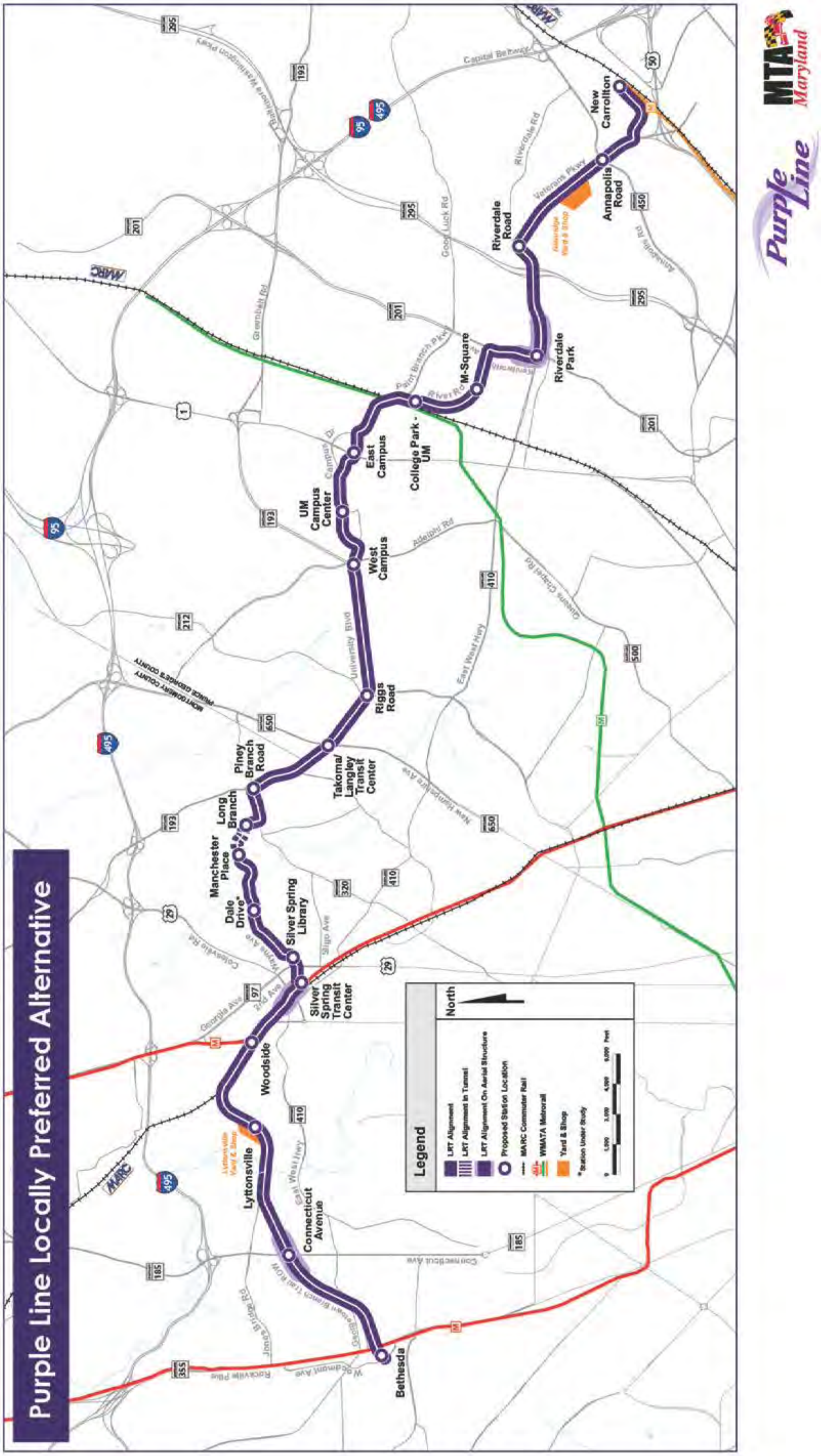

Exhibit 2.4.D. Purple Line Locally Preferred Alternative Map

2.4.3.3 Corridor Cities Transitway

The Corridor Cities Transitway (CCT) is a proposed light-rail and rapid-bus transit line in Montgomery County that is proposed to run from the Shady Grove Metro station in Gaithersburg northwest to Clarksburg. The master plans for both Montgomery and Frederick Counties provide for the eventual extension of the CCT northward along the I-270 corridor into the city of Frederick. The CCT Study Map is replicated in Exhibit 2.4.E [38].

AS discussed in section2.4.1.5 Interstate 270, the I-270/US-15 corridor is a vital link to other highways in the Maryland and Washington, DC region. The level of performance for the roadway is currently sub-par and population projections for Frederick County and Montgomery County indicate the problem will only get worse. It is projected that by 2025, Frederick County's population will have increased by 97,639 from the year 2000, and Montgomery County's population will have increased by 165,935. To relieve some of the projected increase in traffic congestion, the proposed CCT line would reach the neighborhoods near its route and substantially increase ridership.

The CCT will benefit NIH employees who live along the I-270 Corridor by extending mass transit opportunities to them.

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[38] "CCT Study Area Map". Maryland Transit Administration. Accessed November 22, 2011. http://www.cctmaryland.com

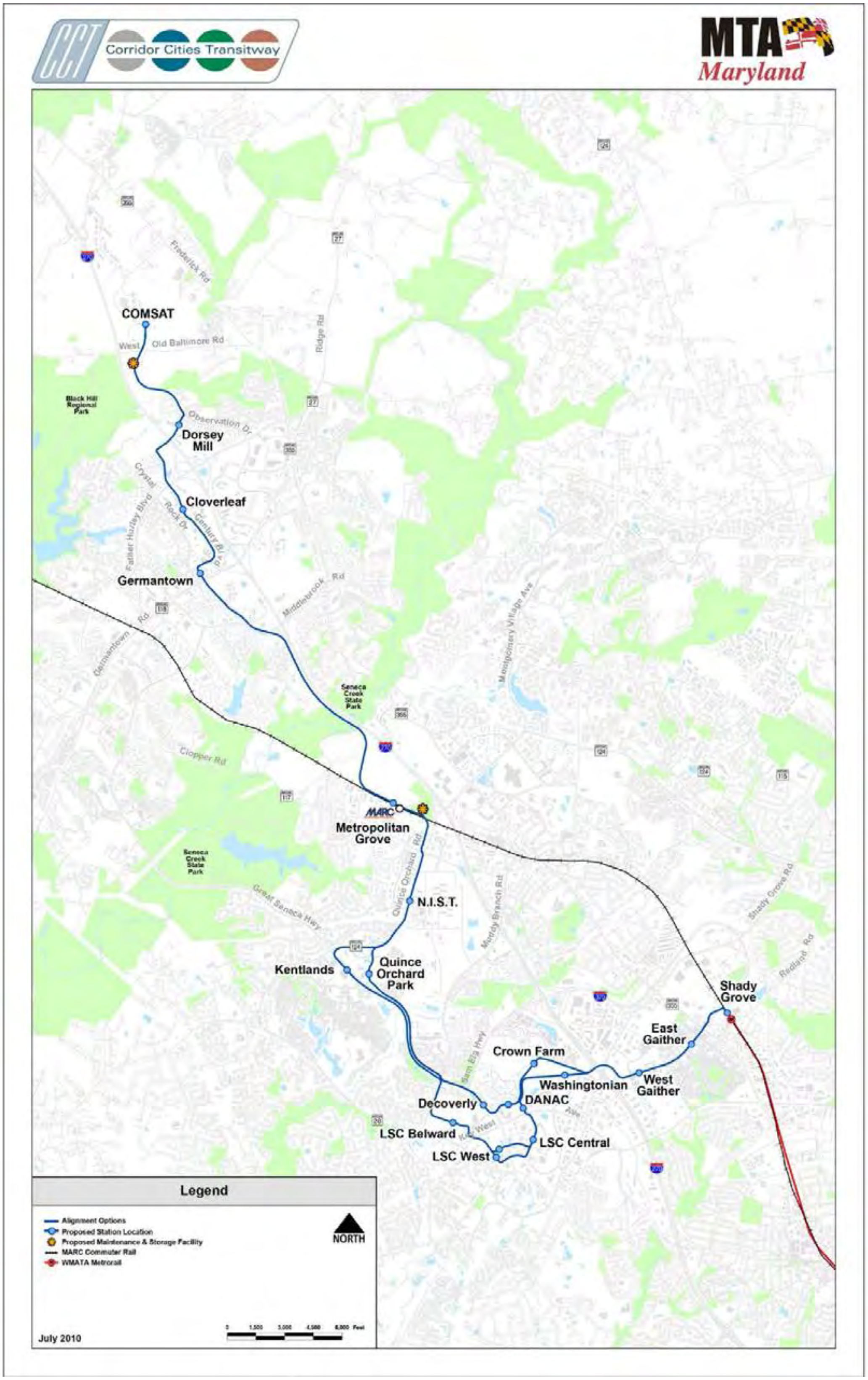


Exhibit 2.4.E. Corridor Cities Transitway Study Area Map

2.4.4 Regional Commuter Rail Access to NIH

2.4.4.1 MARC

MARC (Maryland Area Regional Commuter), known prior to 1984 as Maryland Rail Commuter Service, is a regional rail system comprising three lines in the Baltimore-Washington Metropolitan Area. MARC is administered by the Maryland Transit Administration (MTA), a Maryland Department of Transportation agency, and is operated under contract by CSX Transportation[39] and Amtrak. MARC does not operate on weekends and service is suspended or reduced on select holidays. The MARC system has 187 miles of track with 43 stations and has a daily ridership of 33,300.

The Brunswick Line is the longest line, from Washington, D.C. to Martinsburg, West Virginia. The Camden Line runs between Washington, D.C. and Baltimore, Maryland Camden Station. The Penn Line runs between Washington, D.C. and Perryville, Maryland.

All day on weekends and before 6am and after 10pm on weekdays most Amtrak Regional trains accept MARC monthly and weekly tickets at Amtrak/MARC stations, and some Amtrak trains carry MARC ticket holders boarding at Aberdeen during the week.

2.4.4.2 Virginia Railway Express

The Virginia Railway Express (VRE) is a commuter rail service that connects the Northern Virginia suburbs to Union Station in Washington, D.C., via two lines: the Fredericksburg Line from Fredericksburg, Virginia, and the Manassas Line from Broad Run/Airport station in Bristow, Virginia. Rail service operates Monday through Friday only and is often suspended or reduced on select holidays.

Through a cross-honoring agreement, VRE and the MARC Train allow passengers to transfer to a train on the other system provided that it is going in the opposite direction of the rush-hour commuters.

[39] MARC to seek new operator for CSX-run routes". Trains Magazine. 14 June 2010. http://www.trains.com Retrieved 14 June 2010.

VRE operates on lines owned and maintained by Amtrak, Norfolk Southern and CSX Transportation. As of July 2010, VRE transports an average of 17,600 passengers per day.[40] A future VRE station on the Fredericksburg Line for Spotsylvania is planned as early as 2012.

2.4.5 Regional Bus Service Access to NIH

Metrobus is a bus service operated by the WMATA. Its fleet consists of 1,480 buses covering an area of 1,500 square miles in Washington, D.C., Maryland, and Virginia. There are over 300 bus routes serving 12,216 stops, including 2,398 bus shelters. In fiscal year 2009, Metrobus provided more than 133 million trips. On a typical weekday, it provides more than 400,000 trips.

2.4.6 Transportation Element of the NCPC Comprehensive Plan

It the goal of the federal government to: Develop and maintain a multi-modal regional transportation system that meets the travel needs of residents, workers, and visitors, while improving regional mobility and air quality through expanded transportation alternatives and transit-oriented development.

2.4.6.1 Parking Ratios

The parking ratios are intended to be used as goals for federal agencies. Federal agency Transportation Management Plans (TMPs) should be developed around attaining these goals, although each federal facility's parking ratio will be evaluated independently and final determination will be based upon the circumstances specific to that facility's operational characteristics and location, including local area impacts. Detailed TMPs will be required to justify all proposed parking ratios. TMPs are required to include an analysis of impacts to surrounding local transportation facilities as a result of the anticipated vehicle or transit trips generated by employees.

Suburban Areas within 2,000 Feet of Metrorail One Parking Space for Every Three Employees (1:3) Because suburban areas in the region tend to be less well served by transit at the home side of trips, commuters must often park and ride to utilize Metrorail. Bus transit services in general are fewer and far between. Offices may be located near

[40] "VRE CEO Report - July 2010

Metrorail, but ridership to these offices is expected to be lower than in more urban parts of the region. Walking conditions typically degrade with distance from Metrorail stations, and there are fewer commercial parking facilities than in the more urban parts of the region. Suburban areas within 2,000 feet of Metrorail are defined as those areas beyond the Historic District of Columbia boundaries, but within 2,000 feet of a Metrorail station. Federal facilities that fall into this category include the Suitland Federal Center and the National Institutes of Health. Special consideration will be given to federal facilities near Metrorail stations at or near the end of the line.

2.4.6.2 NIH Employee Distribution in the Region by Zip Codes

Currently NIH has a parking ratio of 1:2 (one space per two employees). NIH employees reside in most postal zip codes in the region, however the majority of NIH employees are not served well the region's mass transit system. The following is based on a 2011 list of NIH employees per residential zip code; it does not include on-site contractors, fellows and auxiliaries. The discussion below is summarized in Exhibit 2.4.F.

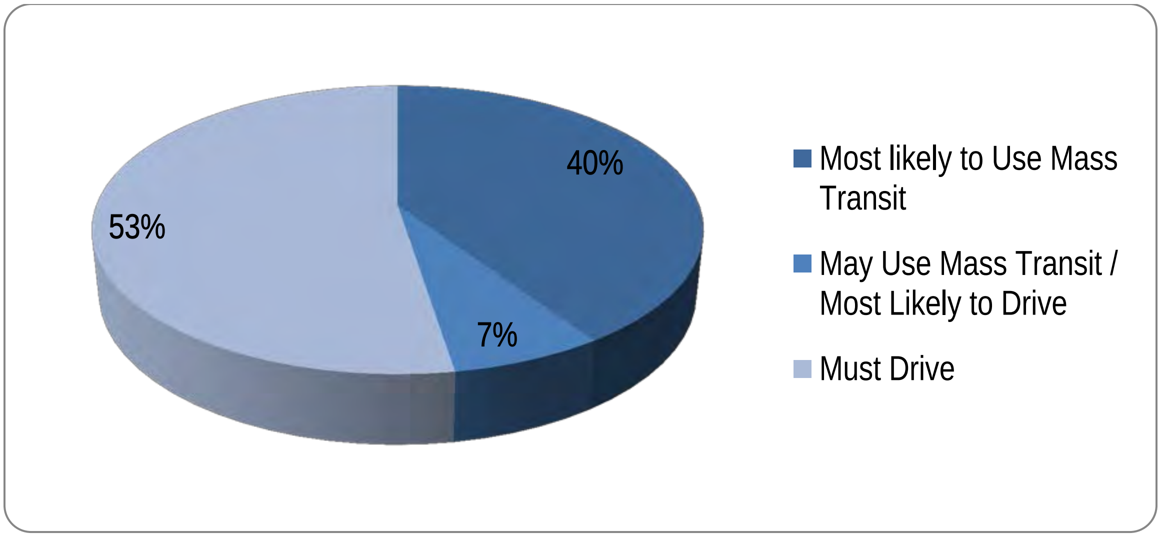
Approximately 6,853 (40%) of NIH's employees are served well by the region's mass transit system. These employees are most likely use the regions mass transit system. The region's mass transit system is very convenient from the employee's residence. However, some of these employees may choose to drive because it is still more convenient and efficient with respect to travel time and needing to stop at multiple destinations besides the work location. For example, it may be quicker and more cost effective drive around the beltway than take Metrorail from Virginia.

Approximately 1,172 (7%) of NIH's employees are served well by the region's mass transit system; however, it is not convenient, efficient or cost effective to and from NIH. These employees are most likely to drive to NIH than use the region's mass transit system and a vast majority of them live north along I-270 or east of Connecticut Avenue. Although they live close to or on a Metrorail line, it is more convenient, efficient and cost effective to drive to NIH because of the configuration of the rapid rail system, which is a radial system or hub and spoke system. The construction of the proposed Purple Line would make Metrorail very convenient for many of these NIH employees.

Approximately 8,883 (53%) of NIH employees are not served well or not served at all by the region's mass transit system and they must drive to NIH. Although some might take commuter trains into work but the vast majority is not served and will drive.

Based on where NIH employees reside, NIH cannot meet the parking ratio goal of 1:3 set forth in the Transportation Element in NCPC Comprehensive Plan

Exhibit 2.4.F. NIH Employee Mode of Transportation Based on Residential Zip Codes



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U.S. Department of Health and Human Services

National Institutes of Health

Chapter 3
NIH Bethesda Campus and its Community

Prepared by the Division of Facilities Planning
Office of Research Facilities

06-14-2013

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3 NIH Bethesda Campus and Its Community

3.1 General

The NIH main campus is located in Montgomery County, Maryland, one of the largest jurisdictions in the Washington, D.C. region. NIH is located within the Bethesda census designated place (CDP) as identified by the US Census Bureau.

The NIH Bethesda campus is also within the National Capital Region (NCR), as defined in the National Capital Planning Act of 1952, as amended. The jurisdictions within the NCR include:

- The District of Columbia;
- Montgomery and Prince George's Counties in Maryland;
- Arlington, Fairfax, Loudoun, and Prince William Counties in Virginia;
- All cities now or hereafter existing in Maryland or Virginia within the geographic areas bounded by the outer boundaries of the combined areas of said counties. (40 U.S.C. '71(b))
- The campus is located in southern Montgomery County, Maryland and at the southern end of the highly developed Washington, D.C./Rockville, Maryland Corridor following I-270 and MD Route 355 (Rockville Pike).

3.2 Montgomery County Census Data

Montgomery County is the second largest jurisdiction in the region, accounting for eight percent of total population in the Washington, D.C. metro area and ranks 45th in population among counties nationwide.[1]

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. 198,400 new County residents are forecasted between 2010 and 2040, a 21 percent increase. 98,000 new households are expected between 2010 and 2040, a 27 percent increase. Between 2000 and 2008, average household size increased from 2.66 persons per household to 2.75 persons per

[1] All data in section 3.2 taken from Montgomery County Snapshot, Council Districts by the Numbers, July 2010, Montgomery County Planning Department

household. However, in the long run, average household size is expected to revert to the national trend and decline to 2.51 by 2040.

Montgomery County ranks fourth in the Washington, D.C. region and tenth nationwide in median household income. 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. 24 percent of all households in the County make less than $50,000 per year.

Montgomery County ranks third in the Washington, D.C. region 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. One in four (24 percent) of the region's most highly educated residents live in Montgomery County.

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 Naval Medical Center (WRNNMC). Adventist Healthcare, Lockheed Martin, and Giant Food are the three largest private sector employers. Sixteen percent of persons employed in the County work in the professional and technical services sector.

55 percent of the County's housing was built before 1980. Twenty-five percent of the County's homes were constructed during the building boom of the 1980s. Only 20 percent of the County's housing stock was built after 1990. There are 93,815 rental units in Montgomery County, of which 80 percent are in multi-unit buildings and the remaining 20 percent in single-family and condominium structures.

Of the 324,428 acres that make up Montgomery County, 318,150 acres (98 percent) are land and 6, 278 (two percent) are water. 171,268 acres (54 percent of the County's land area) are zoned for open space uses, including agriculture and parkland. Residentially zoned land totals 103,302 acres (32 percent). There are 3,005 acres zoned for commercial office or retail use (one percent) and another 7,973 acres (three percent) zoned for mixed commercial and residential use. 6,661 acres (two percent) are zoned for industrial use. Roads and other transportation rights-of-way take up the remaining 25,942 acres (eight percent) of land in the County. Montgomery County Planning Department reported that there are 5,637 acres of vacant, developable land in the county of which 78 percent is contained in small properties of less than two acres.

3.3 County Planning Initiatives

3.3.1 "Wedges and Corridors"

The NIH campus is situated at the southern end of the highly developed "Technology Corridor" in Montgomery County, as shown in Exhibit 3.3.A. The Maryland-National Capital Park & Planning Commission works with Montgomery County residents to develop an overall vision for the County. The foundation of general planning for the last three decades is the "Wedges and Corridors" concept first developed in the early 1960s.

The County General Plan, called "Wedges and Corridors", as it was updated and revised in 1969 and again in 1993, calls for growth centers and corridor cities along the concentrated growth corridor of I-270 and Rt. 355 (Rockville Pike), and low-density "wedge" areas east and west of the corridor. Most of this corridor is devoted to residential land use with clusters of commercial, institutional and industrial land use along the corridor, and wide expanses of agricultural and low-density residential uses in the wedges. The satellite communities of Clarksburg and Damascus to the north, Olney to the east, and Poolesville to the west are interspersed through the low density wedge areas.

Interstate-270 corridor is the location of numerous high-technology companies, non-profit organizations and federal agencies, such as the National Institute of Standards and Technology (NIST) and Department of Energy (DOE), housed in large office buildings, office parks and complexes. These groups specialize in telecommunications, biomedical research, computer science, electronics and aerospace just to name a few.

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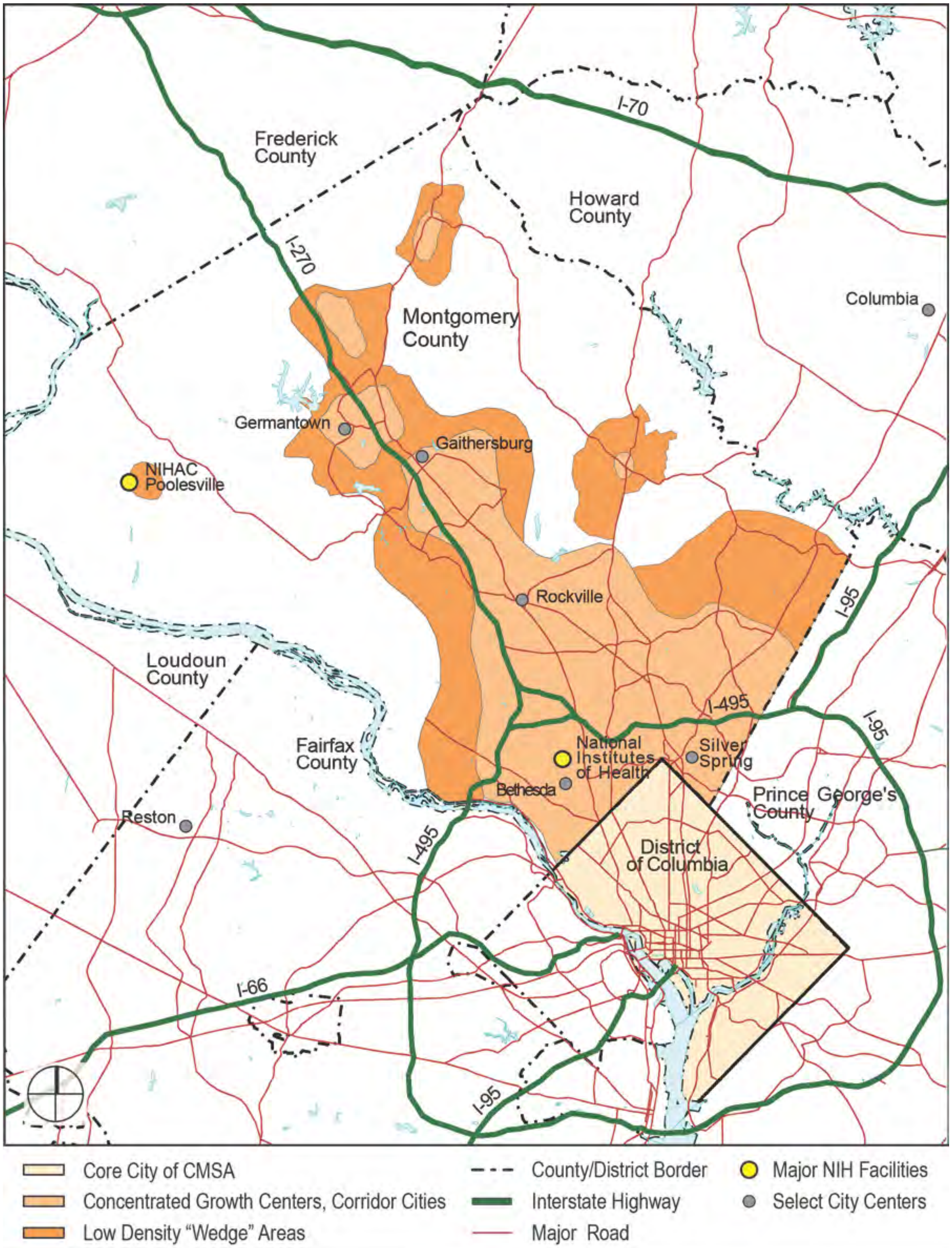

Exhibit 3.3.A. Montgomery County General Plan - Wedges and Corridors

3.3.2 White Oak Science Gateway

The former Naval Surface Weapons Center White Oak on the border of Montgomery and Prince George's Counties is currently under development as a campus for the Food and Drug Administration (FDA) which will include new space for relocation of the Center for Biologics Evaluation and Research (CBER) now located in Buildings 29, 29A, and 29B on the NIH Bethesda campus. Montgomery County Planners are setting the stage for a new master plan in this area, referred to as the White Oak Science Gateway. The White Oak Science Gateway planning effort will explore options for a new research and technology node that capitalizes on the growing presence of the FDA and is complemented by mixed-use development. The plan will address land use, urban design, transportation, and environmental issues.

The Master Plan will create a new vision and guide future growth by amending the 1997 White Oak and Fairland Master Plans. The plan area includes several major properties and developments, the largest of which is the 610-acre Federal Research Center (FRC). The FDA occupies 130 acres of the FRC and now has 5,500 employees on-site. Adventist HealthCare plans to build a new Washington Adventist Hospital and medical campus on nearly 50 acres along Plum Orchard Drive (pending approval of a Certificate of Need from the State). In addition, approximately 300 acres on two sites (Site 2 and Percontee) near the FRC and Washington Adventist Hospital may provide the potential for economic synergies, as well as the possibility of new housing and retail near jobs. The area's largest employers are the FDA, Seventh Day Adventist Church, Kaiser Permanente, Holy Cross and Comcast.

The plan also will examine the future of several sites, including the National Labor College (located on 47 acres at New Hampshire Avenue and I-495), the White Oak and Hillandale shopping centers, and several vacant properties on US 29.[2]

3.3.3 Bethesda-Chevy Chase Master Plan

The NIH Campus is situated within the boundaries of the April 1990 Bethesda-Chevy Chase Master Plan. It is located within the Bethesda-Chevy Chase/North Bethesda Planning Area 2 boundaries, adjacent to the northern edge of the Bethesda Central Business District (CB75D). See Exhibit 3.3.B.

[2] The Maryland National Park and Planning Commission Website, Updated November 29, 2011

Master plans and sector plans in this Community-Based Planning Area acknowledge the established and stable nature of local residential neighborhoods. These plans also recognize that the central business districts of Bethesda and Friendship Heights, the transit station areas of Grosvenor, White Flint, and Twinbrook, and the commercial centers of Westbard and Wildwood serve as community focal points for the surrounding residential neighborhoods.[3] The Walter Reed National Military Medical Center (WRNMMC) at the Naval Support Activity Bethesda (NSAB) and the NIH campus serve as major employment areas for the area and region. MD Route 355 (Wisconsin Avenue/Rockville Pike), county and regional buses, and the Metrorail system provide major transportation links within this geographic area.

3.3.4 Bethesda Central Business District

Being federal agencies, the NIH is exempt from local zoning ordinances; however NIH will develop sites and buildings consistent with local agencies' zoning and land use policies and development, redevelopment, or conservation objectives, to the maximum extent feasible. The NIH borders the Bethesda Central Business District (CBD) to the south. The CBD contains high-density, multiple family residential (R-10) and townhouse (RT.-12.5) zones, as shown in Exhibit 3.3.C. All other sides of the campus, except the WRNMMC to the east, is R-60 single-family zoning. In the past, there have been a number of special exceptions granted along Old Georgetown Road, especially between McKinley Street and Beech Avenue, a practice the Bethesda-Chevy Chase Master Plan seeks to discourage.

Predominantly low- to mid-density residential uses comprise the Bethesda-Chevy Chase area surrounding the NIH campus. In addition; a limited number of clearly defined, high-density commercial and residential precincts are near the campus. Numerous institutional, private and public facilities are dispersed throughout the surrounding area. Several large land holders include federal installations, country clubs, private schools and institutional services. These large land holders, combined with a broad park system and low-density wooded sites, create a strong sense of openness that adds to the special character of the community.

[3] The Maryland National Park and Planning Commission Website, 2009

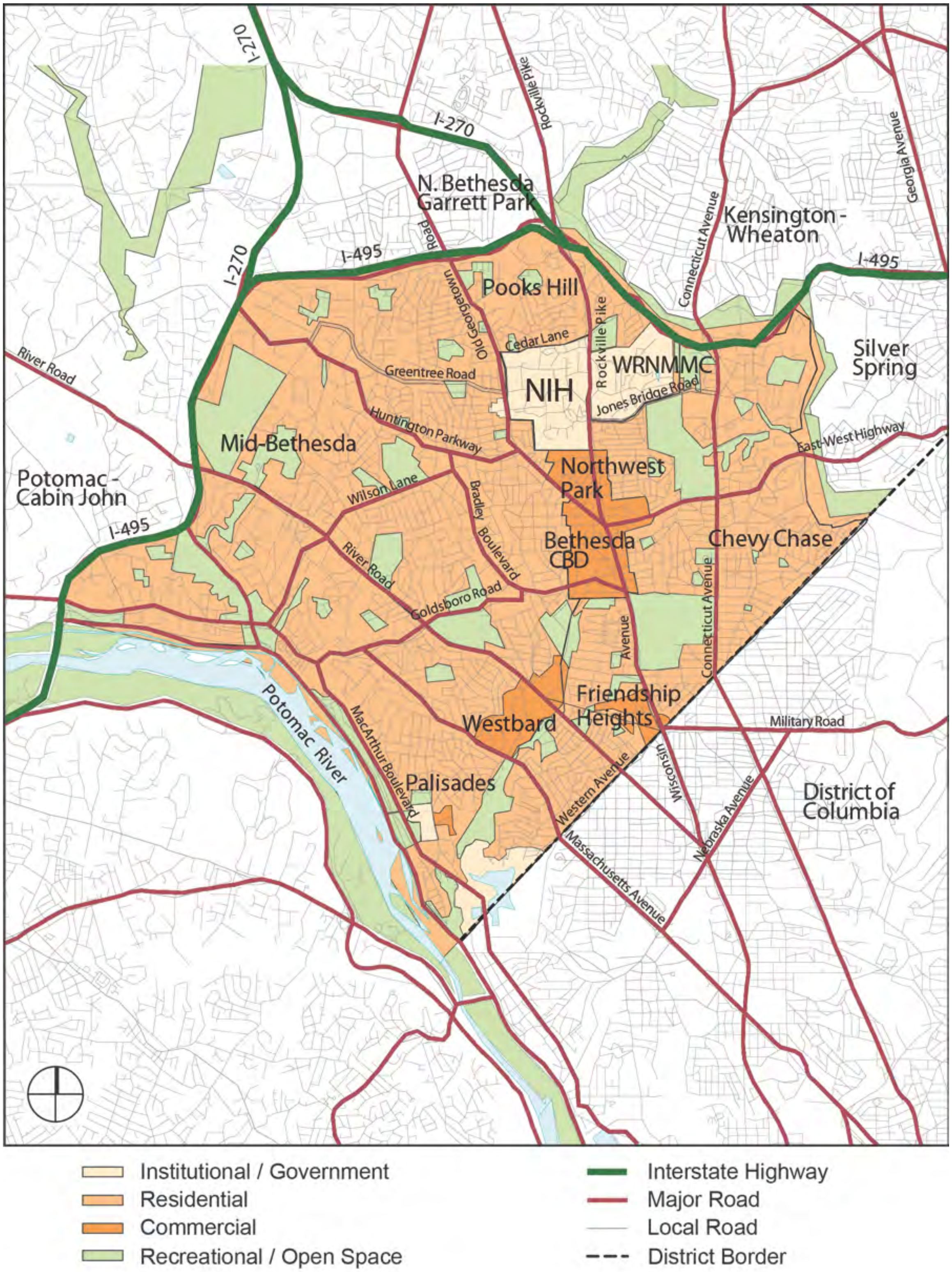

Exhibit 3.3.B. Vicinity Land Use Map

Exhibit 3.3.C. Local Zoning

3.3.4.1 Job Growth within the Bethesda CBD

In 2010 the Bethesda CBD had 35,721 jobs and is expected to have 40,884 jobs in 2030. NIH currently has 20,594 jobs and is expected to have 23,594 jobs in 2033. The Naval Support Activity Bethesda has 11,685 and is expected to have 12,611 jobs in 2022. These trends are shown in Exhibit 3.3.D.

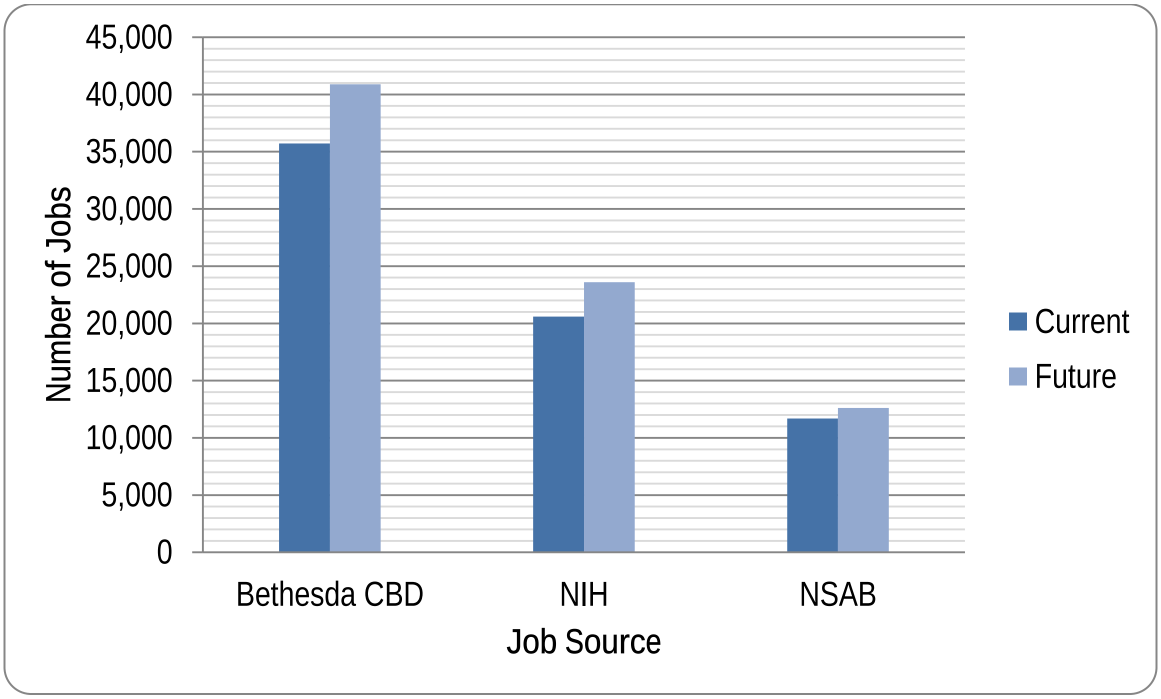

Exhibit 3.3.D. Job Growth in the Bethesda CBD Area

3.3.5 Friendship Heights Central Business District

The Friendship Heights Central Business District, at the intersection of Wisconsin and Western Avenues bordering Washington, D.C., is a compact, high-density urban area containing a mix of regional department stores, high-rise office buildings, corporate headquarters, specialty retail shops and high-rise housing. The Sector Plan for Friendship Heights was approved and adopted by M-NCPPC in March of 1998. This plan recommends adding up to 1,979,286 square feet of new office, retail, hotel and residential development in the Sector, including as many as 4,490 dwelling units.

Friendship Heights, like the Bethesda CBD, straddles the Wisconsin Avenue corridor which is heavily used as a main artery from Montgomery County to employment centers in the District of Columbia and depends heavily on the WMATA's Red Line Metrorail service to mitigate the additional volume of trips to and from the area. Friendship Heights continues to experience major development. There are currently 500 dwelling units and 295,793 square feet of office and retail space development projects that have been approved by the Planning Board but not completely built[4].

The Westbard area to the west of Friendship Heights contains a variety of retail commercial uses, both regional and local. The area includes and is surrounded by single-family and townhouse neighborhoods. It is located on the edge of the environmentally sensitive Palisades district overlooking the Potomac River. Two other high-density residential neighborhoods are located near the NIH, Pooks Hill to the north and Northwest Park to the south of the campus.

3.3.6 White Flint Sector Plan

The Montgomery County Council on March 23, 2010 unanimously approved the White Flint Sector Plan. This Sector Plan updates the 1992 North Bethesda Garrett Park Master Plan

The White Flint Sector Plan aims to:

- Create thriving, diverse mixed use center with highest intensity closest to Metro and along Rockville Pike
- Create new parks and open spaces
- Transform Rockville Pike into a boulevard with street trees and improved crosswalks
- Develop a transportation network that includes a grid of new public streets
- Improve the pedestrian and bicycling environment
- Promote sustainable development

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[4] The Maryland National Capital Park and Planning Commission, November 2011, Pipeline Master Plan Summary

3.4 NIH Vicinity

3.4.1 The Immediate Neighborhood

Seven predominantly single-family neighborhoods and one multi-family neighborhood are immediately adjacent to the NIH. These include Edgewood/Glenwood, East Bethesda, Huntington Terrace, Maplewood, Sonoma, Locust Hill, and Ayrlawn. One predominantly multi-family neighborhood adjoins the campus to the south, Battery Lane District.

Only one of these single-family neighborhoods - Glenwood, the eastern portion of Edgewood/Glenwood - adjoins the NIH campus directly, along with the Battery Lane District. The other six are separated from the campus by major roads.

Most of this area (64.4% of the Bethesda-Chevy Chase households) is developed with single-family detached homes on relatively small lots (one-quarter acre or less). The oldest homes date from the 1920s when this was a summer cottage area for residents of the District of Columbia. These were supplemented over the years by a varied assortment of additional summer houses, and then by permanent homes. The last major group of homes was built after World War II in the late 1940s and 1950s. However in the late 1990's home building continued on the remaining vacant land in the area, including a cluster of townhouses across Rockville Pike from NIH south of Jones Bridge Road, and several detached houses opposite the Center Drive entrance on Old Georgetown Road.

This segment of Bethesda has not experienced the extensive tract house construction seen further north and west in Montgomery County. It is filled with an eclectic assortment of housing styles and sizes, set on relatively narrow, tree-lined streets. These varied houses, with their convenient down-county location and good schools, command sale prices in the upper price ranges for their respective size and categories. They tend to sell relatively quickly when they come on the market. There are some isolated pockets where more expensive new homes have replaced smaller older models around them.

A significant concentration of apartment buildings lies immediately to the south of the NIH campus. Along both sides of Battery Lane are over 1,600 apartments, many of them rental units. Most are in mid-rise buildings built 40 to 50 years ago, but there are a few newer high-rise towers. Phoenix House, a private assisted-living residential tower for the elderly, is also located on Battery Lane. Most homes in the area are owner-occupied. However, rental units account for 26% of all households, which are supported, in part, by NIH employees.

3.4.2 Suburban Hospital

Directly west of the NIH is Suburban Hospital. Suburban Hospital is a community-based, not-for-profit hospital serving Montgomery County and the surrounding area since 1943. On June 30, 2009, Suburban Hospital became a member of Johns Hopkins Medicine. Suburban Hospital is affiliated with many local healthcare organizations, including the National Institutes of Health. This facility is currently planning a renovation and expansion.

3.4.2.1 Suburban Hospital Key Statistics[5]:

- Suburban Hospital is an acute-care, medical-surgical hospital featuring all major services except obstetrics. Admissions total more than 14,000 annually.
- Suburban Hospital has various strategic partnerships with local and national healthcare providers including the National Institutes of Health.
- Medical Staff: 900+
- Beds (as of July 2011): 233
- Hospital Employees: 1,400+
- Nursing Staff: 450+
- Volunteers: 430+

3.4.2.2 Suburban Hospital Future Plans

Suburban Hospital is planning to expand their facility at their current site on Old Georgetown Road. Features of their plans include:

- Improved access to their emergency/trauma center
- More private patient rooms
- Larger operating rooms
- Onsite physician offices in their patient care wing
- Long range land use predictability
- Compatibility with surroundings/context
- Contain hospital traffic on campus
- Improved access/circulation (vehicular/pedestrian)
- Adequate parking
- Flexibility to accommodate future changes
- Improved functional interrelationships

[5] Data acquired from Suburban Hospital Website, 2011

- Enhanced NIH connection/emergency preparedness
- Enhanced security

The buildings will be concentrated in the center of the site towards NIH and Old Georgetown Road, away from residential areas. The new building height will be greatest along Old Georgetown Rd. and steps down closer to the residential edges. The physician offices will be included in new patient-care wing, eliminating the need for a separate building. Landscape and building facades will screen the visual impact of cars. Setbacks will allow for significant landscaping, such as gardens and pathways, between the campus facilities and nearby residences and roadways. Primary mechanical equipment will be housed within buildings to minimize visual impact and noise. Parking will be concentrated in structured parking garage along Old Georgetown Rd. Closing of one block of Lincoln St. prevents hospital traffic from cutting through neighborhood. Separate entrances for emergency vehicles and patient/visitor traffic will enhance pedestrian safety and campus circulation.

3.4.3 Naval Support Activity (NSA) Bethesda

Directly east of the NIH Bethesda Campus is NSA Bethesda, the home of the Walter Reed National Military Medical Center (WRNMMC) and the Uniformed Services University of the Health Sciences (USU). (See the NSA Bethesda Installation Map at Exhibit 3.4.A.)

The mission of NSA Bethesda is to support their tenant commands in their pursuit of excellence in patient care, medical research and education. They support not only those who work at the commands, the staff, but also those who use the commands: patients and students.

- NSA Bethesda hosts the WRNMMC, the President's Hospital, that serves our Nation's Leaders, Warriors (past and present), and their families.
- NSA Bethesda is also home to Uniformed Services University of Health Sciences, the Armed Forces Radiobiology Research Institute, Commander, Joint Task Force,

National Capital Region Medical, and a cadre of other key tenant commands that provide research and training support to our base population.

- NSA Bethesda and the Navy's Medical Center and the Department of Defense (DoD) Medical School provide the training and education of the medical staff to care for the National Capital Region's beneficiary population. [6]

The Uniformed Services University of the Health Sciences, called the "West Point of Medicine," is an institution that provides the nation with health professionals dedicated to career service in the DoD and the United States Public Health Service.

WRNMMC's primary mission is to assure the readiness and care of the Uniformed Services and their families. They also provide care for the President and Vice-President of the United States, Members of Congress, and Justices of the Supreme Court. In addition, when authorized, WRNMMC provides care for foreign military and embassy personnel. WRNMMC is the Navy's third-largest health care delivery system and provides more than 12,500 ambulatory surgeries and almost 8,000 inpatient admissions each year.

Base Realignment and Closure (or BRAC) is a process of the United States federal government directed at the administration and operation of the Armed Forces, used by the DoD and Congress to close excess military installations and realign the total asset inventory to reduce expenditures on operations and maintenance, aimed at achieving increased efficiency in line with Congressional and DoD objectives. The most recent round of BRAC completed in the fall of 2005 and with the commission's recommendations became law in November 2005.

Exhibit 3.4.A. NSA Bethesda Installation Map

As part of a Base Realignment and Closure announcement on May 13, 2005, the DoD proposed replacing Walter Reed Army Medical Center with a new WRNMMC. The new center is on the grounds of the existing National Naval Medical Center. The proposal is part of a program to transform medical facilities into joint facilities, with staff including Army,

[6] Naval Support Activity Website: http://www.cnic.navy.mil/Bethesda/index.htm

Navy, and Air Force medical personnel. On August 25, 2005, the BRAC Committee recommended passage of the plans for the WRNMMC. On September 15, 2011, the Walter Reed Army Medical Center (WRAMC) relocated all tertiary (sub-specialty and complex care) medical services into the newly constructed WRNMMC facilities on the NSA campus in Bethesda. The merging of WRAMC with NNMC created the new military health care command named Walter Reed National Military Medical Center (WRNMMC). Currently at WRNMMC there are 310 inpatient beds, 10,500 employees, 3,611 daily patients and visitors resulting total daily population of 14,111.

3.4.3.1 NSA Bethesda Future Plans[7]

In September 2011, Naval Support Activity Bethesda conducted Public Scoping for an Environmental impact Statement analyzing the potential impacts of 2 proposed actions. These actions are Medical Facilities development and Expansion of Uniformed Services University of the Health Sciences (USUHS).

The proposed Medical Facilities Development scope includes:

- Demolition of Buildings 2, 4, 6, 7, and 8 at the medical center core
- Construction of a 5-story single facility, “Building C,” (approximately 563,000 SF) in the same basic footprint of the demolished area
- Construction of a 500-space underground parking garage;
- Utility upgrades to accommodate the new facilities;
- Temporary medical facilities in parking Lot G in the northwest corner of the installation to provide uninterrupted medical care during construction of Building C;
- Interior renovations in Buildings 1, 3, 5, 9, and 10.

The proposed expansion of USUHS scope includes:

- Construction of a new research/education facility, “Building F” (approximately 341,000 SF);
- Construction of a 400-space parking structure.

[7] Naval Support Activity Bethesda, EIS Public Scoping Presentation, September 2011

3.5 Local Transportation

3.5.1 Local Arterial Roads

NIH is accessed by three major arterial roads and served by Metrorail and Metrobus as well Ride-On Montgomery County's local bus service. NIH also is accessed by pedestrians and bicyclists. The local roadway system is discussed below and depicted in Exhibit 3.5.A.

3.5.1.1 Rockville Pike

Rockville Pike, on the eastern border of the NIH Bethesda campus, is a major artery which, in the vicinity of the site, links a mixture of institutional, commercial and residential uses. Maryland Route 355 is a 37-mile north–south road. Route 355 has interchanges with both the Capital Beltway (I-495) and I-270.

There are six vehicle entrances to NIH off of Rockville Pike. One entrance is reserved for visitors and second entrance is reserved for commercial vehicles that must be inspected before entering the campus. NIH employees enter the campus from Rockville Pike at North Drive, Wilson Drive, South Drive and Center Drive. Rockville Pike serves NIH employees who live south of the campus in the District of Columbia, Friendship Heights and Chevy Chase. Rockville Pike also serve employees from Virginia, Rockville and Potomac who exit the Capital Beltway or I-270 for destinations on the east side of the campus. The intersection on the North East corner of the Bethesda Campus at MD Rt 355 and West Cedar Lane is considered the 4th most congested intersection in the County[8].

3.5.1.2 Connecticut Avenue

Maryland Route 185 is a state highway in the state of Maryland. Known as Connecticut Avenue, the state highway runs 8.30 mi (13.36 km) from Chevy Chase Circle at the Washington, D.C. border north past MD 97 to S. Leisure World Blvd. MD 185 serves as a major north-south commuter route in southern Montgomery County, connecting the District of Columbia with the residential suburbs of Chevy Chase, Kensington, and Wheaton.

Connecticut Avenue provides access to NIH employees who live in Northern and Central Prince George's County along the MD 214; MD 202, US 50, MD 450, BW Parkway, MD 201, US 1, and I-95 corridors and Eastern Montgomery County along the MD 650, MD193, US 29 and MD 97 corridors. Most NIH employees who live in these areas exit onto

[8] Montgomery County Planning Department Mobility Report, October 2011

Connecticut Avenue on the Capital Beltway. Employees who work on the southern portion go south on Connecticut Avenue and enter NIH via Jones Bridge Road onto Center Drive. Employees who work on the north and central part of the campus go north on Connecticut Avenue to Beach Drive then onto West Cedar Lane to Rockville Pike where they will enter campus on West Drive (West Cedar Lane), North Drive, Wilson Drive, and Center Drive. The intersection at Connecticut Ave at Jones Bridge Rd is considered the 8th most congested intersection in the county[9].

3.5.1.3 Old Georgetown Road

Old Georgetown Road (Maryland Route 187), which constitutes most of the western border of the NIH Bethesda campus, contains a variety of uses, including residential properties, schools, churches and synagogues, fire and rescue services, as well as a number of professional offices. This state highway runs between Bethesda and Rockville.

There are three entrances to NIH off of Old Georgetown Road they are Center Drive, South Drive and Lincoln Drive. NIH employees' access or feed into Old Georgetown Road from I-270 from Frederick, Germantown, Gaithersburg; I-495 from Southern Prince Georges County, Potomac and Virginia; East West Highway MD 410 from Silver Spring and the District of Columbia. Several major collector roads such as Executive Boulevard, Democracy Boulevard, Greentree Road, and Huntington Parkway feed into Old Georgetown Road provides access to NIH employees who live west of the campus.

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[9] Ibid

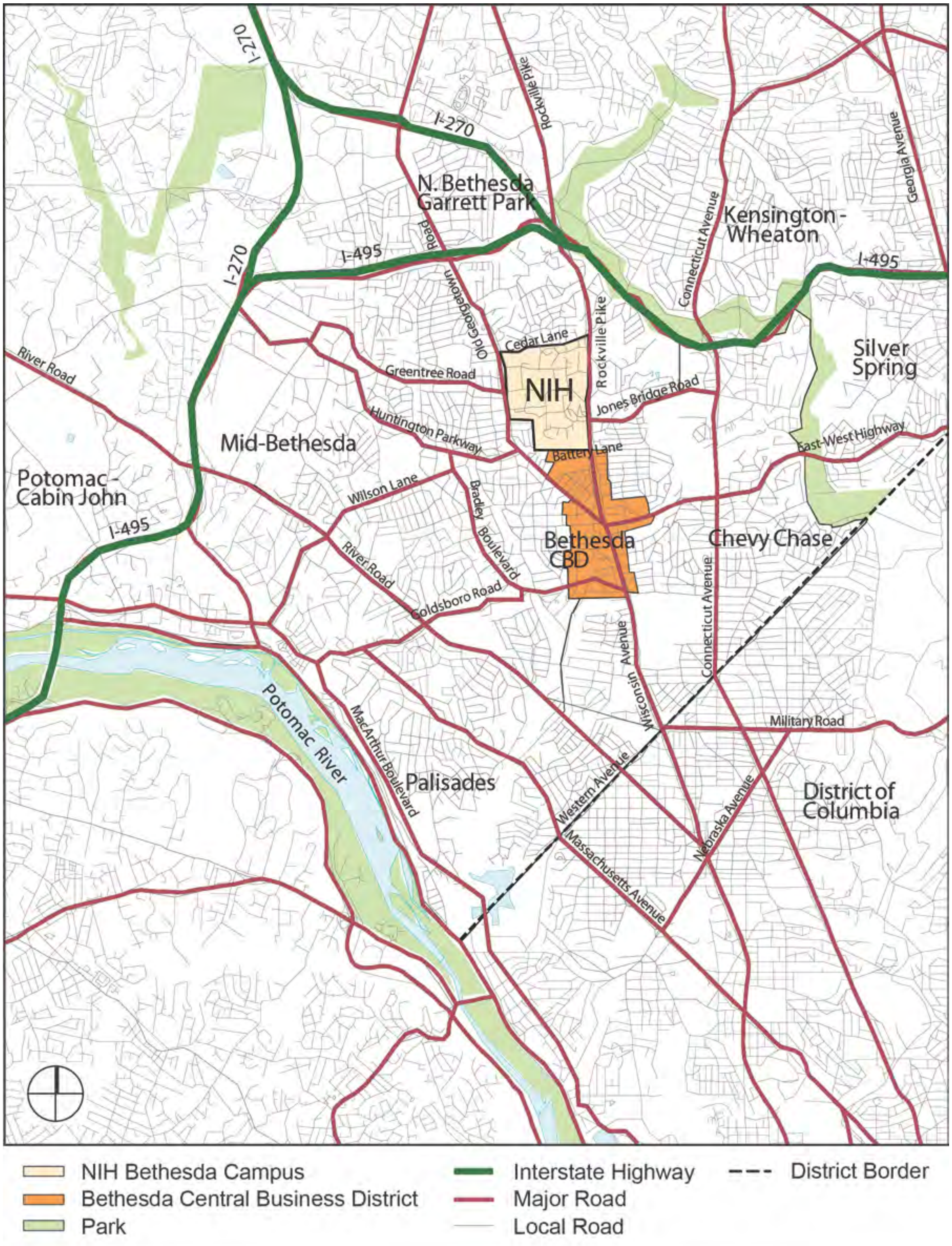

Exhibit 3.5.A. Local Roadway System Map

3.5.2 Traffic Impacts of the Base Realignment

The opening of WRNMMC in September 2011 has had an impact on traffic congestion on Rockville Pike between West Cedar Lane and Jones Bridge Road. All of the above mention roads are extremely congested. The intersection at West Cedar Lane and Rockville Pike is rated the 4th most congested in Montgomery County based on counts taken in 2010 prior to the BRAC move.

To address the increased traffic related to BRAC, the Maryland State Highway Administration (SHA) proposes intersection improvements 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.

Montgomery County has widened the shared use paths on West Cedar Lane and Jones Bridge Road (from Connecticut Avenue to Rockville Pike). The county has also secured funding for a proposed pedestrian underpass and high speed elevators to create a safe pedestrian path from the Medical Center Station buses and metro station to WRNMMC. The location of the shallow tunnel and elevators is shown in Exhibit 3.5.B[10]. The high speed elevators that will be connected to the concourse of the station to the east side of Rockville Pike at the WRNMMC Gate 2 (MD 355 and South Wood Road).

3.5.3 Metrorail Access to NIH

3.5.3.1 Red Line

The Red Line of Metro is a rapid rail transit service operating between 27 stations in Montgomery County, Maryland and the District of Columbia. It is a primary line through downtown Washington and the oldest and busiest line in the system. It forms a long, narrow U capped by its terminal stations at Shady Grove and Glenmont.

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[10] Plans prepared by URS for Montgomery County Department of Transportation, September 2010

Proposed Pedestrian Underpass   Relative Pedestrian Circulation Area

Exhibit 3.5.B. Proposed Pedestrian Underpass

3.5.3.2 Medical Center Station

Opened on August 25, 1984, Medical Center is an island platform Metro station built on the east side of NIH Bethesda on Health and Human Services land with a perpetual easement. The station is located at Rockville Pike and South Drive. Since there is little retail in the area and no commuter parking lot, this station is used almost exclusively by employees and patients traveling to NIH or WRNMMC. The average weekday Metrorail passenger boarding in 2011 was 5,866.[11]

The majority of passengers walk to the station. Passengers also access the station by WRNMMC or NIH shuttles, Metrobus, Ride On, personal automobiles, and bicycles.

Growth at WRNMMC and NIH campuses can reasonably expect to encapsulate the vast majority of future development surrounding the station. Employment growth at WRNMMC and NIH will be the primary driver of daily passenger growth at the Medical Center station.[12]

WRNMMC committed to increasing the existing transit mode share from 11 percent to 30 percent by BRAC build-out in September 2011. The WRNMC transit goals will have a substantial impact on future station ridership, as shown in Exhibit 3.5.C. It is estimated that ridership will increase almost 56 percent between 2007 and 2020, with NIH and WRNMMC employees constituting 41% and 31%, respectively, of the total Medical Center boarding and alighting. WRNMMC is also expected to expand its shuttle bus service, which could relieve peak period Medical Center station use by up to 240 people.

As described earlier in this chapter, Montgomery County has submitted a federal grant application to build a pedestrian tunnel under Wisconsin Avenue and high speed elevators to the Metrorail Platform from the east side of Rockville Pike to improve access to the Medical Center stop.

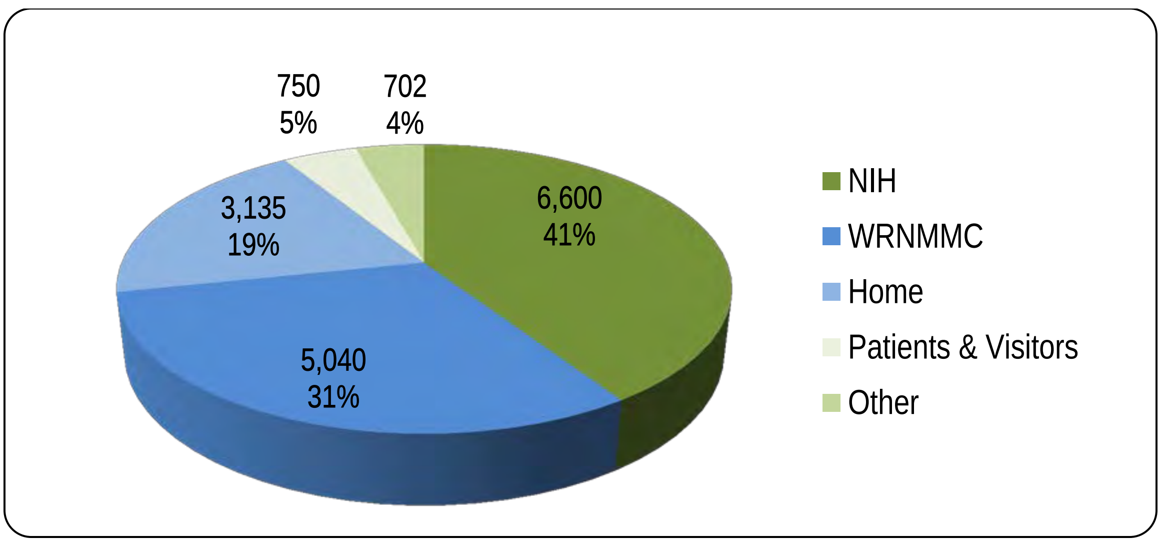

Exhibit 3.5.C. Projected Metrorail Ridership at Medical Center Station in 2020

[11] WMATA 2011 Metrorail Boarding by Station Report
[12] *Final Report: Medical Center Station Access Improvement Study*. Executive Summary. WMATA. 29 July 2009.

3.5.4 Bus Access to NIH

3.5.4.1 Ride On

Ride On is the primary public transportation system in Montgomery County, Maryland. Ride On serves Montgomery County as well as the community of Langley Park in Prince George's County. Ride On also serves the Takoma Metro station, and Sibley Memorial Hospital in Washington, D.C. Ride On operates 80 routes, including operating three Metrobus routes on weekends. NIH is served by the following Ride On route 30, 33, and 46. Route 30 operates between: NIH-Medical Center, Rockville Pike, Pooks Hill Rd, Promenade, Whitley Park (Limited service), Beech Ave, Bulls Run Pkwy, Bradmoor Dr., Huntington Pkwy, Old Georgetown Rd, and Bethesda Station. Route 33 operates between: Glenmont Station, Georgia Ave, Arcola Ave, Newport Mill Rd, Connecticut Ave, Kensington Pkwy, Jones Bridge Rd, Naval Medical Hospital Center and NIH-Medical Center Station. Route 46 operates between: Shady Grove Station (limited), Montgomery College-Rockville, Hungerford Dr., N. Washington Street, Jefferson Street, Monroe Street-County Office Building, Rockville Station, Rockville Pike, Twinbrook Station, White Flint Station, Grosvenor Station, Naval Medical Center, and NIH-Medical Center.[13]

3.5.4.2 Metrobus

As discussed in Chapter 2 Metrobus is a regional bus system operated by WMATA. NIH is served by following Metrobus routes J1, J2, J3, J7 express, and J9 I-270 express. Routes J1, J2, and J3 are routes between Bethesda and Silver Spring Metro Stations. Routes J7 and J9 are routes between Montgomery Village to the Bethesda Metro Station.[14]

The NIH will continue to work with other regional bus services regarding the possibility of designing and implementing new routes, expanding existing routes, or enhancing by innovative ways additional transit services that can assist in filling unmet transit needs. The NIH Transhare program is a key element in assisting with the goal.

[13] Montgomery County Department of Transportation, "Ride On Route and Schedules", 2010
[14] WMATA, "Metrobus Timetables for the State of Maryland", 2010

3.5.4.3 NIH Shuttles

The NIH provides shuttle bus services circulating among selected locations on campus; Campus Perimeter, Executive Plaza, and Rockledge. Shuttle bus service is also provided between the campus and the satellite parking lot at Mid-Pike Plaza on Rockville Pike.

The Campus Perimeter Route has the following stops: METRO, Woodmont/Battery Lane; 4887, 4977, and 5015 Battery Lane; Huntington Parkway; McKinley/Suburban Hospital; Lincoln Drive, Center Drive; Building 82; West Drive, and Cedar Crest Drive. The Executive Plaza Shuttle Bus Route has the following stops: METRO; Rockwall, Mid Pike, 6001, 6011, 6116 and 6100 Executive Boulevard; 2115 E. Jefferson; Executive Plaza North and South; Building 10 South, and Building 31

The Mid-Pike Plaza Route includes the following stops: Mid-Pike Plaza, METRO; Building 31A; Building 10 South and Building 45; The Rockledge Shuttle Bus Route provides the following stops: METRO 6610 Rockledge Drive; 6700B Rockledge Drive; Rockledge Two; Democracy Two; Bldg.10 (South); and Bldg.31A

3.5.4.4 NIH Bicyclists

NIH has the highest number of employees who bicycle to work of any employer in the National Capital Region. The NIH Bicycle Commuter Club is sponsored by the NIH office of Recreation and Welfare to encourage commuting to NIH by bicycle and to represent the interests of bicyclists to the NIH administration. NIH is a 4-time champion of the annual Bike to Work Day.

All pedestrian portals at the perimeter of the NIH campus allow around the clock bicycle access. NIH continues to work with the MD State highway Administration (MD SHA) and Montgomery County Department of Transportation (MC DOT) to maintain and upgrade the shared use paths that lead to and around the Bethesda campus for pedestrians and bicyclist. Recent improvements include replacing the sidewalk with an 8'wide Shared use path on West Cedar Lane; widening the shared use path on MD 355 in the vicinity of the SHA intersection improvement projects, and the plan to build the shallow tunnel discussed in section 3.5.2 which will allow bicyclist to cross MD Rt. 355 at the metro station.

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3.6 Local Transportation Initiatives

3.6.1 Bethesda Transportation Management District

The Bethesda Transportation Management District (TMD) is one of four TMDs in Montgomery County. The three others are Friendship Heights, Silver Spring, and North Bethesda. The County has established a fifth TMD in Greater Shady Grove, now in the early stages of planning and implementation. The Bethesda TMD is operated by the Bethesda Urban Partnership (BUP) under the name Bethesda Transportation Solutions (BTS).

BTS provides free services to employers, employees, residents and visitors in downtown Bethesda. The goals of the TMD are:

- Cut traffic congestion
- Increase transportation capacity
- Reduce air and noise pollution
- Promote bicycle and pedestrian access and traffic safety.

On an average weekday, more than 15,000 persons use Metrorail. There are 11 Ride On bus routes, including the popular, free Bethesda Circulator Trolley, six Metrobus routes, taxi service, and opportunities for carpools, vanpools, biking, walking, and teleworking, and flextime. Under new County legislation, these "TMPs" are required of employers of 25 or more employees in TMDs, to assist with achieving the congestion reduction objectives for the area. With these plans, employers can ensure their employees are aware of their commuting options while discouraging solo driving. TMD staff can show employers how they can offer these benefits at little or no cost, providing assistance to their employees while at the same time helping their bottom line and the community.

3.6.2 North Bethesda Transportation Management District

The North Bethesda TMD is Montgomery County's largest TMD and established in 1996 in cooperation with the planning staff of NIH. It is the County's 2nd oldest TMD (1st was Silver Spring, established 1986). The TMD works with major office employers, retailers, and property owners and is guided by an Advisory Committee.

The Advisory Committee includes: employers – large and small; property owners; Chamber of Commerce representatives; residential and community representatives. TMD is funded by Montgomery County parking revenues; TMD fees on new development; parking reduction payments; and grants. The North Bethesda TMD consists of 800 + companies with 88,000 employees including major private sector companies and federal employers such as NIH, US Nuclear Regulatory Commission (NRC) and US Department of Health and Human Services (HHS).

The TMD offer employers and employees information on better ways to work through transit, carpool and vanpools, telework, flextime, car-sharing, bike and walking, and parking parity. TMD services are provided free to employers and employees and success depends on partnerships with employers. Services are provided in partnership with County, Metro, Metropolitan Washington Council of Governments (MWCOG), and State and Employee surveys are conducted to identify commute patterns and program needs.

3.7 NIH Transportation Improvement Initiatives

3.7.1 The NIH Transportation Management Plan[15]

The NIH executed a trilateral memorandum of understanding with the National Capital Planning Commission (NCPC) and Maryland-National Capital Park and Planning Commission (M-NCPPC) and implemented the NIH Transportation Management Plan (TMP) on October 4, 1991. The following short-term 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 ticketing 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.

[15] APEA-Peat Marwick NIH Facilities Engineering Branch, “Transportation Management for National Institutes of Health, October 4, 1991

- Emphasize parking regulation enforcement by an adequately staffed parking enforcement workforce.
- Further promote the use of flexitime by employees and flexitour 9-day biweekly work schedules. Reserve selected parking areas for later-arriving employees to encourage use of flexitime by employees.
- Have the Employee Transportation Service Office publicize existing programs which utilizes outlying parking areas, such as church lots and park-and-ride areas.
- Institute, pay parking for visitors to NIH, exclusive of patients and blood donors, except after normal working hours.

The following long-term TMP strategies were adopted:

- As the campus develops maintain the effective parking supply at 0.5 spaces per NIH employee. Plus 16 percent additional parking spaces to serve the parking needs of visitors and patients at NIH.
- Within the context of the development of the NIH Master Plan, the parking requirements associated with future campus growth and the reestablishment of the buffer zone surrounding the campus should be accommodated by the construction of multi-level- parking (MLP) structures, within the parking supply criteria adopted by NIH. Planning and funding of these new MLPs should be linked to funding plans for other buildings to be added to the campus.
- Implement an internal perimeter road circulation system within the NIH campus, with two way traffic.
- Improve congested roadway intersections through addition of more turning lanes to selected intersections adjacent to the NIH campus to mitigate traffic congestion.
- Have the Employee Transportation Office explore the feasibility of developing or leasing satellite parking areas near outlying Metrorail Red Line Stations to serve NIH employees.

The NIH TMP is supported by a Memorandum of Understanding (MOU) by and among NCPC, the Montgomery County Planning Board, and NIH. NIH has implemented every short term strategy and every long term strategy contained in the TMP except the internal perimeter road; and NIH has met and exceeded all of the TMP goals.

The current ratio of parking space per employee is less than 0.5 parking spaces per employee. NIH has constructed four MLP: MLP 8, 9, 10 for employees and MLP 11 for visitors.

NIH has established an Employee Transportation Services Office within the ORS Division of Amenities and Transportation Services (DATS). NIH continues to provide for carpools, vanpools visitors to be in close proximity to their destinations. Additionally, NIH has implemented the Transhare Program; NIH has instituted pay parking for visitors; NIH has maintained internal and external shuttle bus routes and services; and the NIH continues to promotes alternate work schedules (AWS) for its employees. Additionally, NIH is promoting telework and hoteling to reduce the number of employees that drive to the campus each day. DATS publicizes roadway improvement projects, NIH transit programs, and state and county commuting resources through traffic.nih.gov.

NIH has conducted biannual traffic counts at all of the campus access points which demonstrate that NIH has decreased our single occupancy vehicle (SOV) traffic by more than 30 percent. The numbers of NIH-generated vehicles on the roads that surround the NIH campus are below the 1991 baseline numbers, even though the NIH population has increased.

3.7.2 Telework

Teleworking can be part of the solution to help NIH support employee work/life balance, improve its ability to retain high-quality staff, maintain performance during emergency situations without reducing productivity, decrease traffic congestion caused by BRAC and meet HHS and NIH sustainability goals.[16] NIH Managers across the agency have found that enabling employees to work remotely has benefited not only telecommuters, but also their organizations.[17] NIH has been able to downsize office space while saving many employees the expense, time and headaches brought on by daily long commutes.

Telework is at the heart of government-wide efforts to reduce greenhouse gas pollution from indirect sources such as employee travel. In July, President Obama committed the government to reducing these emissions by 13 percent by 2020. In reducing the number of cars on the road, telework can significantly reduce air pollution.

Survey feedback conducted on pilot NIH telework programs have shown that both customer and employee satisfaction have increased in response to the new telework arrangements. Currently there are 8,507 teleworkers and 13,242 eligible for telework.

[16] "Briefs", NIH Record, November 11, 2011
[17] Gill, John "Telework Seen as Solution to Many Challenges" NIH Record, December 10, 2010

3.8 Cultural Assets

The employees and families of NIH enjoy a number of first-rate educational and cultural opportunities disbursed (as shown in Exhibit 3.8.A) across Montgomery County.

3.8.1 Educational Assets

3.8.1.1 Primary and High Schools

The Montgomery County public high school districts serving the neighborhoods near the Bethesda campus are the Walt Whitman, Walter Johnson, and Bethesda-Chevy Chase clusters. These are served by three high schools, five middle schools and nineteen elementary schools.

In addition to public schools, there are many private elementary and high schools near the NIH Bethesda campus. The Stone Ridge School of the Sacred Heart is a Roman Catholic college preparatory day school for girls located on a 35-acre site on Rockville Pike and West Cedar Lane opposite the NIH. In addition, within 2 miles of the campus are 8 other private schools.

3.8.1.2 The Uniformed Services University of the Health Sciences

As mentioned in section 3.4.3, the Uniformed Services University of the Health Sciences (USUHS), located on the site of Naval Support Activity Bethesda and accessible from an entrance on Jones Bridge Road, is a military institution and medical school. Other local medical schools are located at Johns Hopkins University and the University of Maryland in Baltimore, Maryland and Howard University, Georgetown University and George Washington University in Washington, D.C.

3.8.1.3 The Foundation for Advanced Education in the Sciences

The Foundation for Advanced Education in the Sciences (FAES) is located at 9109 Old Georgetown Road. The beginnings of FAES can be traced back to the early 1950s, when a Graduate Evening Program was formed at NIH to permit members of the science and medical community to supplement laboratory training with advanced formal education. By 1959, FAES was incorporated as a non-profit organization with a mission “to foster and encourage scientific research and education, and to facilitate communication among scientists, by whatever means may be practical.”

Each year approximately 3,000 individuals participate in the courses offered by the FAES Graduate School at NIH. Courses are offered at both graduate and undergraduate levels. The majority of the school's faculty is made up of NIH staff, making their specialized knowledge available to a wider audience. Although the primary recipients of the school's programs have always been members of the NIH scientific staff at all levels, courses are also open to other federal employees and the general public.

There are presently almost 184 courses at the school, each certified by the Maryland Higher Education Commission and accepted for credit at most universities. The majority of the classes are in the biomedical field. However, there is strong representation in the physical and behavioral sciences, and in English and foreign language studies.

3.8.1.4 The Howard Hughes Medical Institute

The Howard Hughes Medical Institute (HHMI) at 4000 Jones Bridge Road in Chevy Chase, MD, is a nonprofit medical research organization that employs hundreds of leading biomedical scientists working at the forefront of their fields. In addition, through its grants program and other activities, they also support research on the HHMI Janelia Farm Research Campus in Ashburn, VA which opened in 2006. HHMI plays a powerful role in advancing biomedical research and science education in the United States. The Institute spent $825 million for research and distributed $80 million in grant support for science education in fiscal year 2011.

3.8.1.5 NIH

The NIH itself has extensive educational and training programs for all levels of science education from elementary school to postdoc education. In addition, the NIH runs many annual educational series of lectures for the public.

The NIH Office of Intramural Training & Education (OITE) is a division of the Office of Intramural Research (OIR), Office of the Director (OD). Their mission is to enhance the training experience of students and fellows on all of the NIH campuses. They work closely with the Training Offices in the NIH Institutes and Centers to help trainees in the Intramural Research Program develop scientific and professional skills that will enable them to become leaders in the biomedical research community. They serve current trainees in programs; potential applicants to training programs; Investigators and staff at the NIH; and Trainees and investigators outside the NIH in the extramural community.[18]

The NIH Office of Science Education (OSE) coordinates science education activities at the NIH and develops and sponsors science education projects in house. These programs serve elementary, secondary, and college students and teachers and the public.

- Develop curriculum supplements and other educational materials related to medicine and research through collaborations with scientific experts at NIH
- Maintain a website as a central source of information about NIH science education resources
- Establish national model programs in public science education, such as the NIH Mini-Med School and Science in the Cinema
- Promote science education reform as outlined in the National Science Education Standards and related guidelines[19]

3.8.2 Libraries

3.8.2.1 Public Libraries

The Bethesda Regional Library and two community libraries, the Chevy Chase Library and the Little Falls Library, serve the Bethesda-Chevy Chase area.

3.8.2.2 The National Library of Medicine

The National Library of Medicine (NLM), located on the southeast corner of the NIH Bethesda campus, is open to and used by the worldwide medical community as well as the public at-large, and is the world's largest research library in a single scientific and professional field. NLM has nearly 12 million books, journals, manuscripts, audiovisuals, and other forms of medical information on its shelves, making it the largest health-science library in the world. Begun in 1836, the Library today has a statutory mandate from the Congress to apply its resources broadly to the advancement of medical and health-related sciences. Traditionally, this advancement took the form of collecting, organizing, and making available its immense collections. In today's increasingly digital world, NLM carries out its mission of enabling biomedical research, supporting health care and public health, and promoting healthy behavior by:

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[18] NIH Office of Intramural Training & Education website: https://www.training.nih.gov/about
[19] NIH Office of Science Education website: http://science.education.nih.gov/home2.nsf/feature/index.htm

- Acquiring, organizing, and preserving the world's scholarly biomedical literature;
- Providing access to biomedical and health information across the country in partnership with the 5,600-member National Network of Libraries of Medicine (NN/LM®);
- Serving as a leading global resource for building, curating and providing sophisticated access to molecular biology and genomic information, including those from the Human Genome Project and NIH Roadmap;
- Creating high quality information services relevant to toxicology and environmental health, health services research, and public health;
- Conducting research and development on biomedical communications systems, methods, technologies, and networks and information dissemination and utilization among health professionals, patients, and the general public;
- Funding advanced biomedical informatics research and serving as the primary supporter of pre- and post-doctoral research training in biomedical informatics at 18 US universities.[20]

3.8.3 Parks and Open Space

There are approximately 30,000 acres of parks in Montgomery County and 700 acres of parkland within the Bethesda/Chevy Chase area, with 193 acres in community use parks. The remaining acreage is in the county-wide parks: Rock Creek Stream Valley Park is the eastern boundary of the planning area; Cabin John Park and Booze Creek Park are located in the western portion of the stream valley; Little Falls Park starts in the central portion of the area and runs to the southern boundary. These parks are interconnected along major stream valleys and provide public access to streams and trails for jogging, hiking and bicycling.

The recreational facilities within the parks include 30 ball fields, 42 tennis courts, 8 recreation centers, 35 playgrounds, hiker-biker trails and an outdoor swimming pool.

The NIH campus itself is used by the NIH employees for walking, biking, and passive and active recreation. The surrounding community also enjoys the space outside the perimeter fence.

[20] U.S. National Library of Medicine website: http://www.nlm.nih.gov/pubs/factsheets/nlm.html

3.8.4 Other Cultural Assets

Strathmore, an 11-acre arts facility centered on the Strathmore Hall mansion with a new 2000-seat concert hall has become the summer home of the Baltimore Symphony Orchestra.

NIH provides several cultural activities that are open to the community such as: NIH-Comcast Outdoor Film Festival; Science in the Cinema; NIH Community Orchestra; Manchester String Quartet; FAES Chamber Music Series and the National Library of Medicine's Current Exhibitions.

3.8.5 Historic Resources

The architectural heritage of the Bethesda/Chevy Chase area is quite significant, and includes historic structures ranging from early farmhouses to grand estates. Numerous sites within the boundaries of the Bethesda-Chevy Chase Planning Area are listed in the National Register of Historic Places, including: Bethesda Meeting House; Bethesda Naval Hospital; Chevy Chase Historic District; Woodend; Chesapeake and Ohio Canal National Historical Park, including Locks #7, 8, and 10; Clara Barton House; Glen Echo, Chautaqua; Milton Loughborough House; Cabin John Aqueduct; Wiley-Ringland House; Robert Llewellyn Wright House; and the David W. Taylor Model Basin.

Montgomery County's Master Plan for Historic Preservation (1979) contained in Chapter 24A of the Montgomery County Code (1979, rev'd. 1989) and the Historic Preservation Ordinance of Montgomery County are designed to protect and preserve the county's historic and architectural heritage. The George Freeland Peter Estate is the only site on the NIH campus listed on the County's Master Plan for Historic Preservation.

The historic sites listed[21] in Exhibit 3.8.B are found in the Master Plan for Historic Preservation and are located within the boundaries of the Bethesda/Chevy Chase planning area, as depicted in Exhibit 3.8.C.

[21] The sites are numbered with the convention "M: 35-xxx", wherein "M" refers to the Montgomery County Architectural Survey and the number 35 has been assigned to the NIH. The following numbers have been assigned to that specific property, each of which is contained within the Maryland Historical Trust's Maryland Inventory of Historic Properties (MIHP number). For more information, see the MHT and MIHP web pages at http://mht.maryland.gov/ and http://www.mdihp.net/dsp_search.cfm?search=property.

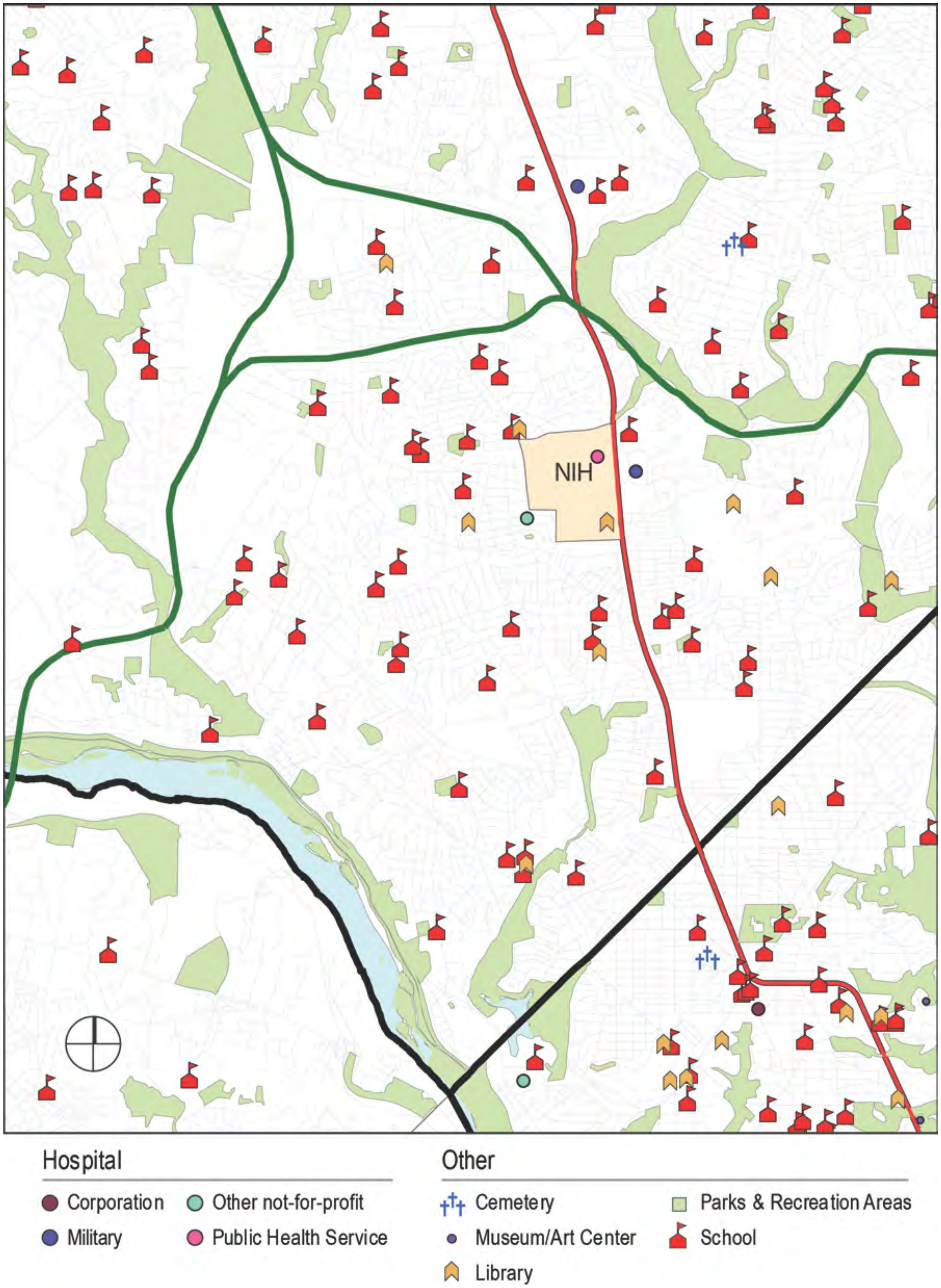

Exhibit 3.8.A. Cultural Assets Map

Exhibit 3.8.B. Historic Sites Table

No.	Site
35/3	Alta Vista
35/4	Samuel Perry House
35/5	Bethesda Meeting House
35/8	Bethesda Naval Hospital Tower Block
35/9	George Freeland Peter Estate (NIH)
35/10	Hayes Manor
35/11	Chevy Chase Lake /Trolley Station (moved out of county)
35/12	Woodend
35/13	Chevy Chase Historic District and numerous individual sites located in Chevy Chase Section 3, Section 5, and in the vicinity of Martin's Additions.
35/13	1 - Corby Mansion
35/14	1 - Farm Women's Market 2 - Madonna of the Trails Statue 3 - Little Tavern 4 - Bethesda Theater Complex 5 - Bethesda Post Office 6 - Brooks Photographers 7 - Community Paint & Hardware 13 - Leslie Beall House (Mrs. Wither's House) 14 - Bethesda-Chevy Chase High School
35/16	C. W. Landsdale House/Landon School
35/18	W. Lynch House
35/20	Lock #10 & Lockhouse
35/21	Lock #8 & Lockhouse
35/22	Oakmont/Rammed Earth House
35/23	Cabin John Hotel Gas House

No.	Site
35/24	Reading House
35/25	Clara Barton House
35/26	Glen Echo Chautaqua [Historic District]
35/27	Lock #7 & Lockhouse
35/29	1 - Baltzley Castle 2 - R. A. Charles Castle 3 - Kimmel House
35/32	Civil War Earthworks
35/34	DC/MD Boundary Stones
35/35	Milton House
35/36	Somerset Historic District
35/37	Cabin John Aqueduct
35/38	"In the Woods"
35/43	Bethesda Community Store
35/46	Walter Johnson House
35/47	Bonfield's Garage
35/54	Hawkins Lane Historic District
35/56	Hurley Sutton House
35/57	Gilliland-Beloom House

Exhibit 3.8.C. Historic Resources Map

3.9 NIH Leased Facilities

NIH has a very large lease portfolio in Montgomery County consisting of 63 leases at 3,151,089 Rentable Square Feet (RSF). Nationwide NIH has 3.9 million RSF. The lease portfolio is divided among occupants as shown in Exhibit 3.9.A.

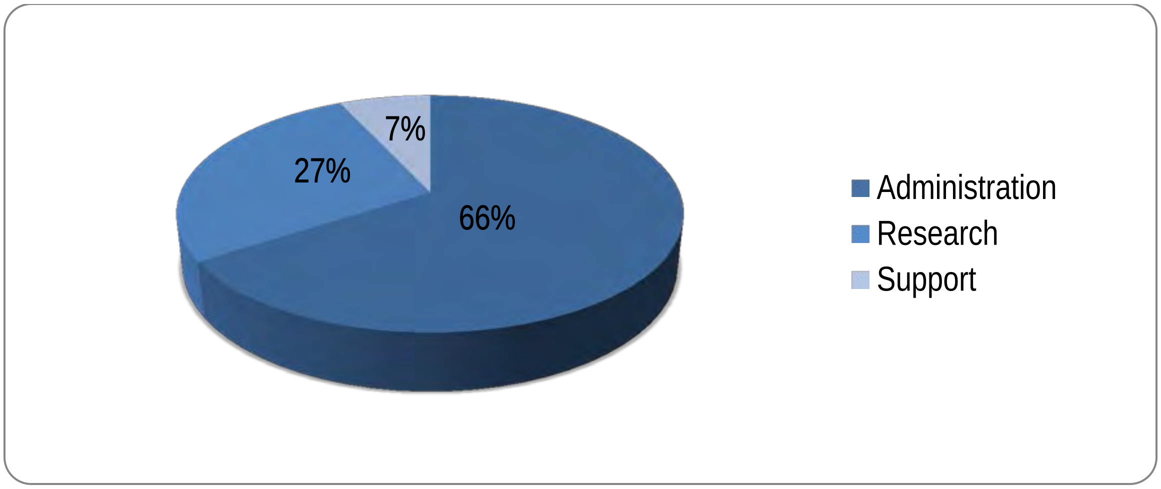

Exhibit 3.9.A. NIH Lease Portfolio

Locally leased facilities (rentable sq. ft.) include the following in the Bethesda/Rockville/Gaithersburg area as of October 2011 (Exhibit 3.9.B). These facilities are distributed in clusters and individually as depicted in Exhibit 3.9.C.

The NIH proposes to bring back to the Bethesda Campus leased laboratory facilities within the next 20 years. In 2013 NIH will terminate the lease for research space at 5 Research Court in Montgomery County and return the scientific programs to Porter Neuroscience Research Center on the Bethesda Campus. In 2018 NIH will terminate the lease at 5640 Fishers Lane and return the scientific programs to Building 29A on the Bethesda Campus.

Exhibit 3.9.B. Locally Leased Facilities Table

Address	Type	IC/Tenant
Individual Sites		(Listed from northern to southern locations)
9 West Watkins Mill Rd	Office	NIAID
8424 Helgerman Ct	Office	NCI

Address	Type	IC/Tenant
8697 Grovemont Cir	Lab	NCI
8717-25 Grovemont Cir	Lab	NCI
16050 Industrial Dr	Warehouse	OD
5 Research Ct	Lab	NHLBI, NIDCD
9607-09 Medical Center Dr	Lab	NCI
9800 Medical Center Dr	Lab	NCGC, IPDC, NIAAA, CC, NHGRI
301 N. Stonestreet Ave	Light Industrial	ORS
5411 - 5415 W. Cedar Ln	Clinic	NIMH, NIAID
7201 Wisconsin Ave	Office	NIA
Executive Blvd. Cluster		
6001 Executive Blvd	Office	ORS, NINDS, NIDA
6006 Executive Blvd	Office	CIT, NIDDK, OD, ORS
6011 Executive Blvd	Office	OD
6100 Executive Blvd	Office	NICHD, OD
6101 Executive Blvd	Office	NINDS, NIMH, NIDA
6116 Executive Blvd	Office	NCI
6120 Executive Blvd	Office	NCI, OD, NIDCD
6120-6130 Executive Blvd	Office	NCI
Rock Spring Cluster		
10401 Fernwood Rd	Office	NIAID, CIT
10401 Fernwood Road	Warehouse	NIAID
6707 Democracy Blvd	Office	CIT, OD, NIBIB, NLM, CC, NICHD, NIDDK, OHR, NCRR, NHGRI
6701 Democracy Blvd	Office	NIDCR, NIAMS, NINR, NCRR
6610 Rockledge Dr	Office	NIAID
6700 A&B Rockledge Dr	Office	NIAID
6701 Rockledge Dr	Office	CSR, NHLBI
6705 Rockledge Dr	Office	OD, NICHD, ORS, NHLBI, NLM, CC
Twinbrook Cluster		
5601 Fishers Lane	Office	NIAID
5625 Fishers Ln	Lab	NIAAA, NHGRI, NEI, NIMH, NINDS
5635 Fishers Ln	Office	NIAAA, NHGRI, NEI, NIMH, NINDS, OD
5640 Fishers Ln	Lab	NIAID
12441 Parklawn Dr	Lab	NIAID
12735 Twinbrook Pkwy	Lab	NIAID

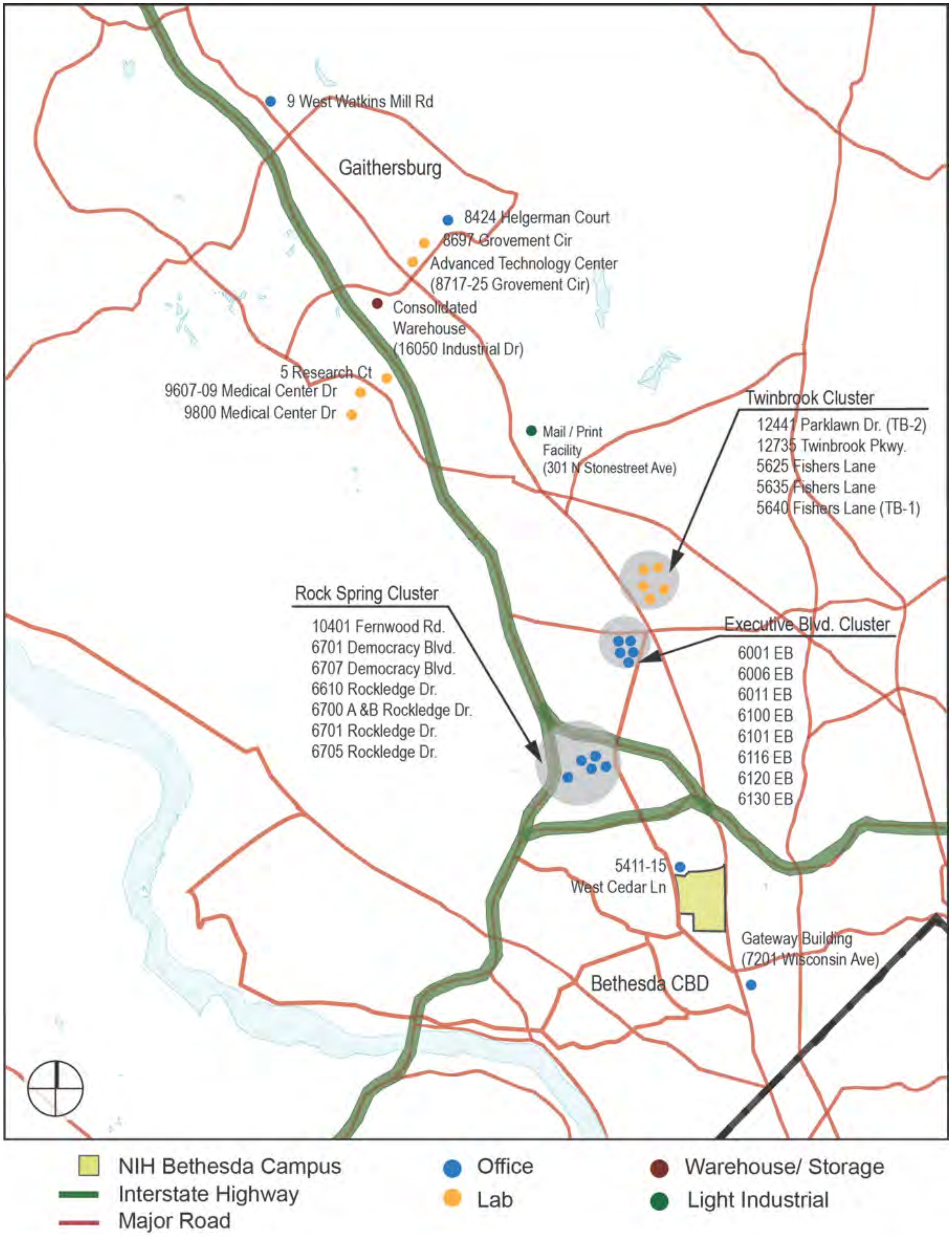

Exhibit 3.9.C. NIH Leased Facilities Map

3.10 NIH Current Construction

3.10.1 American Recovery and Reinvestment Act Projects

Starting in 2009, the American Recovery and Reinvestment Act (ARRA) directly provided $10 billion to the National Institutes of Health (NIH). $500 million of those funds are being used for NIH's Buildings and Facilities program. This includes three major projects on the Bethesda Campus and a variety of smaller renovation and improvement projects that were aimed at improving the reliability and condition of NIH facilities.

3.10.1.1 John Edward Porter Neuroscience Research Center, Phase II (PNRCII)

Phase II of the Porter Neuroscience Research Center is the second part of 600,000 gross square feet of space being constructed on the sites of Buildings 35 and 36. The first part, Phase I, is complete and occupied and makes up about 45% of the entire project.

Construction of phase II will complete the state-of-the-art John Edward Porter Neuroscience Research Center (PNRC) which was envisioned as a single complex to promote world class biomedical research. The PNRC II will be a 5 story 306,476 Gross Square Feet (including interstitial space) laboratory, lab support, animal, imaging, office and public spaces facility that will complete the Phase II portion of the combined PNRC I and II project. The PNRC II facility will incorporate a number of features aimed at sustainability and energy conservation. NIH is seeking certification by the two leading green building industry third party assessors (US Green Buildings Council and Green Globes) of achievement in sustainability and energy conservation design.

PNRC II will house the following Institutes: National Institute of Neurological Disorders and Stroke (NINDS), National Eye Institute (NEI), National institute of Child Health and Human Development (NICHD), National Institute of Dental and Craniofacial Research (NIDCR), National institute of Mental Health (NIMH), National Institute on Deafness and Other Communicable Disorders (NIDCD), National Institute of Biomedical Imaging and Bioengineering (NBIB).

3.10.1.2 Building 10, F Wing Renovations

Building 10, NIH's original Clinical Research hospital was completed in 1955 and the oldest wings are no longer capable of supporting biomedical research and training without extensive renovation. The conversion of F Wing, Phases B1-B2, Floors 6-13 from hospital to laboratory space will support translational research for 9 of the 12 ICs that have Clinical Research programs in the new Clinical Research Center and strive for Leadership in Energy and Environmental Design (LEED) certified status.

3.10.1.3 Building 3 Renovations

Building 3 was constructed in 1938 as a laboratory building. The build-out of Building 3 will transform the unused, vacant building into useable office space. The adaptive re-use of the existing facility, which is eligible for the historic register, will be completed using an environmentally sensitive approach that minimizes construction waste and conserves energy.

The project for the build-out of 49,243 gross square feet in Building 3 will provide office and administrative space for approximately 148 personnel in the Intramural Research Program. Work will include newly renovated spaces designed to house administrative office functions including private and open office space with standard furniture and system furniture work stations. The new interiors will include drywall partitions, acoustical tile ceilings and new finishes. Supplemental space will be provided such as conference rooms, break areas, copy centers, storage areas, mail rooms, vending machines areas and corridors.

The new design and construction will update the building's ADA compliance, fire protection and security requirements. The buildings entire support functions and core spaces will be replaced including the elevators, egress stairs, restrooms, mechanical, electrical and telecommunication distribution systems. New work on the building's exterior includes complete window restoration, re-pointing, repairing, replacing and cleaning the existing brick, partial roof replacement, refurbishing and reinstalling existing light fixtures, replacing the existing front entrance doors and repairing front entrance stairs. New Site work includes several new service ducts and new concrete sidewalks and landscaping.

3.10.2 Northwest Childcare Center

In FY 2010, NIH received congressional appropriations to design and build a new 21,000-gross-square-foot Northwest Child Care Center (NWCCC) in the northwest quadrant of the campus at the intersection of Convent Dr. and Center Dr., just across the street from the Safra Family Lodge. The new NWCCC will provide a permanent home for the infant center and begin to address the urgent need for more child care on campus.

The new 2-story NWCCC will have a maximum capacity of 170 children and contain administrative areas, a multi-purpose room, classrooms, outdoor play areas and a parking/drop-off area for parents. The new structure will meet the licensing requirements of the Maryland state department of education, Office of Child Care and the accreditation requirements of the National Association for the Education of Young Children.

The Office of Research Facilities has completed concept plans for the new Northwest Child Care Center in partnership with the Office of Research Services, which oversees the NIH Child Care Programs.

3.10.3 Stoney Creek Pond Project

The Stoney Creek Pond is a joint project of the NIH and the Montgomery County Department of Environmental Protection. The Pond will help control storm water flows and filter and remove contaminants from runoff originating in the downtown Bethesda business district. The pond will help manage the amount of water discharges into storm drains and streams surrounding the NIH community from buildings, roads, and parking lots. Rapidly flowing water can erode stream banks, eventually causing property damage and harming the local ecosystem and, over time, the Chesapeake Bay.

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3.11 Utilities

NIH, as it has done in the past, will continue to reexamine its utility requirements on the campus on a regular basis and alert the appropriate authorities, as well as the community, in the event our requirements dramatically change. The master plan will continue to be updated on a regular basis and if new proposals come forward that would introduce a new utility requirement in this Master Plan, these proposals will be reviewed, shared with the community, and go through the established environmental and other review processes with the federal state authorities that presently oversee development on the Bethesda campus.

3.11.1 Water

Water is supplied to the NIH by the Washington Suburban Sanitary Commission (WSSC), and the Bethesda campus is surrounded by the WSSC transmission and distribution grid. WSSC maintains 12-inch and 24-inch diameter mains under Old Georgetown Road and a 6-inch and 24-inch main under West Cedar Lane. The water main along Rockville Pike is 12-inch in diameter between West Cedar Lane and South Drive, and 8-inch in diameter to the south. The system head or pressure elevation is 495 feet. Area mains are fed by water from the WSSC Patuxent and Potomac Water Filtration Plants.

3.11.2 Natural Gas

Natural Gas is supplied to the NIH by the Washington Gas Light Company from gas mains along West Cedar Lane and Old Georgetown Road.

If NIH would require a new natural gas line in the future dedicated solely to NIH use, it will follow the NEPA process. If area natural gas demands (Bethesda CBD, WRNMMC, residential growth, etc.) require expansion of the Washington Gas system, NIH will follow and participate, as appropriate, in all applicable environmental review processes.

3.11.3 Sanitary Sewer

NIH is in the WSSC sanitary sewer service area. WSSC maintains an 8-to 12-inch diameter sanitary collection main under Old Georgetown Road, and a 15-inch main under West Cedar Lane on the north side of the campus. Beginning at Rockville Pike, an 18-inch sanitary relief sewer runs parallel to the 15-inch Cedar Lane main. The 15- inch main carries an estimated 80,000 gallons per day of sanitary waste from sources outside NIH.

3.11.4 Stormwater

With the exception of a 32-acre area in the southeast corner and 5-acre area along Old Georgetown Road, all of the NIH campus drains to the northeast toward the West Cedar Lane/Rockville Pike intersection. 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 the NIH along Rockville Pike and on the WRNMMC property.

The second drainage area covers the northern sector of the campus. The dry channel of the North Branch of the NIH Stream is the main drainage system 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 and street and parking lot inlets. Stormwater 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 small dry stormwater pond to the southeast of these structures.

The storm drainage system on the Bethesda campus has sufficient capacity for the 10-year storm event. During the 100-year storm event some flooding occurs in the vicinity of Building 46 and the T-46 Child Care Center.

Stormwater management (SWM) for the campus is regulated by the State of Maryland Department of the Environment. All construction projects are required to meet applicable State Stormwater Management Requirements.

NIH prepared a NIH Bethesda Institutional Stormwater Management Plan (ISMP), which has been approved by the Maryland Department of the Environment (MDE) for review. The ISMP proposes management on a campus-wide basis.

A North SWM facility, shown as an open pond in the 1995 Master Plan, was completed and consists of underground fields of large diameter pipe laid side-by-side in rows about 50 to 100 feet in length. The facility will capture runoff from the entire North Branch watershed, as well as roof top drainage from the new CRC and Building 10 that lie within the NIH

Stream basin. Release of stored runoff is controlled through a single smaller diameter outlet pipe for each buried field.

NIH and Montgomery County have signed a Memorandum of Understanding (MOU) wherein the NIH granted an easement for and implementation of a new county SWM facility. The proposed county SWM Facility, or Stony Creek Pond (under construction), will have three 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 forebay water pool, about 60 feet in diameter, where settlement of suspended material would occur. Outfall from the forebay pool would then flow into the main pool, which would be one acre in extent under dry weather conditions. The pools would have water depths up to 5 or 6 feet in the center. Montgomery County requires fencing around all wet ponds greater than two feet in depth.

3.11.5 Electrical Power

3.11.5.1 Primary Capacity

Power is supplied to the campus by the Potomac Electric Power Company (PEPCO) via three PEPCO substations.

- **Building 17**: PEPCO Substation 80 is located to the northwest of the Rockville Pike/South Drive intersection in Building 17. Primary distribution to the substation is via four 35 kilovolt (KV) lines from Rockville Pike. PEPCO operates four 20,000 kilovolt-amp (KVA) transformers in Building 17.
- **Building 46:** 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.
- **Building 63:** Building 63, the North NIH Substation, was completed in 2003. The purpose of the station was to provide needed additional capacity, and increase service reliability. The substation has space for three 30,000 KVA, 35/13.8 KV transformers.

3.11.5.2 Cogeneration

A state of the art "cogeneration" power plant, shown[22] in Exhibit 3.11.A, recently came online at NIH in 2005. Fueled by natural gas, it provides 23 megawatts of electricity (about 40 percent of campus needs) and about 30% of the steam NIH required to both heat buildings in winter and sterilize scientific equipment year round.[23]

Exhibit 3.11.A. Building 11 CUP

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END OF CHAPTER 3.

[22] Photo by Ernie Branson

[23] NIH Record, August 26, 2005, “Cogeneration Power Plant Adds Steam, Watts to Campus”, Rich McManus

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U.S. Department of Health and Human Services

NIH National Institutes of Health

Chapter 4
NIH Bethesda Campus

Prepared by the Division of Facilities Planning
Office of Research Facilities

06-14-2013

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4 NIH Bethesda Campus

4.1 Site Overview

4.1.1 Site Size and Condition

The NIH Bethesda site is a 310-acre parcel located north of and adjacent to the Bethesda Central Business District (CBD), with buildings and uses arranged in a campus-like setting (as shown in Exhibit 4.1.A). The principal boundaries of the site are Rockville Pike (also known as Wisconsin Avenue or MD-355) on the east, West Cedar Lane on the north, Old Georgetown Road on the west, and the Edgewood/Glenwood neighborhood as well as the Battery Lane residential district on the south. The principal impression from the edges of the campus is one of cluster buildings placed in a rolling, wooded landscape. This character is created by major topographic changes (the total topographic relief is over 150-feet across the site), and by the existence of mature trees and tree groupings around the perimeter of the site. There is a strong landscaped buffer around the perimeter of the campus. Over the years it has been mostly undisturbed or has been restored. A more intensely developed core is at the center of the campus. Although most buildings are organized on an orthogonal grid, there is little sense of coherence between building groups, open spaces, or circulation patterns.

Building-82, “The Bloch Center”, which is located on the southwest corner of Oakmont Avenue and Old Georgetown Road is a part of the NIH Bethesda Campus, but not included in this Master Plan.

4.1.2 Existing Land and Building Use

Existing land use for the Bethesda campus is summarized in Exhibit 4.1.B and discussed herein. The largest land use on the site is open space. Landscaped, wooded, and open areas account for approximately 179 acres or 58% of the campus. The largest open areas occur at the perimeter of the site in four primary locations:

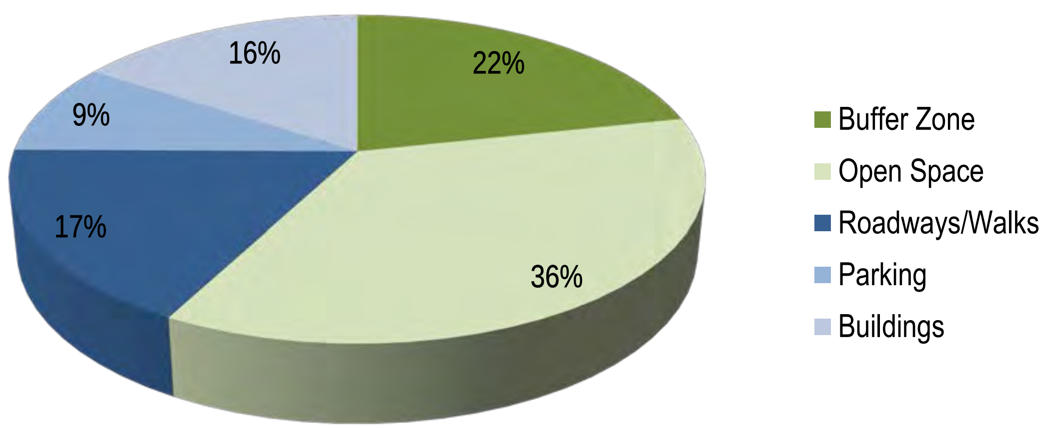
- the northwest corner of the campus
- along Rockville Pike between Wilson and South Drives
- the southeast corners of the campus near the Library of Medicine (Building-38), and the area southwest of the Animal Facility Building (14/28 complex).

Exhibit 4.1.A. NIH Bethesda Campus Aerial Photograph

Of the total 179 acres, approximately 67 acres (22% of the site) lie within the current perimeter landscape/open space buffer. The buffer zone is a constant width of 250 feet along the campus perimeter.

The second largest category of land use on the site is circulation and parking, with approximately 82 acres (26%) being used for roads and surface or structured parking areas. Although this is a significant land area allocation, the development of multi-level parking structures has reduced the amount of surface parking which would otherwise have been required. Also significant is the amount of space dedicated to circulation alone, with 54 acres (17%) of the site used for roadways, walks, and service areas. Buildings make up the final 44 acres (14%) of the campus.

Exhibit 4.1.B. Existing Land Use Chart & Table



Land Use	Acres	Percentage of Site
Buffer Zone	67	22
Open Space	112	36
Sub Total Open Space	179	58
Parking	28	9
Roads/Walks/Service	54	17
Sub Total Parking & Circulation	82	26
Buildings	49	16
Total Land Area	310	100

There are 12 building use categories on the NIH Bethesda Campus, as listed in Exhibit 4.1.C and depicted in Exhibit 4.1.D:

- Biomedical research laboratories:[1] includes research laboratory, laboratory office, shared laboratory support, instrument or special function laboratories shared support and ancillary service space.
- Biomedical research education: includes the National Library of Medicine.
- Clinical research: includes patient care, diagnostic and treatment[2].
- Animal Research: includes buildings which are primarily used for animal holding.
- Administration: includes offices for IC administration and the Office of the Director of administration.
- Service/Support: includes logistics, shops[3], grounds maintenance, motor pool[4], repair garage, waste management, and storage.
- Public safety facilities: includes the Gateway Visitor's Center, commercial vehicle inspection facility, security booths at campus entry points, NIH fire station and police station[5].
- Family Housing: includes housing for NIH employees, the U.S. Surgeon General and the NIH Director.
- Lodging: includes on-site hotels for Clinical Center patients.
- Employee amenities:[6] includes childcare centers, fitness centers, food service, credit union, convenience retail shops, etc.
- Utilities: includes campus district heating and cooling plants, sanitary and storm sewer lines, electrical distribution lines as well as electrical substations and vaults.
- Vacant: Includes buildings that are under construction or are planned to be renovated or demolished in the near term.

[1] A biomedical research laboratory building may include a vivarium
[2] Biomedical laboratories associated with clinical research must be in close proximity.
[3] NIH logistic and shops are located in Building 13; however the predominant use of that building is administration.
[4] The NIH Motor Pool is located in Building 1. The predominant use of Building 1 is administration.
[5] The NIH Police are located in Building 31, which is predominantly administration.
[6] A vast majority of employee amenities are located in other building, hover, there are several amenities that are stand-alone an occupy land.

Exhibit 4.1.C. Existing Building Use Table

Building Number	Predominant Use
1	Administration
2	Administration
3	Administration
4	Biomedical Research Laboratory
5	Biomedical Research Laboratory
6	Biomedical Research Laboratory
7	Vacant (Biomedical Research)
8	Biomedical Research Laboratory
9	Biomedical Research Laboratory
10	Clinical Research
10 CRC	Clinical research
11	Utility
12	Service/Support
12A	Administration
12B	Administration
13	Administration
14A-H	Animal Research
15B-I	Family Housing
15K	Administration
16	Biomedical Research Education
16A	Biomedical Research Education
17	Utility
18	Biomedical Research Laboratory
21 & 21N	Service/Support
22 & 22A	Service Support
25	Service Support
28 & 28A	Animal Research
29	Biomedical Research Laboratory
29A	Biomedical Research Laboratory
29B	Biomedical Research Laboratory
30	Biomedical Research Laboratory
31A-C	Administration
32	Biomedical Research
33	Biomedical Research

Building Number	Predominant Use
34	Utility
35	Biomedical Research Laboratory
38A	Biomedical Research Education
40	Biomedical Research Laboratory
41	Biomedical Research Laboratory
41A	Biomedical Research Laboratory
45	Biomedical Research Education
46	Utility
49	Biomedical Research Laboratory
50	Biomedical Research Laboratory
51	Public Safety
53	Utility
54	Utility
60	Lodging
61	Administration
61A	Service/Support
62	Lodging
63	Utilities
64	Employee Amenity
65	Lodging
66	Public Safety
67	Public Safety
T2	Service/Support
T14	Service/Support
T23	Service/Support
T26	Service/Support
T39	Employee Amenity
T46	Employee Amenity
MLP6	Structured Parking
MLP7	Structured Parking
MLP8	Structured Parking
MLP9	Structured Parking
MLP10	Structured Parking
MLP11	Structured Parking

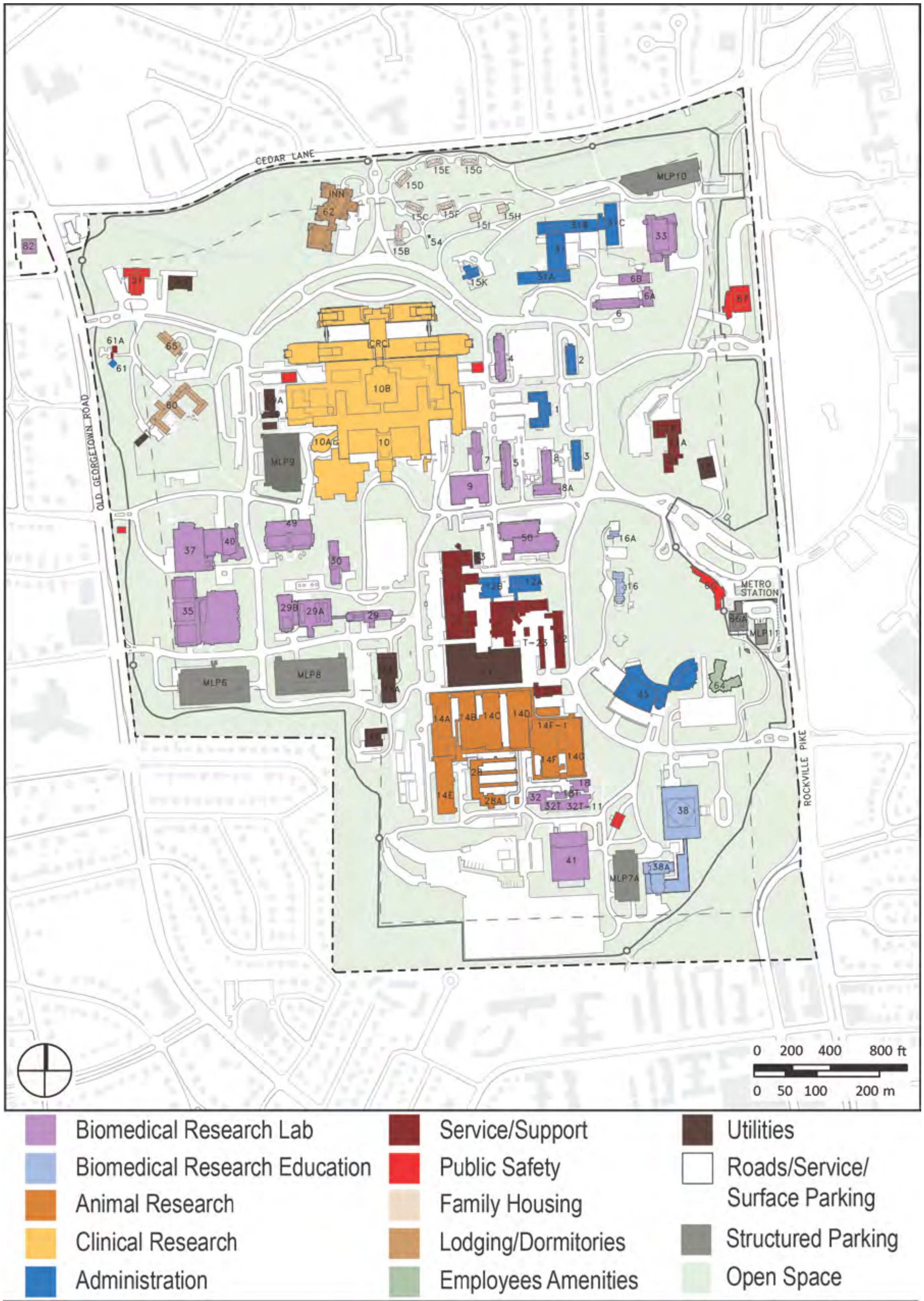


Exhibit 4.1.D. Existing Land and Building Use

4.1.3 Implementation of the 2003 Master Plan Update

As a result of the 1995 Master Plan review by the National Capital and Planning Commission (NCPC), it was required that NIH update its Master Plan approximately every five years. The NIH Master Plan was amended in 1999 and updated in 2005 although titled *“Master Plan 2003 Update”*. NCPC encourages agencies to review master plans on a periodic basis to insure that both inventory material and development proposals are current. Such reviews should be conducted at least every five years. The 2013 NIH Bethesda Campus Master Plan will respond to changing NIH requirements and developments while integrating new federal mandates into the plan.

4.1.3.1 Specific Implementation

Specific major developments that have occurred on-campus since the 2003 Master Plan Updates are listed below and shown in Exhibit 4.1.E. All projects except MLP-9 and Porter Neuroscience Center Phase 2 were listed as under construction in the 2003 Plan.

- Addition to Building-10, Mark O. Hatfield Clinical Research Center (CRC)
- Building-62A, Children’s Inn expansion
- Building-35, Neuroscience Research Center (NRC), Phase-1
- Building-65, Family Lodge
- Research Building-33
- MLP-10
- Wrought-iron perimeter fence around the entire campus
- Building 66, Gateway Visitors Center
- MLP-11, parking structure for visitors
- Building 67, Commercial Vehicle Inspection Facility and security check points at each NIH Entrance.
- MLP-9
- Addition to Building-35, Porter Neuroscience Center Phase 2[7]

[7] Building currently under construction

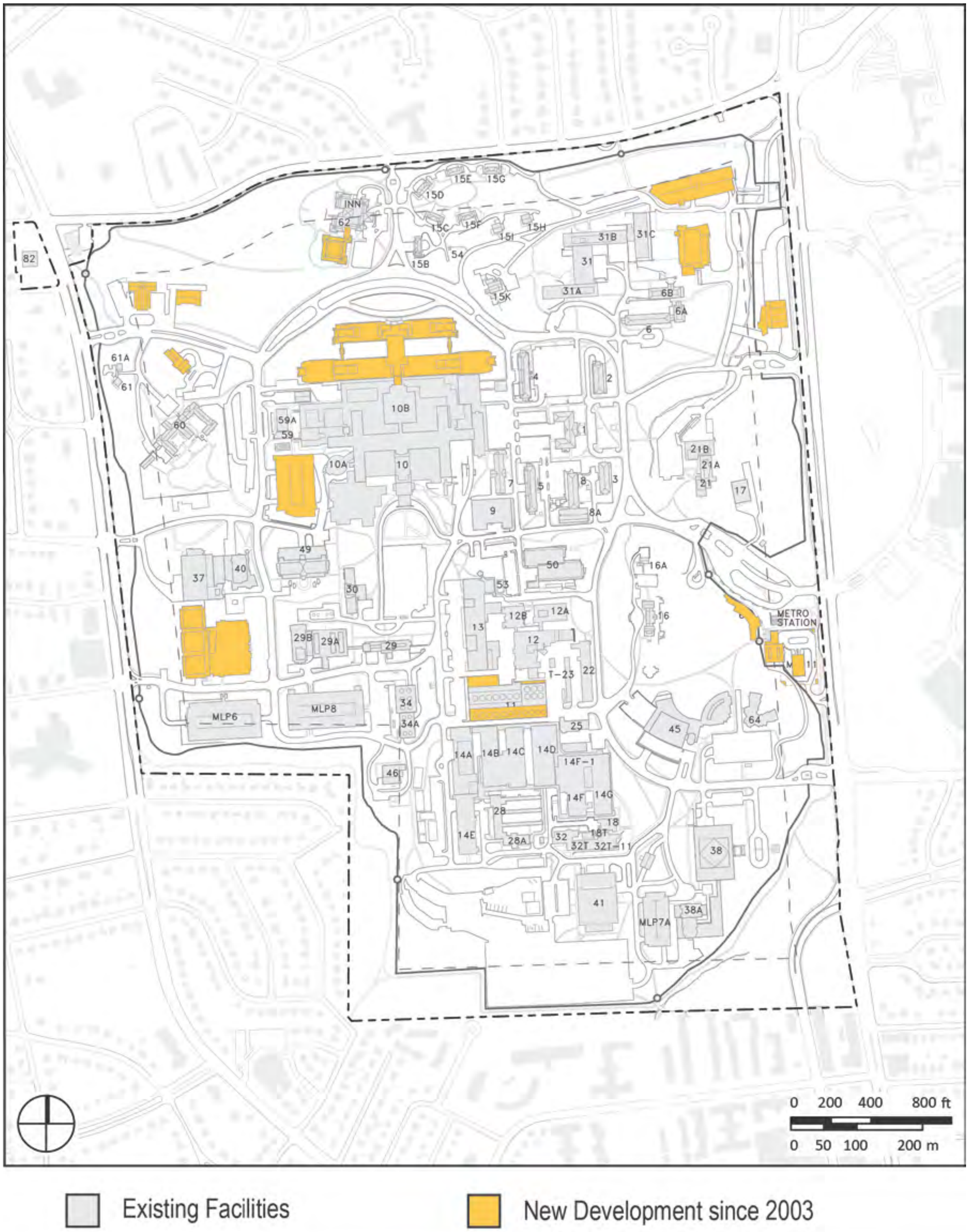


Exhibit 4.1.E. Development Since the 2003 Master Plan

4.2 Natural Features

4.2.1 Topography

Elevations on the NIH campus range from a low of 232 feet above mean sea level (MSL) at the northeast corner (Rockville Pike and West Cedar Lane) to a high of 384 feet MSL north of Building 37 near Old Georgetown Road. There is a total of 152 feet of topographic relief across the campus.

The site is divided into three topographic zones (as shown in Exhibit 4.2.A) with the highest area being along the west and south sides, the lowest area surrounding the NIH Stream in the northeast quadrant, and relatively level areas in the center of the campus. Within this overall pattern there are several prominent hilltops, which are the locations of significant campus buildings. Due to the past piping and filling of the NIH Stream valley as it crossed the campus, topography is generally near its natural condition at the perimeter of the site than near the center.

Steep slopes (over 15%) primarily exist along the north and east perimeters of the NIH site as well as the site immediately surrounding historic Building-16. Additionally, steep slopes cover large portions of land along the margins of the NIH Stream and the NIH tributary stream, and a large area to the north of Stoney Creek. Steep slopes in the southwest area of the campus must be considered in the design of the proposed South Laboratory Cluster. Convent Drive is also flanked by steep slopes along both its east and west margins. These steeply sloping areas must be considered prior to construction and expansion.

4.2.2 Hydrology and Floodplains

The existing hydrology and floodplains of the Bethesda campus are discussed below and diagramed in Exhibit 4.2.B.

4.2.2.1 Subsurface Hydrology

The decomposed crystalline rock that underlies NIH is a "type-1 aquifer" as classified by Maryland standards. This type of aquifer normally produces less than 10,000 gallons per day and is considered a poor source of water. NIH presently has two wells for emergency supply. These wells extend to 250 and 300 feet depths, respectively. Both wells have both been capped.

4.2.2.2 Surface Hydrology

The NIH Stream and Stoney Creek are both tributaries of Rock Creek. Generally speaking, the site drains from west to east, with the NIH Stream and its northern tributary receiving most of the campus surface runoff. The NIH Stream enters the site in a storm sewer from the Edgewood/Glenwood community and flows northeasterly until it daylights at an oil-water-grit separator before entering an open channel restored to simulate natural stream condition near Building-21. Its tributary originates in the northwest corner of the site and flows toward the east in a series of open concrete-lined drainage ditches and storm sewer pipes until its confluence with the main NIH Stream in the northeast corner of the site. Stoney Creek, whose watershed covers about 32 acres (10%) of the NIH campus, enters and exits the site at the southeast corner. The ridge that separates these two watersheds crosses Rockville Pike just north of Jones Bridge Road.

The fall of the exposed main NIH Stream is 75 feet on site. The total fall from entry onto the site to confluence with Rock Creek is 112 feet. The average stream gradient across the site is about 1.5%. The north tributary to the NIH Stream falls about 106 feet from the high point on the watershed to the confluence with the main NIH Stream with a gradient of about 5%. Stoney Creek traverses the site for a short distance at its southeastern corner before crossing under Woodmont and Wisconsin Avenues and entering the WRNMMC. On the NIH site this stream receives runoff from the National Library of Medicine buildings (Buildings 38 and 38-A), structured parking garage MLP-7, and from the area around lab Building-41. The stream drops only 9 feet as it passes through the site over a distance of 1,040 feet for an average gradient of about 0.3%.

4.2.2.3 Floodplains

The floodplains of the two principal streams on the NIH site reflect the differences in the geomorphology of these streams. Stoney Creek, with its gentle gradient, has a wider floodplain than that of the NIH Stream with its steeper gradient. Studies of site obstructions or impediments to flow indicate that the existing storm sewer system is adequate to accommodate 10-year storms, with the most likely impediment being in the Rockville Pike culvert on the NIH Stream. Flooding that occurs on-site for 50-year and 100-year frequency storms is generally contained within the low areas adjacent to the streams and does not reach the Rockville Pike elevation.

The MD State Highway Administration has a project underway to enlarge the Rockville Pike culvert on the NIH Stream to accommodate the added runoff due to the intersection improvement projects underway at MD 355 at Jones Bridge Road and Cedar Lane. The proposed culvert under MD 355 will pass the 100-year storm. This will be a major improvement from the existing culvert under MD 355, which only passes the 10-year storm.

If, as anticipated, the MD State Highway Administration intersection improvements at Old Georgetown Road and West Cedar Lane are funded, SHA will upgrade the culvert that transports storm water under West Cedar Lane to a surface channel that forms the west end of the North Branch stream. A waiver was acquired from Montgomery County for Cedar Lane to pass the 50-year return interval due to constructability issues associated with the 100-year design. The placement of the proposed structure will be a major improvement from the existing culvert at Cedar Lane, which currently only passes the 10-year storm.

4.2.3 Geology

Across Montgomery County, the underlying geology reflects the differential erosion rates in the various underlying crystalline and sedimentary rocks. The NIH site is in the Piedmont Physiographic Province. Specifically, NIH is underlain by the “Lower Pelitic Schist” of the “Wissahickon Formation”. This metamorphic rock is composed of relatively soft mica overlain by 10 to 30 feet of weathered, in-situ, rock materials (saprolite). The major structural jointing features in the rocks follow a northeast pattern. The “strikes” (slopes) of these joints appear to be the major factor in the alignment of the on-site streams.

An old fault zone in Howard County is associated with the orogeny of the “Baltimore Gneiss Dome” 12.5 miles north-east of Bethesda. The region has been seismically quiet since Triassic times with only minor earthquake activity reported in Montgomery County. The age of the bedrock materials together with the stability of the structural features provides a local setting of relative geologic integrity in spite of a rare, recent, 5.8 magnitude earthquake in August 2011.

4.2.4 Soils

4.2.4.1 Surface Soils

The two major surface soil series at the NIH site are the “Glenelg” and the “Manor” series. Both are formed in-situ with the Glenelg series more deeply weathered. Other soils on site, of limited distribution, include the “Worsham”, “Glenville” and “Neshaminy” series. The majority of the soils found on the NIH site are well-drained upland soils. Because of the relatively good fertility, gently sloping nature, and deep character of these soils, they are well suited to suburban development.

4.2.4.2 Sub-Surface Soils

The term "saprolite" is used for the in-situ weathered bedrock overlying the crystalline rocks in the Maryland piedmont. Based on the parent rock and the derived soil, the saprolite group is generated from six different parent rocks. Three of these are found on the NIH site (as shown in Exhibit 4.2.C) and are categorized as follows:

- Saprolite-5B:- on micaceous schist, well drained
- Saprolite-5D - on silty, bouldery gneiss, well drained
- Saprolite-5F - on clay rich, poorly drained mafic rock

The bedrock underlying the Bethesda campus is metamorphic, consolidated, hard, unaltered, and locally overlain by saprolite and organic surface soils. Due to erosion in the NIH Stream valley, this bedrock is close to the surface in the northeast corner of the site. Additional areas of known bedrock include the southwest corner of site, specifically between Buildings-41 and MLP-7.

4.2.4.3 Structural Stability

The physical characteristics of the saprolitic soils found at NIH, are that they are composed of sand, silt, clay, angular rock fragments with a residual deposit of soft red, brown, gray, earthy porous material.

Near the surface, the saprolite is easy to work with light power equipment however; the material becomes moderately difficult to work below a depth of 20-feet. A compaction density of 90 to 95 percent of maximum is achievable with the majority of the soils found on the campus.

Most soils are "fair to good" for support of "moderate-size" structures. With bearing strengths ranging from three to four tons per square foot near the surface, increasing to five tons per square foot at greater depths. Most of the soils are stable in near-vertical cuts up to 15-feet deep.

In the saprolite mantle, disintegrated rock occurs between 20 and 60 feet below the surface, with hard rock at 40 to 50 feet below the surface or deeper. Boring data indicates that the water table is approximately 15 to 30 feet below the surface throughout the site (except near in or near the stream valleys.

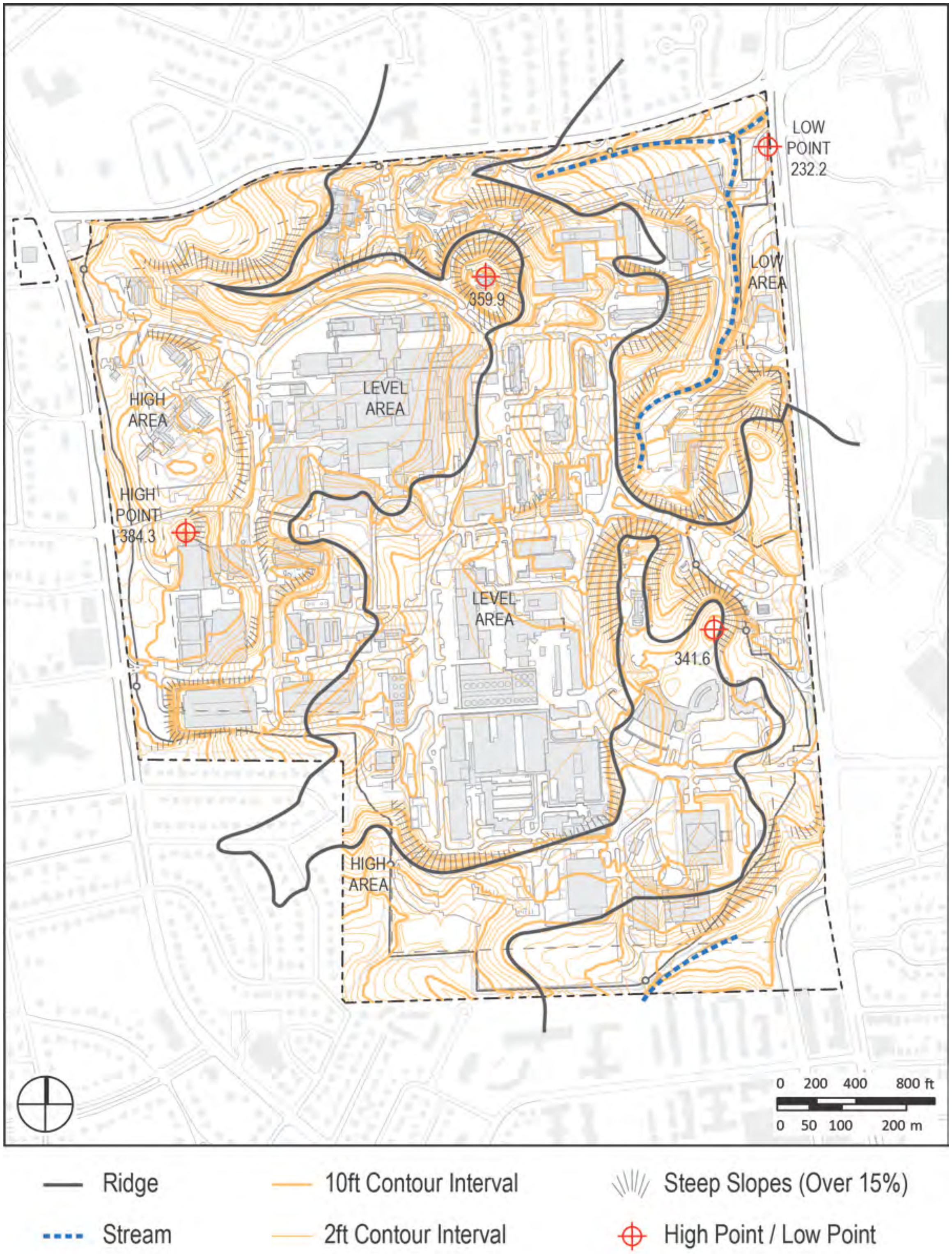


Exhibit 4.2.A. Existing Topography

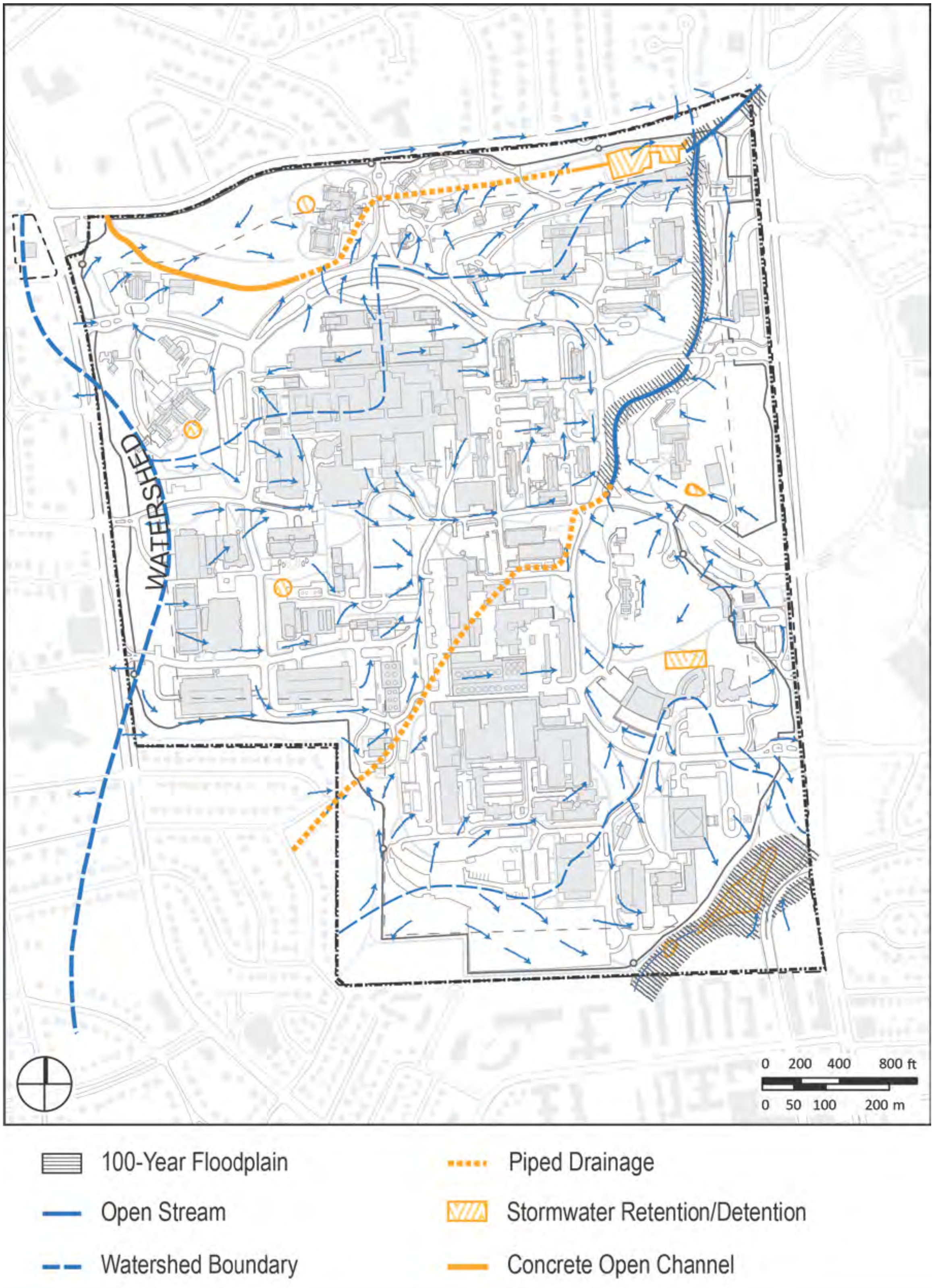


Exhibit 4.2.B. Existing Hydrology

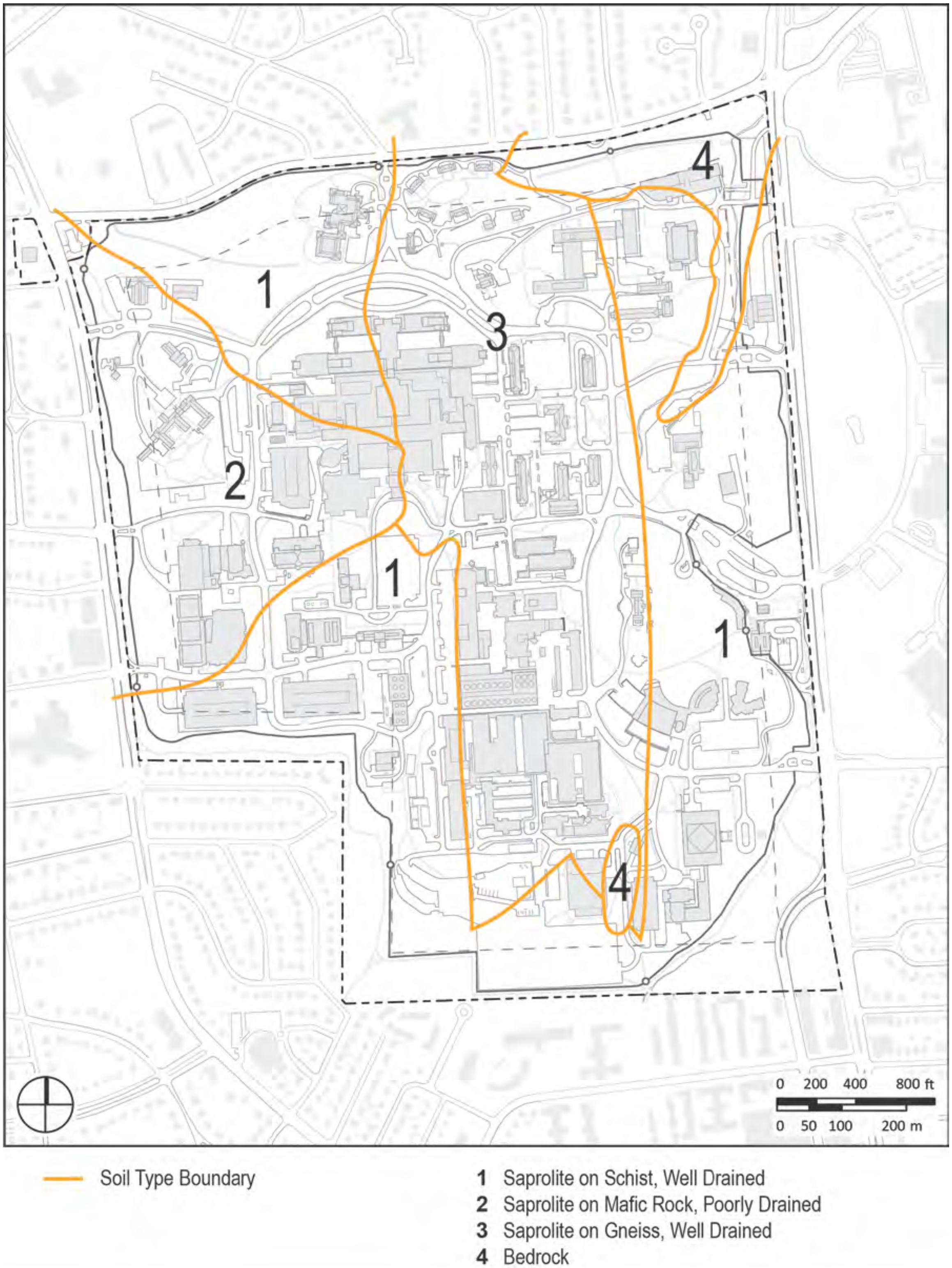


Exhibit 4.2.C. Existing Subsurface Soils

4.2.5 Vegetation and Ground Cover

Tree cover on the Bethesda Campus is of two distinct types: woodland stands found around the perimeter of the site, and formal plantings associated with development of the interior portions of the property.

Over 8,500 trees have been identified, numbered, and tagged on the campus. A database of all trees over two-inch caliper is maintained by the NIH, Office of Research Facilities, Division of Environmental Protection. There are 164 tree species (not including cultivars) of which 101 species (62%) are native to our region. Predominant species in the woodland stands are oak, tulip poplar, sycamore, and maple. Tulip poplars and oak species occupy the upland portions of the site while sycamores and maples dominate the lower areas. Trees are mature or maturing stature. They range in size from 12" to 36" diameter at breast height (dbh) with some specimens up to 48" dbh. Similar species often occur in nearly pure stands of like-aged trees of even density. Evergreen species are found throughout the property, generally in small stands of similar species. They are mostly white pine, Austrian pine, Virginia pine, and American holly concentrated around the perimeter of the property. The landscape style of the interior of the campus is manicured and highly managed forming attractive formal and informal gardens, courtyards, and patios.

Over 22 acres of "no-mow" zones have been created in the past 15 years. The areas where mowing does not occur allow natural plant succession to create supplemental native reforestation. The "no-mow" zones filter and absorb storm water run-off, provide wildlife habitats, and decrease landscape maintenance costs.

4.2.6 Plant and Animal Communities

4.2.6.1 Plant Community

Most of the regional woodlands in the vicinity of the Bethesda campus have been modified by the urbanization of the area. Small remnants of the original local woodland communities still exist on the grounds of the WRNMMC and further east in Rock Creek Park. In these communities, as at NIH, the tulip poplars and the white oaks are the most prominent native woodland tree species, followed by the northern red oak.

The "no-mow" zones along streams have allowed the reemergence of native riparian vegetation. The current construction of the southeast storm water management pond will create a specially designed 1/3-acre wetland to provide initial filtering of sediment, debris and contaminants from entering Stoney Creek. Additional native aquatic plants will be planted around the perimeter of the associated three-acre wet-pond. Completion of this construction is scheduled for the fall of 2012.

4.2.6.2 Animal Community

Wild mammals at NIH are limited to those species that can tolerate the urban park setting and concentrated vehicular and pedestrian activity. Those, which may be found on-site, include white-tail deer, raccoon, opossum, cottontail rabbit, gray squirrel, and black squirrel. The habitat in the area is appropriate for a variety of small mammals including the house-mouse, white-footed mouse, deer mouse, least shrew, short-tailed shrew and the Norway rat. Aquatic creatures on campus include crayfish, black-nose dace, American toads, spotted salamanders, and wood frogs.

Over the past ten years, as NIH set aside areas for reforestation and the planting of understory tree species, the campus has seen a resurgence of native bird species nesting and feeding on the campus grounds or resting while migrating. Fifty species have been identified. Woodland bird species such as towhee, wood thrush, great crested flycatcher, and woodpecker species are now frequently seen. Species of woodland edges such as nuthatch, titmouse, brown creeper, and goldfinch have become common. Since 2002, NIH has provided 89 nest-boxes that attract bluebirds, tree swallows, chickadees, house wrens, and Carolina wrens. Special nest boxes have been placed along creek edges for wood ducks. Open-sided parking garages have become home for barn swallows. The NIH now leaves dead tree trunks (“snags”) standing, where appropriate, to attract woodpeckers and other cavity nesters. Bat-boxes have also been placed in an effort to support new bat colonies. Since 1996 a resident family of red-tailed hawks has helped control pigeon, starling and English sparrow populations. No endangered bird species are known to visit the Bethesda campus.

4.3 Circulation

4.3.1 Vehicular Circulation

Vehicular access is currently served by seven employee entrances, as shown in Exhibit 4.3.A. Three are on the west and four are on the east sides of the campus. Each of the employee entrances features a security check point. Of the total vehicle trips entering the campus during the morning peak-hour in October 2011, 53% occur on Rockville Pike, 45% on Old Georgetown Road, and 2% on West Cedar Lane. Peak-hour traffic flows for NIH occur from 8:00 to 9:00 in the morning and from 4:45 to 5:45 in the evening.

Visitors to NIH must be cleared at the NIH Gateway Visitor's Center (Building-66) or the Commercial Vehicle Inspection Facility (Building-67). Visitors coming to NIH via automobiles must enter NIH through a secured visitor's vehicular entrance on Rockville Pike and park in a designated visitor's garage or have their vehicles inspected prior to entering campus. Commercial vehicles must be inspected at the Commercial Vehicle Inspection Facility on Rockville Pike before they enter the campus. The Cedar Lane entrance on the north is currently only used by patients and their family's coming to the Clinical Center. There is no vehicular access from the south campus boundary.

The primary internal road is Center Drive, running from the northwest corner to the southeast corner of the site. The other primary roads are Wilson Drive, South Drive to Convent Drive, Convent Drive, and Lincoln Drive to West Service Road to South Drive. The secondary roads are Memorial Drive, West Service Road from Lincoln Drive to South Service Road, and South Road. This internal circulation system creates an unbalanced perimeter-road within the campus which is inconvenient to use for internal campus circulation and can be confusing to people who are not familiar with the physical campus layout.

There are numerous service roads creating a web throughout the campus, allowing vehicular access to most areas of the site. Most roadways are curvilinear, lending to the informal character of the site. However, since roadways and building patterns are not closely related, roadways do not create a coherent system of building sites.

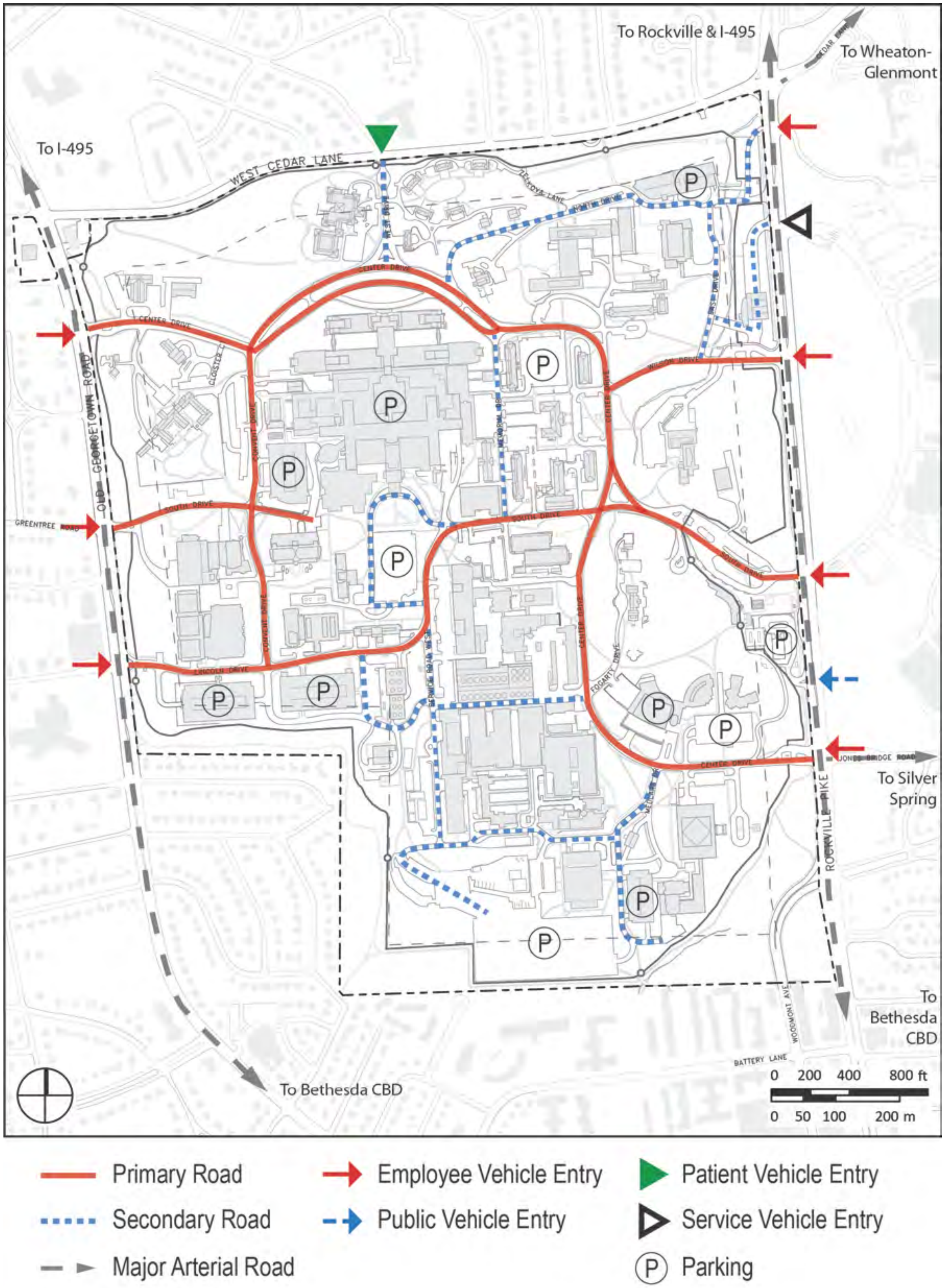


Exhibit 4.3.A. Existing Vehicular Circulation

4.3.1.1 Campus Roadways

Most roadways on campus are 22 to 35 feet wide with one travel lane in each direction. Notable exceptions are: Center Drive which varies from a 60-foot wide boulevard at its northwest entry to the site to a 40-foot wide, 4-lane roadway at its southeast entry, and the eastern segment of South Drive which has a 40-foot wide, 4-lane section flanked by landscaped bus staging and parking areas. Toward the center of the campus, roadways are generally bounded by sidewalks and formalized planting, whereas, at the periphery, roadways run through a more natural landscape.

4.3.2 Public Entries

The majority of public entrances or "front doors" to buildings on the campus faces directly onto or can be accessed from Center Drive, as shown in Exhibit 4.3.B. This pattern is clear for prominent campus buildings such as Buildings 38 and 38A (the National Library of Medicine and the Lister Hill National Center), Building-45 (the William H. Natcher Building), Building-1 (the Central Administration Building), the Building-31 office complex, Building-50, and Building-10 (the Clinical Center Complex). Buildings on the west side of campus have public access from Convent Drive or off of Service Road West, including Building-35 (the John Porter Neuroscience Research Center (NRC)), which opens onto Lincoln Drive. Many of the major building entries have unclear relationships to adjacent streets or buildings.

4.3.3 Service Areas

Service areas are interspersed among buildings throughout the campus, as depicted in Exhibit 4.3.C. The largest concentration of service areas occurs in the south-central area of the campus near Buildings 13 and 14, the north-central area of campus between the Clinical Center Complex and Building-1, and the southwest area of campus along Service Roads West and South, and the central portion of South Drive. Since there is little separation between service and public routes on the NIH campus, there are inevitable traffic and pedestrian conflicts. Along Center Drive, which is the primary public drive on campus, visitors and employees co-mingle with service vehicles and have views directly into unsightly service areas. Likewise on Lincoln Drive, those accessing parking at the multilevel parking structures, or continuing to the campus core, must pass numerous service areas. Access to research Buildings 29A, 29B, and 30, passes by the truck docks of support services of Building-13. Along Memorial Drive public entries to buildings (e.g. Building-7) and service areas (e.g. Building 10, Building-4 and Building-5) face a high traffic pedestrian and vehicular thoroughfare.

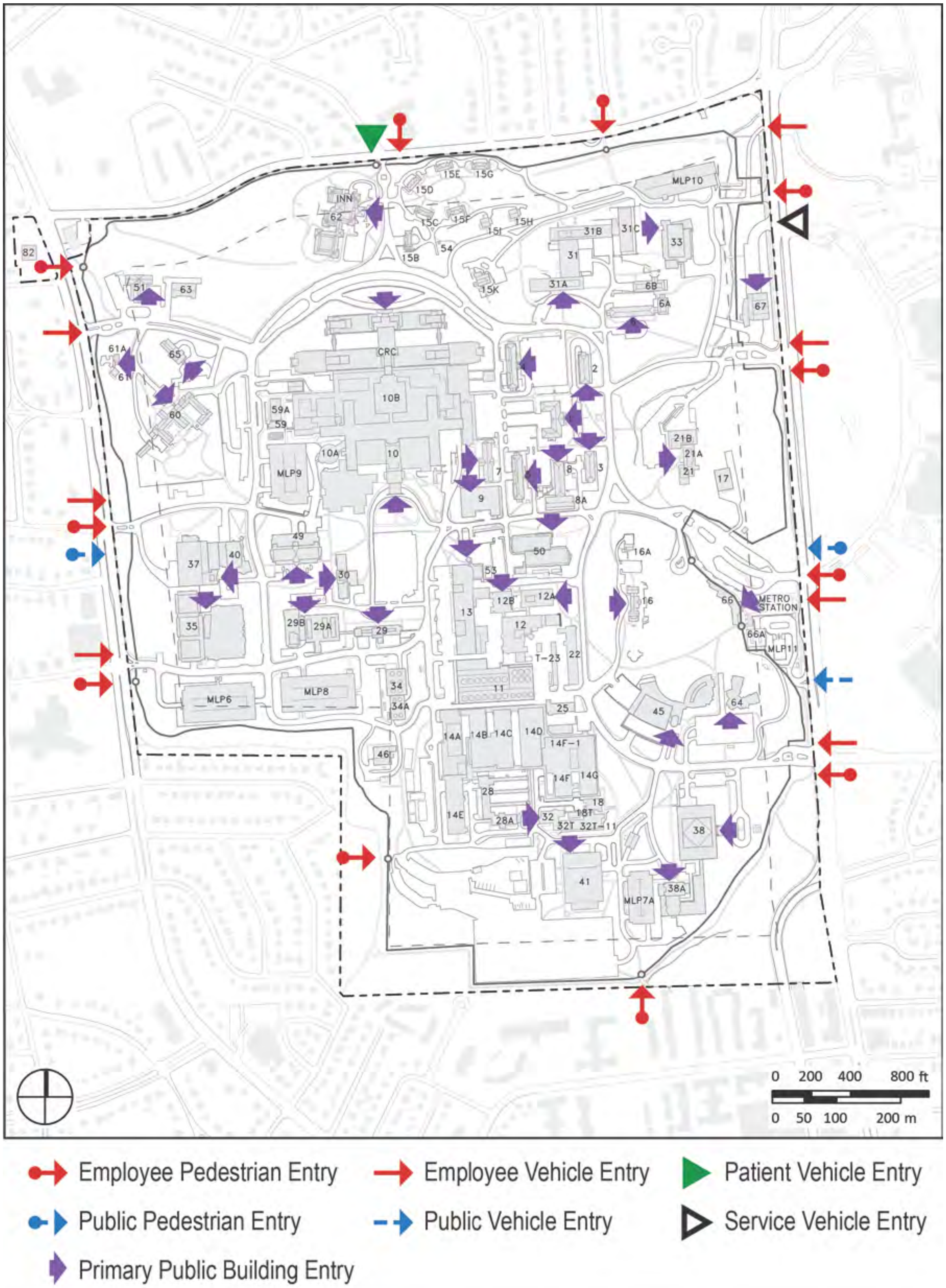


Exhibit 4.3.B. Existing Entries

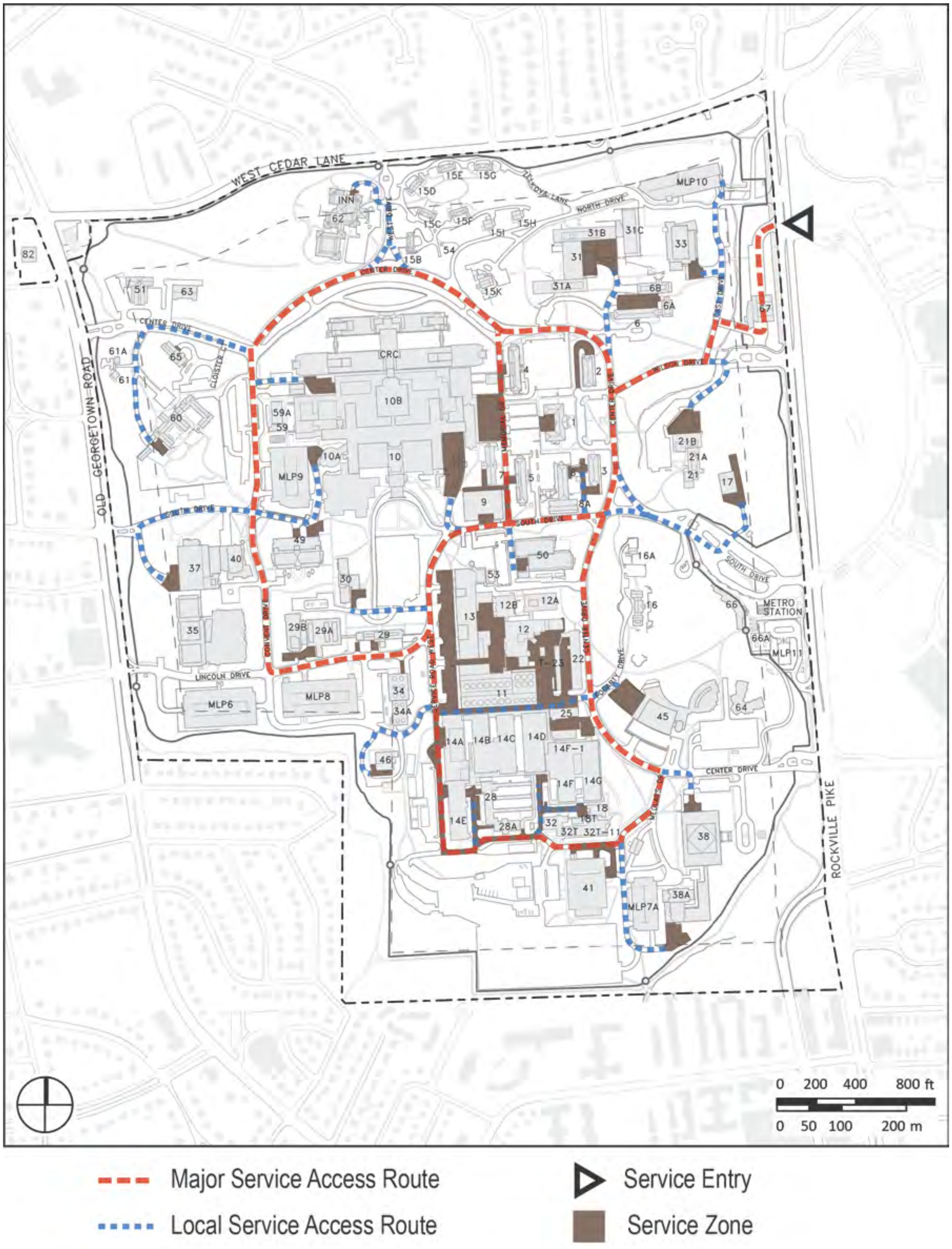


Exhibit 4.3.C. Existing Service Areas and Access

4.3.4 Parking Resources and Distribution

The NIH campus has numerous surface parking lots, seven multi-level parking structures and limited on-street parking to serve the needs of employees and visitors. Parking surveys are conducted annually.

Parking supply type is summarized in Exhibit 4.3.D. Less than half of the NIH campus parking supply is comprised of surface lots. Several of these lots are partially or entirely located in the perimeter buffer zone of the campus. The supply of parking is designated by different categories of users; the most recent parking allocation is shown in Exhibit 4.3.E.

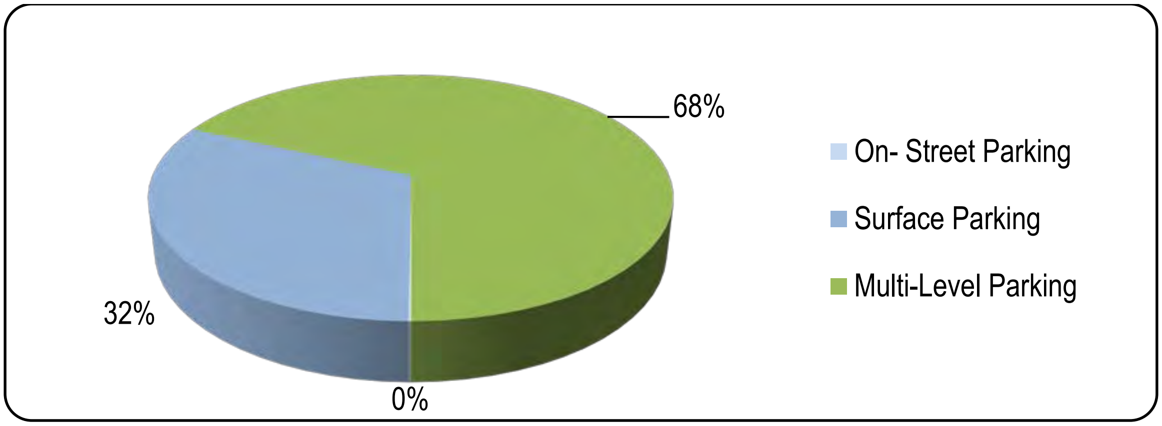
NIH employees park on-campus with a valid parking permit. Based on the existing parking supply identified herein, the ratio of employee-designated spaces per employee is currently 0.46 compared to a ratio of 0.54 in 1995. Thus, NIH has succeeded in its goal of maintaining the employee-to-parking ratio at the same 1995 level or lower.

Parking space distribution across campus is detailed in Exhibit 4.3.F (based on the October 2012 parking inventory provided by the Division of Amenities and Transportation Services). Parking areas are distributed throughout the site with the largest parking areas located at the perimeter of the campus. The major concentrations of parking are at the following locations:

- the Clinical Center Complex served by patient-parking in the Clinical Center MLP-9 garage,
- the northeast corner of the site near general office Building-31 served by MLP-10,
- the southwest corner of the site at parking structures MLP-6 and MLP-8, and
- the south side of the site at surface Lot-41, parking structure MLP-7 at the National Library of Medicine and at the William H. Natcher Building (Building-45).

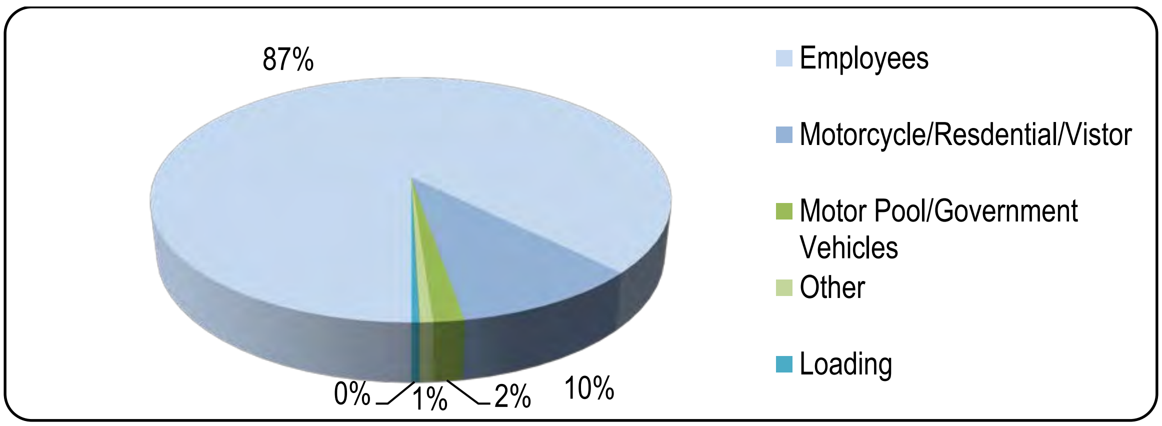
In general, parking is distributed proportionately to population around the campus, with a higher proportion of parking per employee distribution in the northern and southern parts of campus. In addition, 623 parking spaces are currently provided at two off-site satellite locations.

Exhibit 4.3.D. Existing Parking Type Chart and Table



Type	Spaces	(%)
On-Street	17	0
Surface Lot	3,260	32
Multi-Level	7,017	68
TOTAL	10,294	100

Exhibit 4.3.E. Existing Parking Allocation Chart and Table



Type	Spaces	(%)
Employees	8,994	87
Motorcycle/Residential/Visitor	1017	10
Motor Pool/Government Vehicles	170	2
Other	69	1
Loading	44	0
TOTAL	10,294	100

Exhibit 4.3.F. Existing Parking Distribution Table

Parking Lot / Parking Type	General	CP	Red	Reserved	HC	Resident	Visitor	Loading	MC	DO/PU	VP	Govt.	Other	Total
1A - Traffic Circle				28	6									34
1B	55	50			6							6		117
2				4	3			1						8
4A	20	35	10	20	5						6			96
4A Visitor					4		85							89
5 Loading Dock								3						3
5A	32		64	10	9				1					116
6 Loading								3						3
6A	5	2	6	1	6				1					21
7 Loading Dock								2						2
9 Loading Dock								3						3
Fire House						24								24
10E	21			1					1			1	40	64
10E (Valet Lot)							53							53
10H	127	60	69	1	3						9			269
10 East Dock				24										24
10 South Dock				5								5		10
10 Animal Dock				5										5
11	28				2									30
13 Platform Area				1	11			3	4			44		63
13C			7	18	14		24							63
13 Pit Area												3		3
14A	52	7	3											62

Parking Lot / Parking Type	General	CP	Red	Reserved	HC	Resident	Visitor	Loading	MC	DO/PU	VP	Govt.	Other	Total
14G	4	6			2							1		13
14A Loading					1									1
14 E North														0
14 E South	2											3		5
15K	19		3	1	1									24
16/16A	12		13	2	1		3							31
18			2	4										6
18A	4				2									6
21B	112		8	1	1			6	2			3		133
22	5			6								33		44
25				6										6
28A	12				2									14
28B	16				2									18
29 Circle			5	1	1									7
29A			1	1	9									11
29C												8		8
29D			8					3						11
29 Service								3				9		12
30 Loading Dock							4	1						5
31A Traffic Circle				12	4		8							24
31B					13			3				28	3	47
31A/B Loading				6				2				4		12
34A	58											1		59
36A	Under Construction													0

Parking Lot / Parking Type	General	CP	Red	Reserved	HC	Resident	Visitor	Loading	MC	DO/PU	VP	Govt.	Other	Total
36 Delivery	Under Construction							4						4
37 Service	2			2	9									13
38A	28				9									37
38B Loading Dock				7										7
38B	11						31							42
Medlars	34													34
40 Service	6													6
41A	65		4		4									73
41B	997													997
45 Natcher Garage	369	4	30		15			1				1		420
45B	78			18	5		7							108
45 Visitor Lot					2		26							28
49					4									4
50				24	4									28
60					1	27	2							30
61	4				1									5
Children's Inn						65								65
Family Lodge					6	31								37
Ambo Entrance/10												14		14
Visitors Center												1	3	4
CVIF					2								8	10
ACRF - P1 Level					57		281							338
ACRF - P2 Level			476											476

Parking Lot / Parking Type	General	CP	Red	Reserved	HC	Resident	Visitor	Loading	MC	DO/PU	VP	Govt.	Other	Total
ACRF - P3 Level	409			36										445
Gas Station	10			38	1									49
Lister Hill Loading								6						6
Convent Drive					3									44
South Dr				2	12									14
MLP 6 Garage	765	4	88	5	22							1		885
MLP 7 Garage	308	3	44	5	14				1			2		377
MLP 8 Garage	1596			2	17									1615
MLP 9 Garage	833	11	67	10	23							2	15	961
MLP 10 Garage	927	21	75	84	47									1154
MLP 11 Garage				2	8		336							346
Category Totals	7,026	203	983	393	374	147	860	44	10	0	15	170	69	10,335

4.3.5 Transit Systems

The NIH Bethesda Campus is served by a variety of public and private transit services, as depicted in Exhibit 4.3.G and described in Chapter 3, Section 3.5.4 Bus Access to NIH. NIH has actively worked with Montgomery County and WMATA officials to add several Ride-On and Metro-bus routes to provide better access to campus. The Metro station entrance is located on NIH property, on the east side of the campus at Rockville Pike. The Medical Center transit node is still somewhat remote from some of the major facilities at NIH and the WRNMMC. The northern half of the site is better served by public transit than the southern half because of additional bus routes and a more continuous street system.

There are numerous NIH shuttle routes, which circulate through the campus or connect to satellite office and parking locations. Campus shuttles that travel on the "NIH Campus Route" run at approximately 10-minute intervals.

4.3.6 Pedestrian and Bicycle Systems

Pedestrian paths are parallel to most roadways on campus and make connections between buildings (see Exhibit 4.3.H). Almost all pathways have been upgraded to be a minimum of five-feet wide and are paved with concrete, macadam, or in some cases, special pavers.

Major pedestrian movements occur between pedestrian generators such as transit nodes, parking areas, and significant buildings. On the NIH Bethesda Campus, this includes:

- from the Metro station north to administrative Buildings 1 and 31, west to the campus core and the Clinical Center Complex (Building-10), and south to Building-38A,
- from general office Building-31 to the central administration Building-1 and the Clinical Center Complex,
- from the campus core south to Building-38A along Center Drive, and to parking Lot-41,
- from the Clinical Center Complex to parking Lot-10K, and
- from parking structures MLP 6 and MLP 8 to research Buildings 36, 37, 49, and the Clinical Center Complex.

From north to south, the campus is approximately a 15- to 20-minute walk (nearly two-thirds of a mile), and most major facilities are within a five to 10-minute walk (one-quarter to one-half mile) of the Metro station.

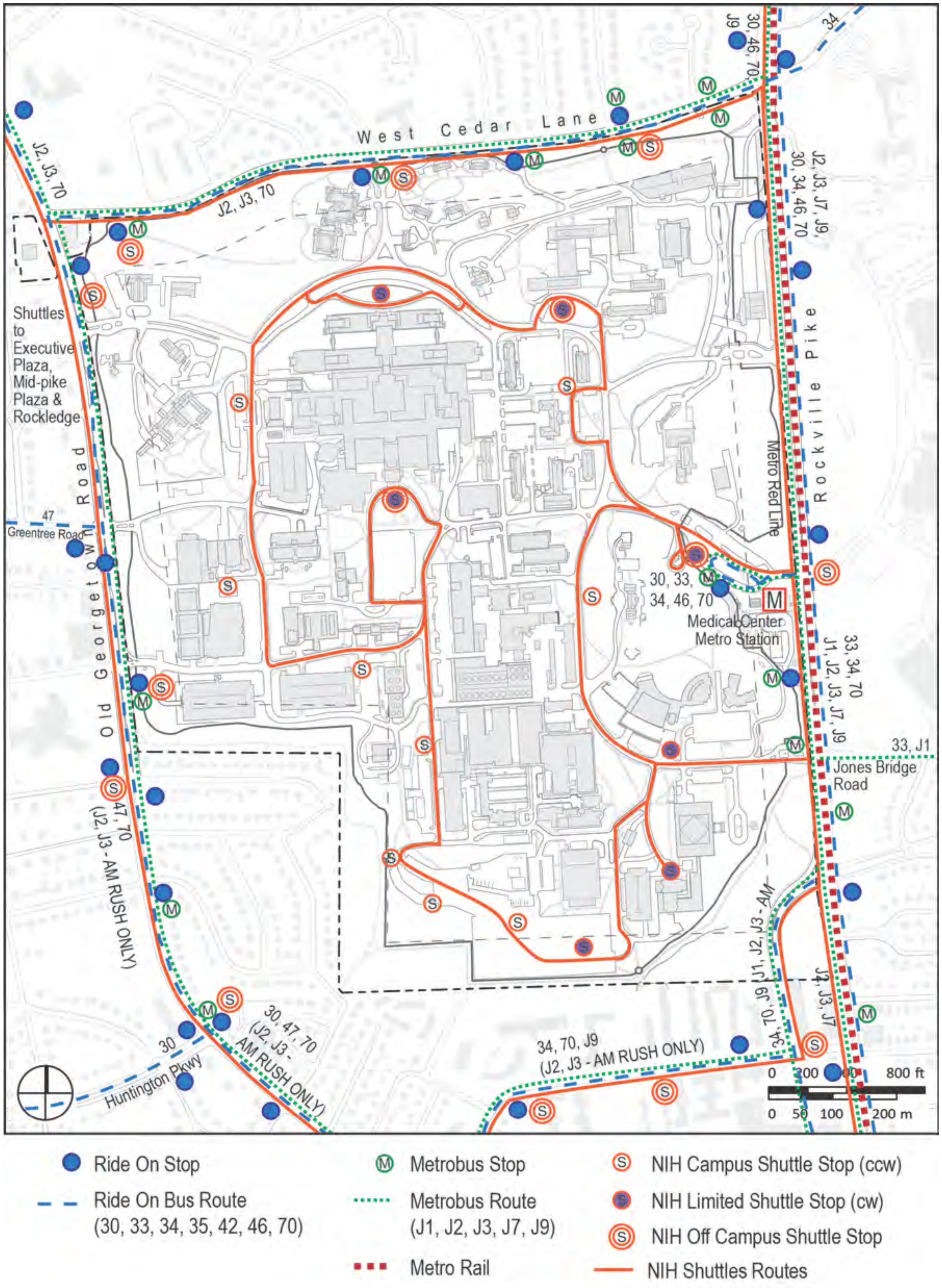


Exhibit 4.3.G. Existing Transit Systems

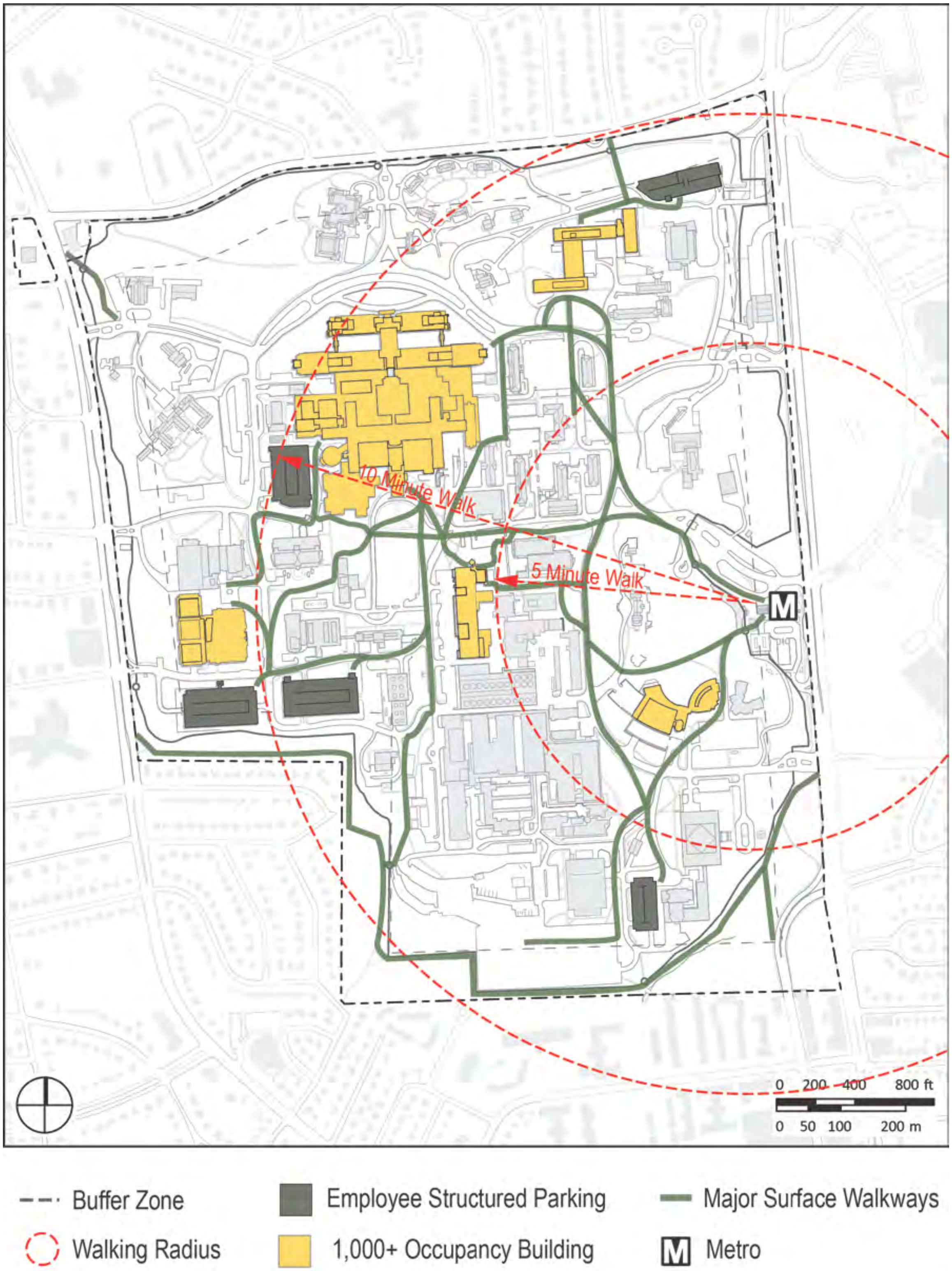


Exhibit 4.3.H. Existing Pedestrian Circulation

Primary campus pedestrian and bicycle access points (Exhibit 4.3.B) are listed hereafter:

- Old Georgetown Road at Cedar Lane,
- Rockville Pike at Cedar Lane,
- Jones Bridge Road at Rockville Pike,
- along the south campus boundary at Woodmont Avenue, the Spring House building, N. Brook Lane, Maple Ridge Road, and Roosevelt Street, and
- Greentree Road at Old Georgetown Road.

There are few clear paths traversing the entire campus north-to-south or east-to-west, with the exception of the east-west path along the south fence. Inadequate lighting and signage also hinder nighttime pedestrian movement.

Exhibit 4.3.I shows existing County bike-paths along the east side of the campus parallel to Rockville Pike, along West Cedar Lane, along Old Georgetown Road, and across the southern end of the campus on the “Trolley Trail”, with connections to surrounding areas at key locations. These paths are designated in the bike plan as Class-I, eight feet wide, paved bikeways. If anticipated intersection improvements are funded (at MD 355 and Jones Bridge Road; MD355 and West Cedar Lane; and Old Georgetown Road and West Cedar Lane), the MD State Highway Administration will widen the shared use paths in the respective areas to 10 feet wide with a five feet wide green buffer between curb and path.

The NIH provides secure bicycle racks and a number of sheltered bicycle parking facilities in close proximity to many building entrances. The NIH Employee Transportation Services Office works with the Metropolitan Washington Council of Governments, Commuter Connections, and cycling organizations such as the NIH Bicycle Commuter Club to promote bicycle commuting among federal employees[8].

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[8] See http://www.ors.od.nih.gov/pes/dats/transportation/NIHBicycleProgram for more information.

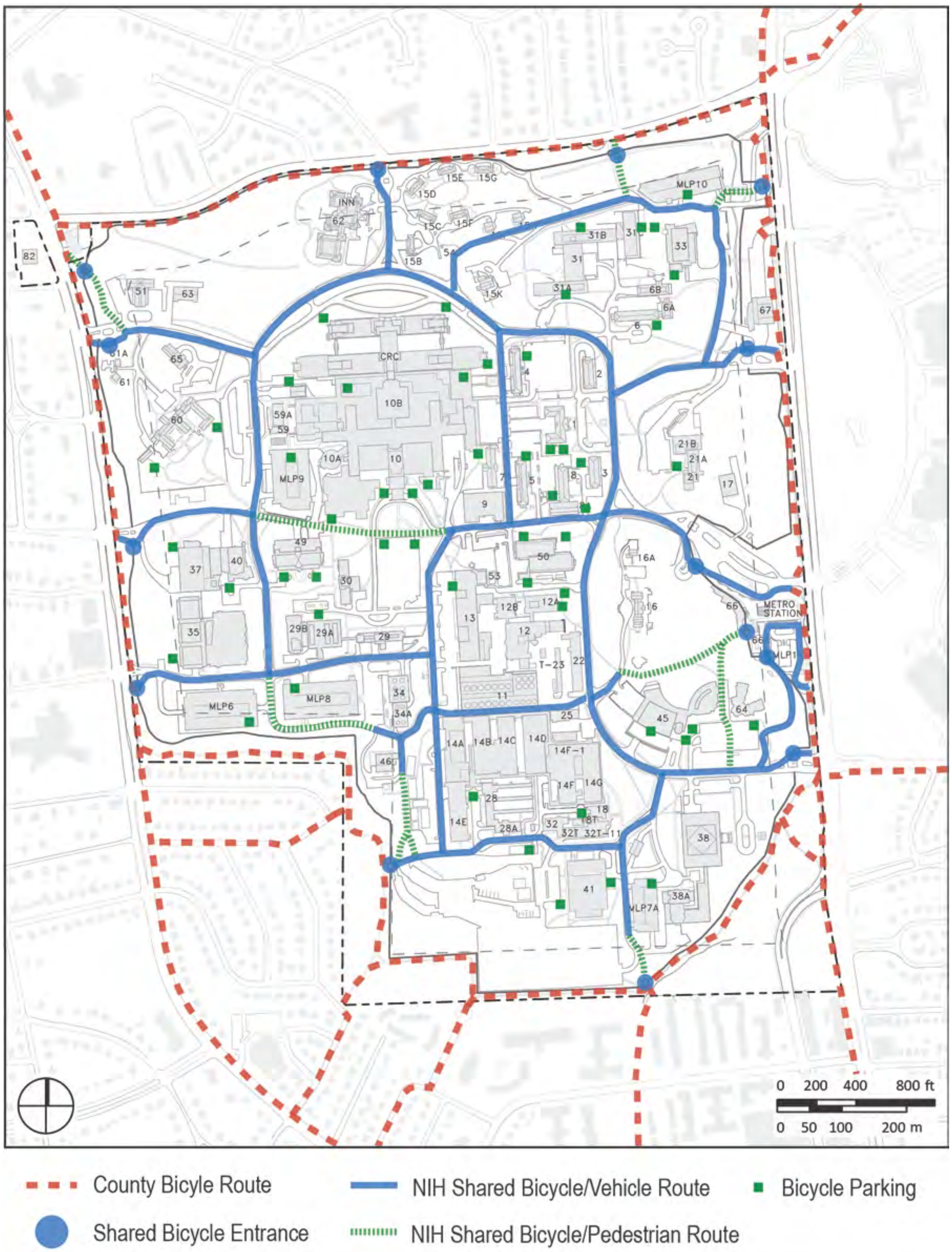

Exhibit 4.3.I. Existing Bicycle Circulation

4.3.6.1 Bicycle Conflict Areas

Close attention should be paid to bicycle/vehicle conflict areas. Any new road and intersection configuration needs to ensure that its design include good visibility for joint use by both vehicles and bicycles. Currently, immediate safety improvements are necessary at the intersections of Lincoln Drive (large boulders blocking the view), Center Drive and West Cedar Lane to improve visibility between bicycles and vehicles for bicycle commuters to the NIH campus. Traffic studies should take into consideration pedestrian and bicycle circulation. Recommended areas for study based on reported or potential conflicts with vehicles and pedestrians are shown in Exhibit 4.3.J.

4.3.7 Access for Persons with Disabilities

As a federal entity, NIH does not fall under the jurisdiction of the "Americans with Disabilities Act" (ADA). However, the National Institutes of Health, along with other federal agencies, is required to follow the "Architectural Barriers Act Accessibility Guidelines" (July 2004) as its standard for accessibility planning for new construction. NIH completed a building accessibility survey in 2007 and approved a Management Plan in 2008, which establishes priorities along with a 5-year capital plan for building improvements. The campus accessibility map[9] is shown in Exhibit 4.3.K

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[9] Campus accessibility maps are posted at http://www.ors.od.nih.gov/maps/accessibility/Pages/access_map.aspx.

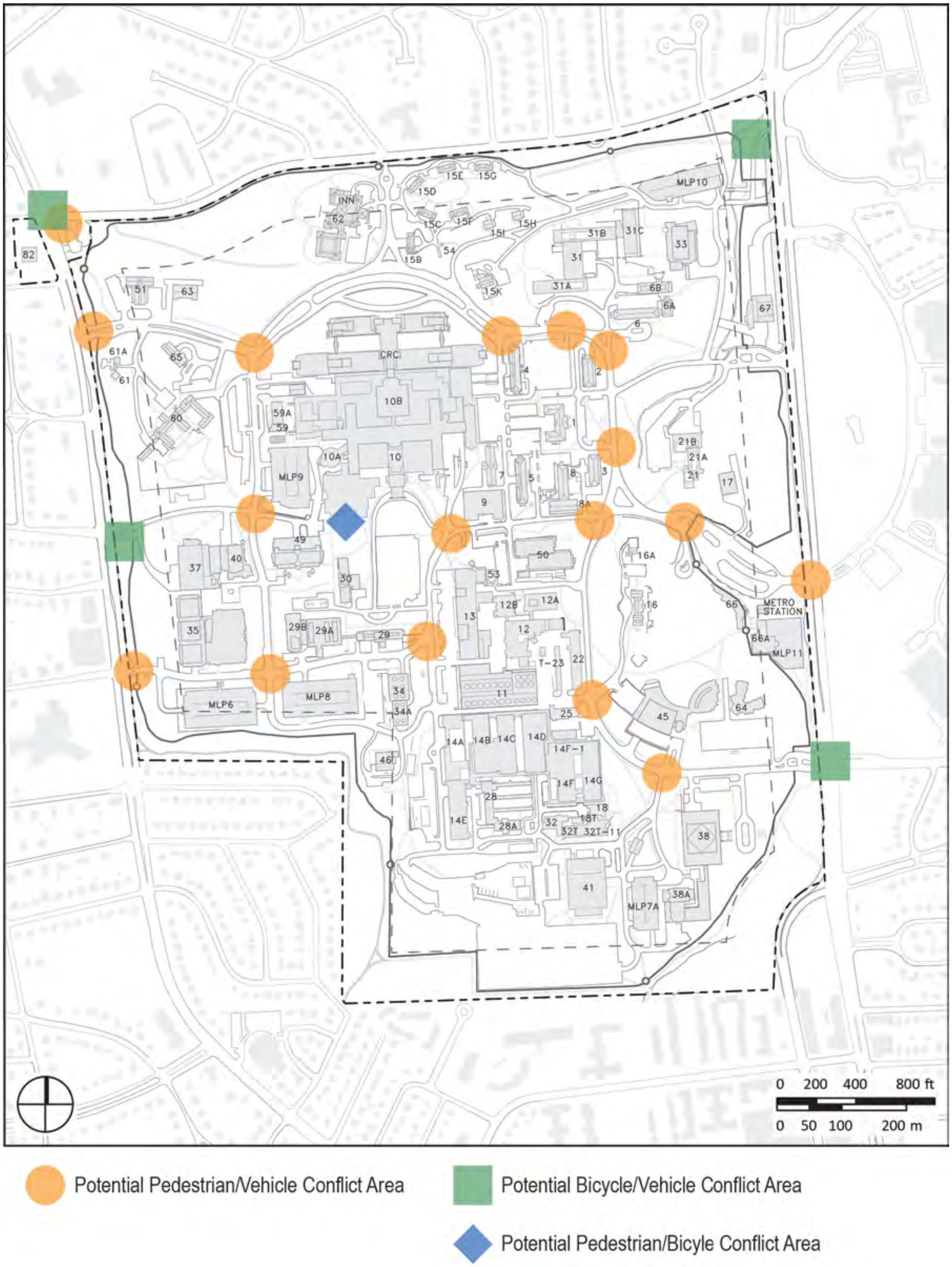

Exhibit 4.3.J. Pedestrian and Bicycle Areas for Study

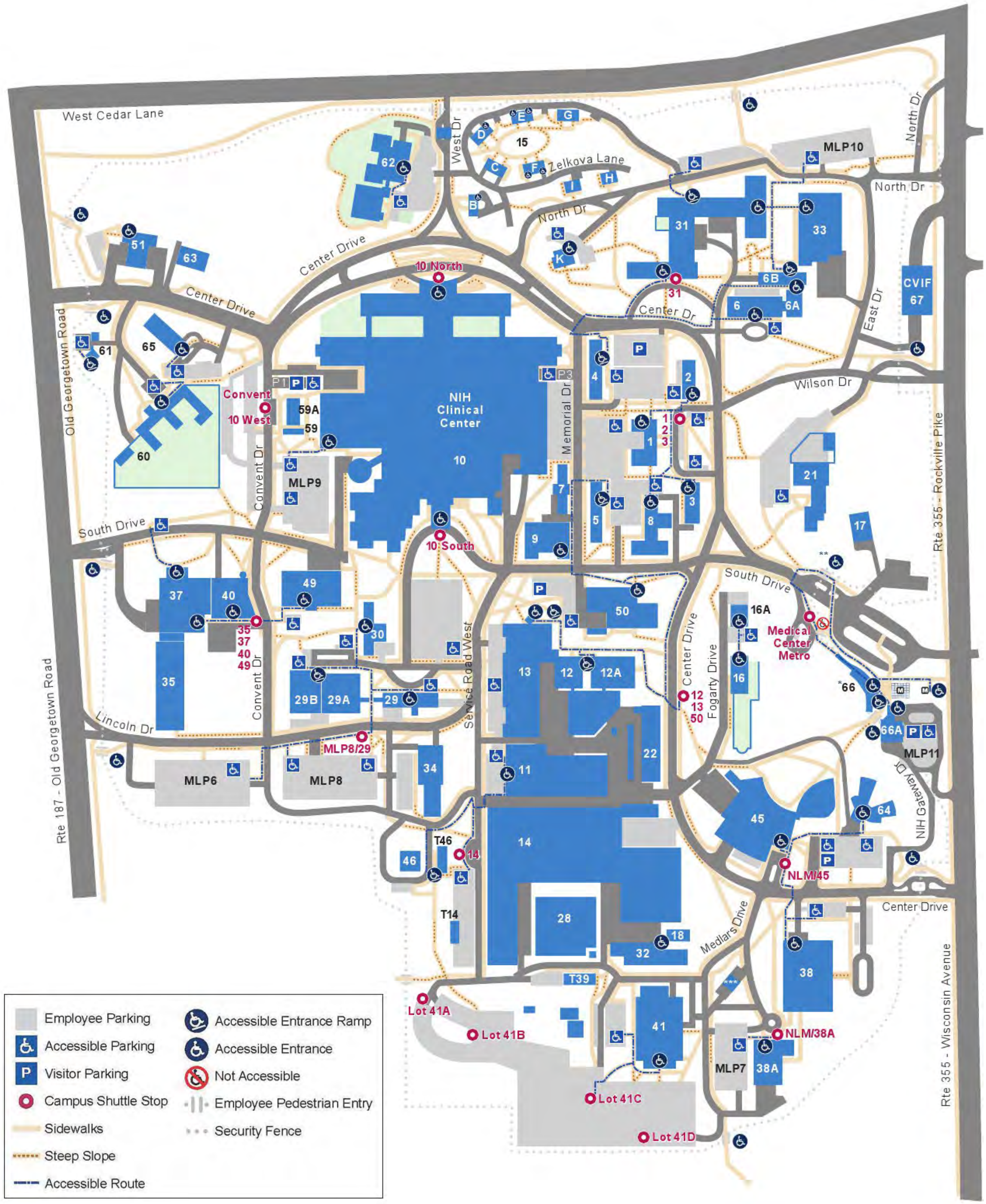

Exhibit 4.3.K. Campus Accessibility Map

4.3.8 Transportation Management

The National Institutes of Health has an ongoing Transportation Management Plan (TMP) with the objective of reducing peak hour vehicular traffic by encouraging NIH employees who drive alone to ride-share, use public transportation, or use other alternative modes of transportation. The TMP is an important element of the transportation component of the Master Plan because it defines policies and programs that influence the design of the transportation and parking systems at NIH.

A primary goal of the NIH TMP is to reduce the rate of vehicular trip generation per employee such that growth in employment does not generate additional peak hour vehicular traffic. Through the TMP, NIH employees are encouraged to increase the use of multiple-occupant vehicles (carpools, vanpools, shuttles, and HOVs) and public transportation when traveling to and from NIH. Maintaining the TMP as part of the NIH administrative responsibilities is mandated in a Memorandum of Understanding (MOU) signed by NIH, the Montgomery County Planning Board, and the National Capital Planning Commission in May 1992. NIH will continue to explore a variety of approaches to reducing its vehicular trip generation and parking demands.

4.3.8.1 Division of Amenities and Transportation, ORS

Since the 1995 Master Plan, NIH has consolidated the parking and shuttle programs, along with transportation planning, into its Division of Amenities and Transportation (DATS). NIH actively manages the elements of the TMP through this office, including handling daily employee/visitor inquiries regarding local and regional transit systems such as Metro, MTA, MARC, Ride-On, VRE and several rush period express bus systems. NIH has been extremely successful in implementing a more robust transportation management program since the 1995 Master Plan. The transportation management plan goals may be reached to differing degrees in the future, with gradual shifts in the mode choice over the Master Plan period. By achieving these shifts the MOU impact goal:

- Parking demand will continue to be reduced
- Non-auto driver mode split will continue to increase
- Average Passenger Occupancy (APO) will continue to increase.

4.3.8.2 Trip Generation Analysis

The NIH conducts semiannual traffic generation and employee parking supply ratio assessment as a condition of the TMP. The last assessment[10] was conducted in October 2011. Currently, there are 21,470[11]employees/contractors/et al on campus on a daily basis. The Campus currently contains 10,002 parking spaces and ±9,927 (max.) cars were observed parked on site at the peak during mid-morning. While there are more parking spaces than cars parked, double parking occurs on some parking lots.

The trip generation assessment indicated that the trip rates for October 2011 are lower than they were for the assessment in June 2011 and are still significantly lower than they were in 1992, which is the baseline for this assessment.

The trip generation portion of this assessment uses the Turning Movement Counts that were conducted from 6 AM to 7 PM at each of the entry and exit points to the campus. Results are summarized in Exhibit 4.3.L below.

Exhibit 4.3.L. Existing Peak Hour Trip Generation Table

Time	In	Out	Total
Morning Peak Hour	2,917	376	3,293
Evening Peak Hour	364	2,682	3,046

The data indicates the following:

- That during the morning peak hour NIH is generating more trips in October, 2011 than it did in June, 2011 (2917 vs. 2693), however, the trip generation/ employee has slightly reduced from June, 2011 (0.139 vs. 0.136) because the number of employees have increased from 19,334 to 21,470. The 2011 AM data remains well under the 1992 thresholds.
- That during the evening peak hour NIH is generating slightly more trips in October, 2011 than it did in June 2011 (2682 vs. 2630) although the number of employees has increased by 2,136 employees. Therefore the trip generation/ employee rate has been reduced from June 2011 (0.136 vs. 0.125) while the number of employees have increased from 19,334 to 21,470. The 2011 PM data remains well under the 1992 thresholds.

[10] Traffic Generation and Employee Parking Supply Ratio Assessment; The Traffic Group; November 21, 2011 Revised March 30, 2012

[11] Population is different than 20,594 because it includes gust researcher, volunteers and visitors

- That the trip generation volumes and rates for the existing facility are still well below the levels in 1992.

Projected 2033 values for the Master Plan, accounting for employee population variation from 16,350 in 1993 to approximately 24,000 by 2033, are approximately 3,360 trips in the peak AM and PM hours. This is significantly lower than the peak AM hour trips 1992 of 4,925. The projection does not include the implementation of telework and hoteling programs since they are adopted by individual institutes. The number of peak trips is likely to reduce further as the utilization of these programs increases.

4.3.8.3 Employee Parking Ratio Assessment

This section[12] discusses historical and current employee parking ratios for the NIH Bethesda Campus, in the context of the 1992 Memorandum of Understanding (MOU) executed by NIH, the Maryland-National Capital Park and Planning Commission (M-NCPPC), and the National Capital Planning Commission (NCPC). Specifically, this section complies with the following MOU agreement:

> *"NIH will assess the need for parking associated with proposed future growth and attempt to reduce the future parking demand to the extent practicable."*

This agreement was based on a long-term strategy established in the 1992 Transportation Management Plan "to maintain the parking supply at no greater than 0.50 spaces per NIH employee, plus additional parking spaces to serve the parking needs of visitors and patients at NIH."

As part of this assessment, a Parking Occupancy Study was conducted over a three (3) day period from October 25, 2011 through October 27, 2011. Prior to conducting this assessment, the existing number of parking spaces on campus was determined based on field observations. 10,002 parking spaces were counted during these observations. This equates to a 0.47 parking supply ratio for the 21,470 population on campus.

Exhibit 4.3.M shows a comparison of the employee parking supply and demand ratios for the period 2003-2011. The parking supply and parking supply ratio include employees, contractors, fellows, guest researchers, students, tenants and volunteers. The demand ratio also includes visitors.

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[12] Traffic Generation and Employee Parking Supply Ratio Assessment; The Traffic Group; November 21, 2011 Revised March 30, 2012

This data shows that the parking supply ratio and the parking demand ratio are lower than the 1992 TMP target (0.50) but still higher than the NCPC requirement (0.33). Based on these considerations, it is concluded that the NCPC goal of 0.33 spaces utilized/employee would be difficult to achieve without further significant reductions in parking supply on the campus or other aggressive methods of reducing the parking demand. However, NIH has agreed to maintain parking at its current level of 9,045 employee spaces.

Exhibit 4.3.M. Parking Supply and Demand Ratio Table

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	9,971	0.57	0.49
2011	21,470	10,022	0.47	0.46

Key TMP measures which would continue to reduce campus auto trip generation increase the share of alternative modes and lower employee parking supply ratio, including the following:

- Carpool/Vanpool Program. NIH previously reserved 463 parking spaces for carpools and vanpools. In the past, there were 269 registered carpools (involving 269 employees) and 14 registered vanpools (involving 122 employees). NIH employees interested in a carpool or vanpool are directed to the web link for Commuter Connections. This is a network coordinated by the Metropolitan Washington Council of Governments (COG). It provides a regional database of commuters and gives NIH employees an opportunity to find a match for their commute not only from with NIH but also from other institutes and offices in the Bethesda-Chevy Chase area.
- Telecommuting. NIH is encouraging employees to work at home on a part-time basis, using their computers and telephones.
- Work Schedules. The NIH has given the option for employees to utilize the following schedule arrangements:
    - Compressed Work Schedule - Employees can fulfill an 80-hour biweekly work requirement in less than 10 workdays with this program
    - Maxiflex Schedule - This flexible work schedule consists of core hours on fewer than 10 workdays in the biweekly pay period and in which a fulltime employee has a basic work requirement of 80 hours for the biweekly pay period.

An employee may vary the number of hours performed on a given workday or the number of hours each week within the limits established by the NIH.

- Bicycle Subsidy Program. This program provides a $20 monthly subsidy to employees who commute to work via a bicycle; however, they are restricted from receiving parking benefits or Transhare in conjunction with the bicycle subsidy.
- Cycling Amenities. The Division of Property Management at NIH has a Facilities Support Program for Cycling where the NIH is promoting bicycling to the NIH campus by improving facilities to have amenities for lockers, showers, and bike racks. Current components of the program that are underway or have been completed are location surveys for showers, lockers, and bike racks, condition surveys, occupancy and user surveys, and rack relocation plans and projects. It is estimated that on any given day there are 350 - 400 cyclists coming to the campus.
- Transhare. Transhare reimburses employees up to a certain amount of travel costs dependent upon commuting distance for using public transportation. It has been instrumental in reducing the number of needed parking spaces at the NIH and has continued to grow since October 1, 1992.

The implementation of the NIH Transportation Management Plan has been highly effective in reducing peak hour and daily trips to the campus, in keeping with the 1992 MOU.

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4.4 Site Infrastructure

The NIH Bethesda Campus Master Plan is developed separately from, but in coordination with, the campus Master Utilities Plan (MUP). For more specific information on campus utilities, see the MUP.

Although utilities are concentrated under campus roadways, buried utility lines crisscross the entire campus. NIH is in the process of consolidating many utilities in utility corridors as recommended in the MUP. There are two existing utility tunnels on site, one running north-south from the Power Plant (Building-11) to the Clinical Center Complex (Building-10) and the Animal Facility (Building-14) The other traverses east-west between the Convent and Center Drive along the axis of South Drive, as depicted in Exhibit 4.4.A. Future third and fourth sections are proposed for completing the loop around Building-10 and around the Building-14/28 complex. Proposed utility trenches carrying steam and chilled-water lines would be extended in the northeast sector of the campus toward Building-33 on the north, and around Building-14 on the south. The purpose of these proposed tunnel and trench expansions is to provide utility service redundancy to all parts of the campus in case of disruptions in service.

Construction of future campus development must take into consideration these existing tunnels and utility lines, as well as proposed corridors, tunnels, and utility improvements. Planned new buildings must take into consideration adequate capacity of chilled-water, steam, and electrical power. Planned new projects must not go forward for approval unless funding for adequate utilities is addressed. Federal regulations require that newly constructed facilities are complete and usable. Each utility is discussed in detail below.

4.4.1 Potable Water

(Exhibit 4.4.B.) The potable water supply to the NIH Bethesda site is from the Washington Suburban Sanitary Commission (WSSC) water distribution system via seven metered incoming water mains. The seven meter vaults consist of six 8 inch and one 10 inch fire flow type meters. The potable water meters enter the site on all four sides of the campus, Cedar Lane, Old Georgetown Road, Rockville Pike, and Roosevelt Street. The Bethesda Campus water distribution system consists of various size lines (1 inch to 16 inch) and material (ductile, casted, and copper). The looped system serves for fire, domestic, and process loads. Several of the pipes were cleaned and cement lined between 2001 and 2002. The water distribution piping consists of approximately 50,000 linear feet of pipe, located in tunnels and directly buried. The average daily gallons per minute during peak summer months is approximately 2,400 gallons per minute.

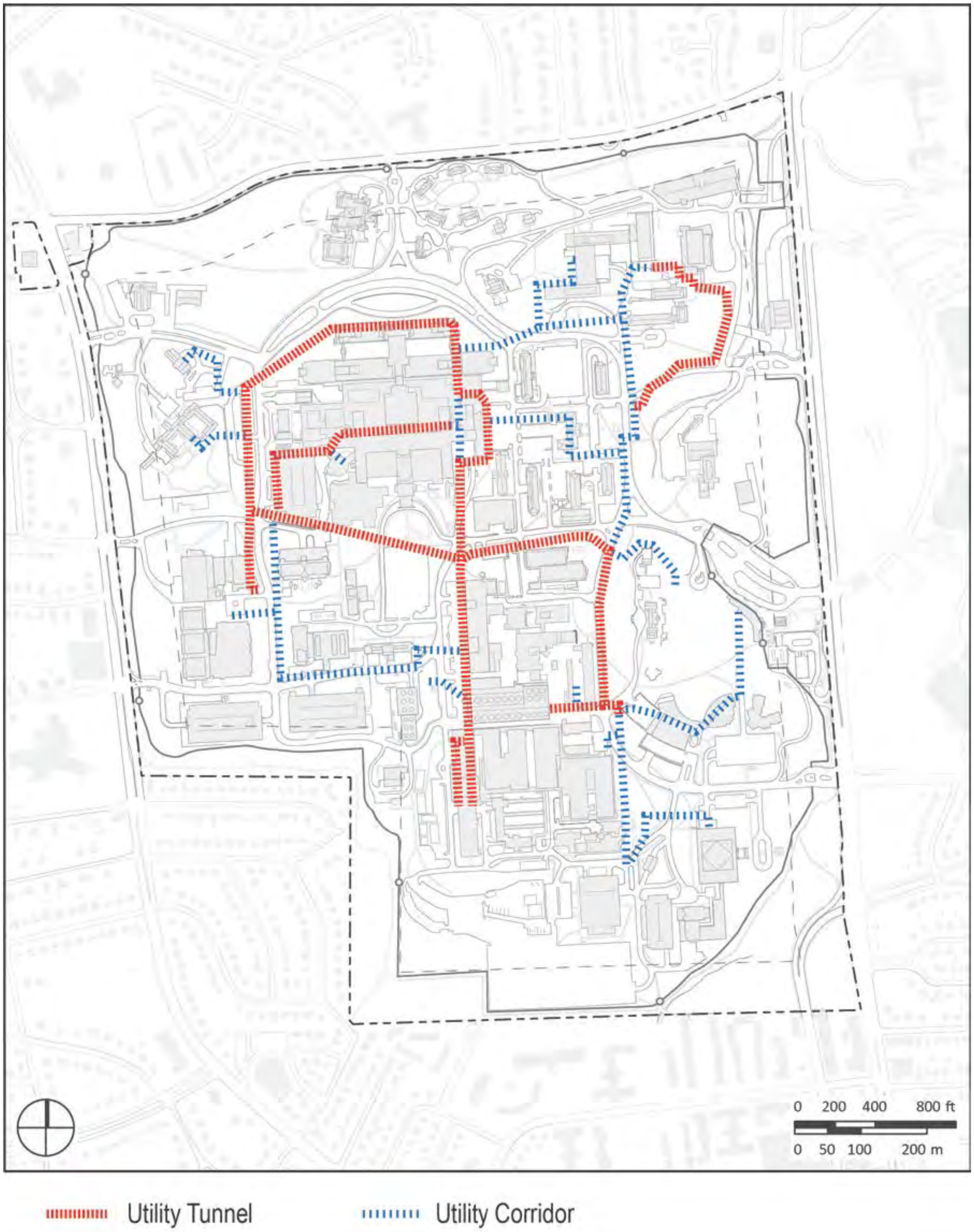

Exhibit 4.4.A. Existing Major Utility Tunnels and Corridors

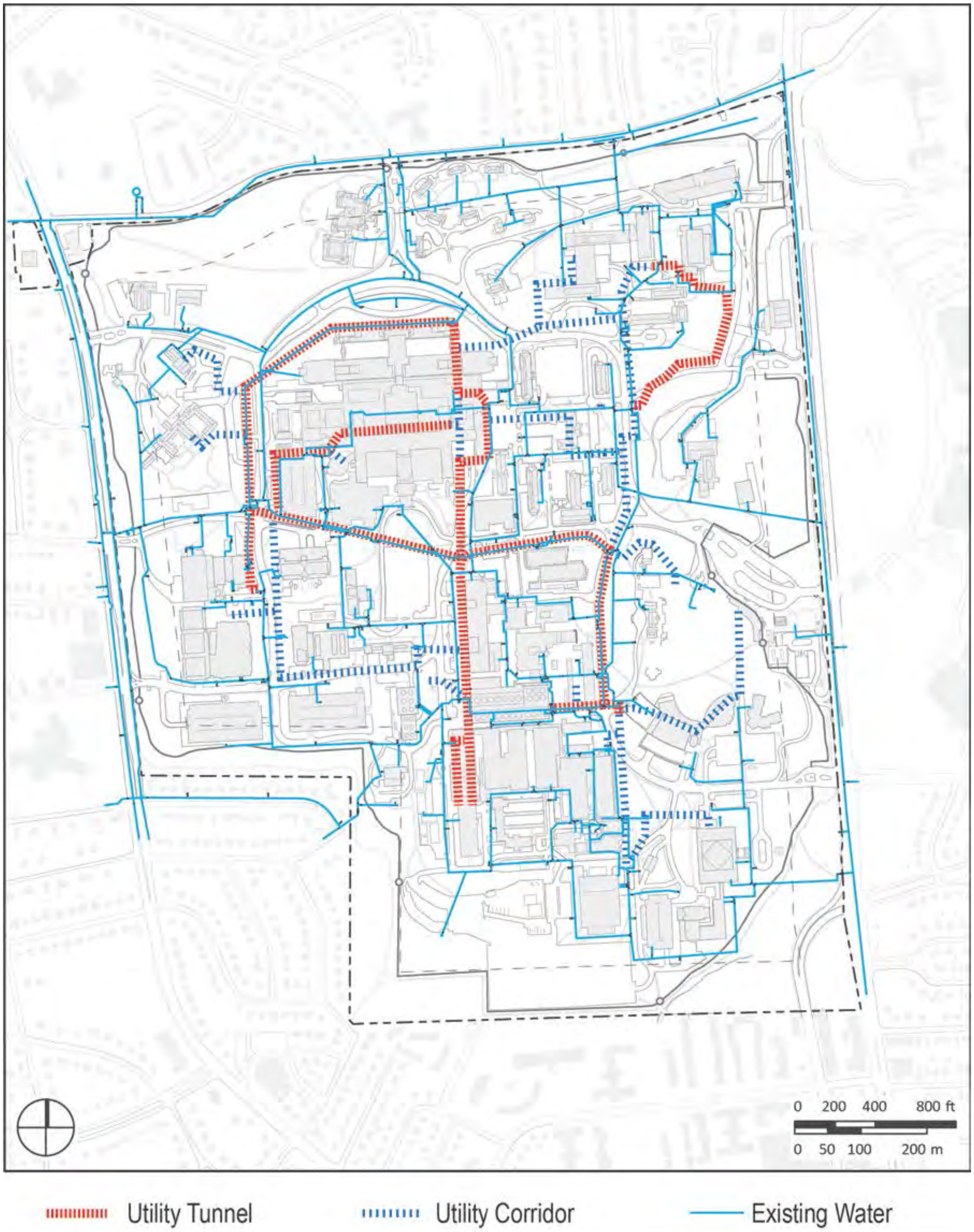

Exhibit 4.4.B. Existing Water Distribution

4.4.2 Natural Gas

(Exhibit 4.4.C.) The natural gas supply to NIH Bethesda site is from Washington Gas via several meters. The main services are connected to Old Georgetown Road and Cedar lane which serves majority of the campus facilities, including residential dwellings. The Visitor Center, Firehouse, Commercial Vehicle Inspection Facility are served directly from Washington Gas. The natural gas distribution piping consists of approximately 16,200 linear feet of two (2) inches to four (4) inches pipe. Several sections and valves were replaced between 2006 and 2008.

4.4.3 Chilled Water Supply and Return: Production and Distribution

(Exhibit 4.4.D.) NIH has two chilled water plants, Building 11 and 34. Building 34 is no longer in use and is scheduled to be renovated for additional chiller systems. Building 11, the CUP, also houses the heating plant. The chilled water plant, Building 11, consists of 60,000 ton of refrigeration. The chillers, with a nominal capacity of 5,000 tons each are of the centrifugal design by Carrier or Johnson-York. Three of the chillers have dual drives, electrical and steam. The Chilled Water Plant has 12-2 cell induced draft cooling towers. The towers are manufactured by Ceramic or Marley. The cooling towers are outfitted with variable speed drives. The plant and distribution design is a primary-secondary-tertiary system; hence, variable volume. The secondary pumps, six (6) -21,000 gallons per minute each, are installed variable speed drives. Several of the buildings have a tertiary bridge that decouples the plant and building pumps. Six older chillers in the plant use R-22 as the refrigerant and the newer chillers use R-134a. The secondary distribution system consists of approximately 66,000 linear feet of chilled water supply and return piping. The lines are installed in tunnel, trench, or direct buried concentric piping. 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. An analysis of the operational data shows that the heating plant experienced a peak load of 697,000 pph in 2008. The current chilled water load on the plant is approximately 54,000 tons.

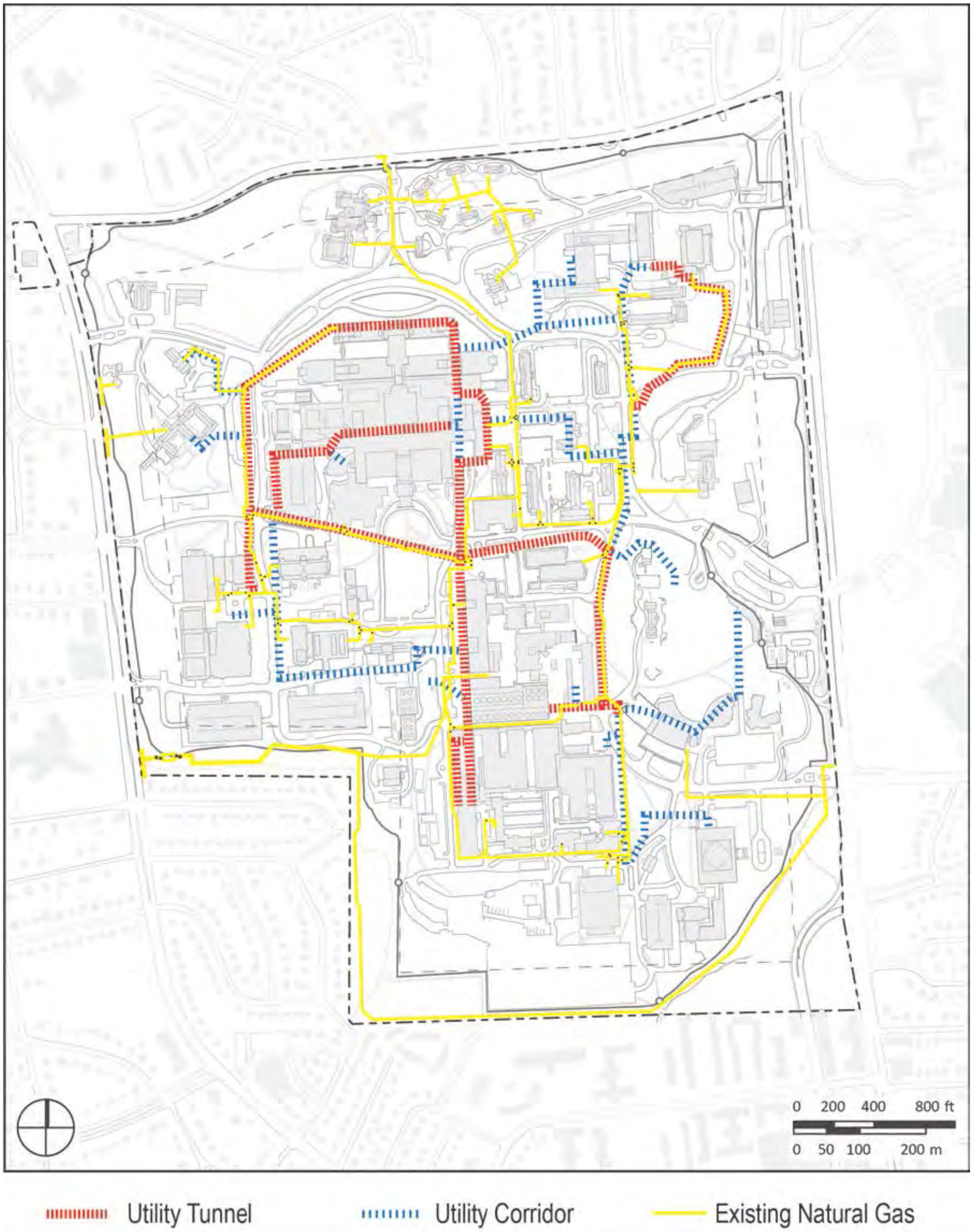

Exhibit 4.4.C. Existing Natural Gas Distribution

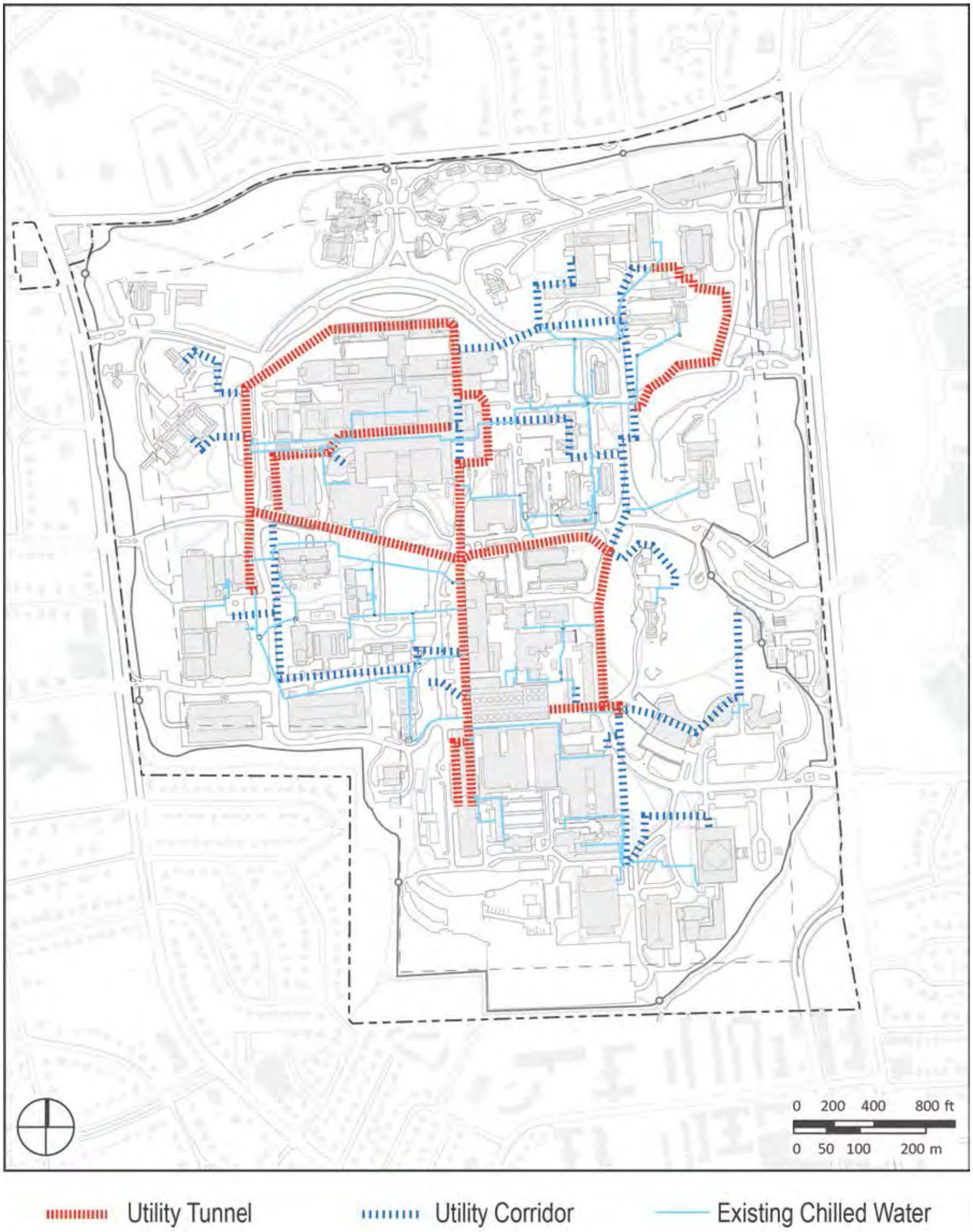

Exhibit 4.4.D. Existing Chilled-Water Distribution

4.4.4 Steam and Condensate: Production and Distribution

(Exhibit 4.4.E.) The National Institute of Health (NIH) Central Utility Plant (CUP) generates saturated steam at 165 psig for distribution to the NIH campus. The campus distribution system provides steam to individual buildings where it is used to generate hot water for heating, domestic, laboratory and animal facility uses and in the generation of steam for use in humidification and process systems. The NIH CUP also has a cogeneration facility that produces steam and electricity. The steam is produced at the same pressures as the boilers.

The CUP consists of five (5) dual-fuel (primary-gas/secondary- ultra low sulfur #2 diesel oil) saturated steam boilers. The steam ratings of the boilers are as follows: 4- 150,000 pph and 1-200,000 pph. The four boilers were installed between 1952 and 1968. The larger boiler was installed in 1997. However, the four smaller boilers were rebuilt in between 1996 and 1997 and the larger boiler was completely re-tubed in 2009. The cogeneration facility is rated for 105,000 pph, with a maximum of 180,000 pph (duct fired). The CUP system consists of deaerators, economizers, condensate polishers, water softeners, steam and electric feedwater pumps; steam and electric drives on the force draft fans, bearing cooling water, chemical feed, and condensate receiver tank systems. The secondary distribution system consists of approximately 84,000 linear feet of steam and condensate lines. The lines are installed in tunnel, trench, or direct buried concentric piping. 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. An analysis of the operational data shows that the heating plant experienced a peak load of 697,000 pph in 2008.

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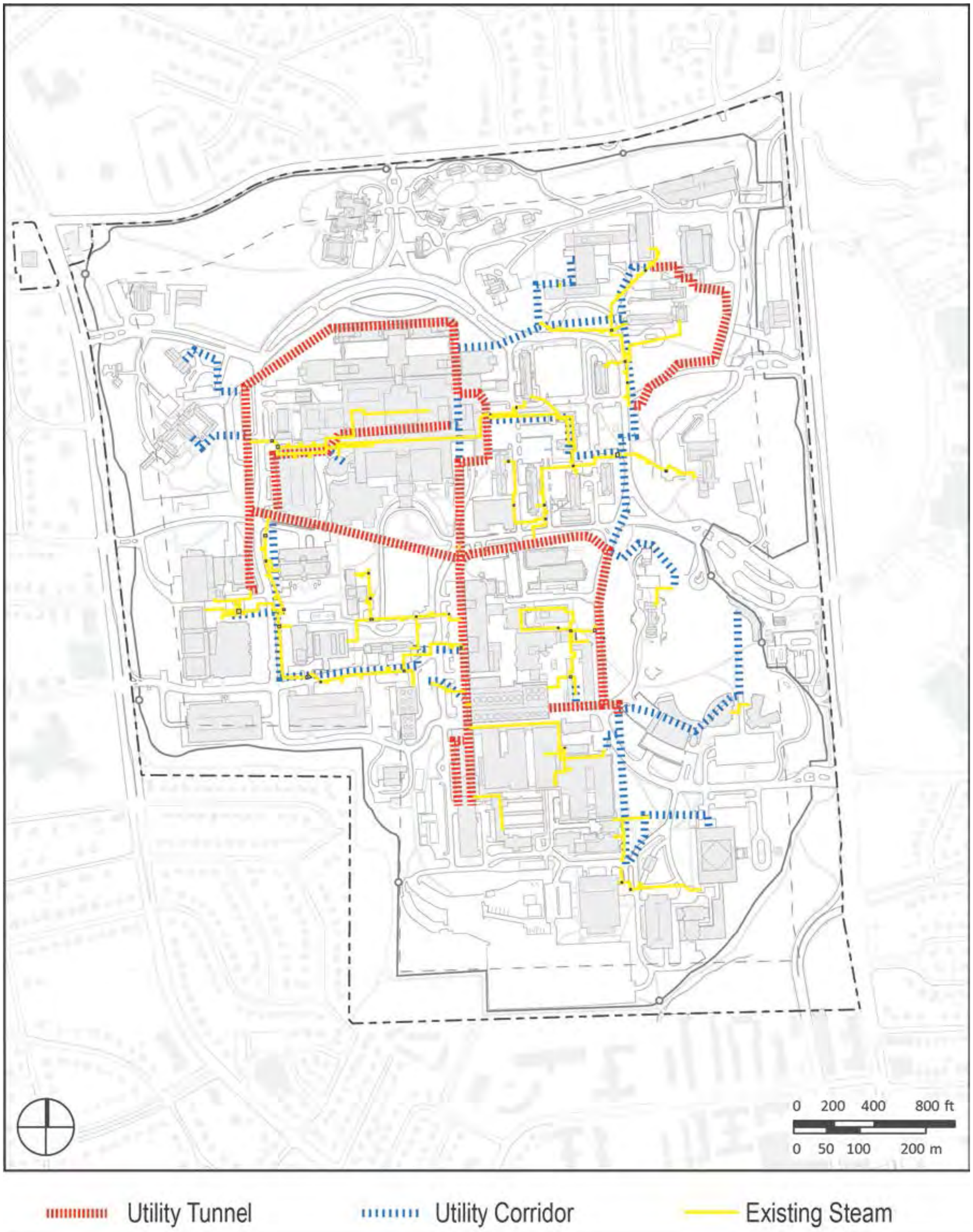

Exhibit 4.4.E. Existing Steam Distribution

4.4.5 Sanitary Sewer

(Exhibit 4.4.F.) The sanitary sewer discharged from NIH is handled by WSSC. The NIH sanitary sewer collection system is divided in to two networks that combine at the northeast corner via a consolidated sewer vault or manhole which contains a metering flume. The north network discharges most of the Clinical Center and all the NIH buildings north of center drive. The southernmost line of this north network is fifteen (15) inches in diameter between west cedar lane and Building 10. The NIH residential buildings discharge to this network. The south network discharges the remainder of the campus. It consists of three branch networks, (1) west (serves the laboratories), (2) stream to Edgewood and Glenwood streets, and (3) line south of Building 41. Building 38 and 38A are served via an independent, short and direct connection to WSSC. The sanitary sewer collection system consists of approximately 39,000 linear feet of pipe that range in size from six (6) to fifteen (15) inches.

4.4.6 Storm Sewer

(Exhibit 4.4.G.) The NIH campus encompasses three drainage areas: The NIH stream (main collection system), North Branch (dry channel- main drain for the north section of the campus), and Stony Creek. Each area has a separate storm drain system. All the NIH storm water discharges to Rock Creek, except the small area on the west side of the campus. NIH owns and maintains all the site storm water system of pipes, manholes, catch basins, traverse drains, head walls, etc. The storm collection system consists of approximately 80,000 linear feet of pipe. The main storm water lines, which range from 84 to 96 inches in diameter, carry the NIH stream across the campus between the southwest corner to the outfall near Building 21. Two other drainage systems join it in the vicinity of Building 50. One of these systems drains the area with the NIH stream basin to the south of Building 11 and the other drains the area within the basin that is north of Lincoln Drive. Drainage in the north and southernmost sections is handled either by surface flow or short pipe systems carrying rooftop runoff. To ensure proper storm water management to the north side and the south side of the campus, NIH installed an underground storm water retention structure in 2004 and is working with Montgomery County which is installing a storm water management pond.

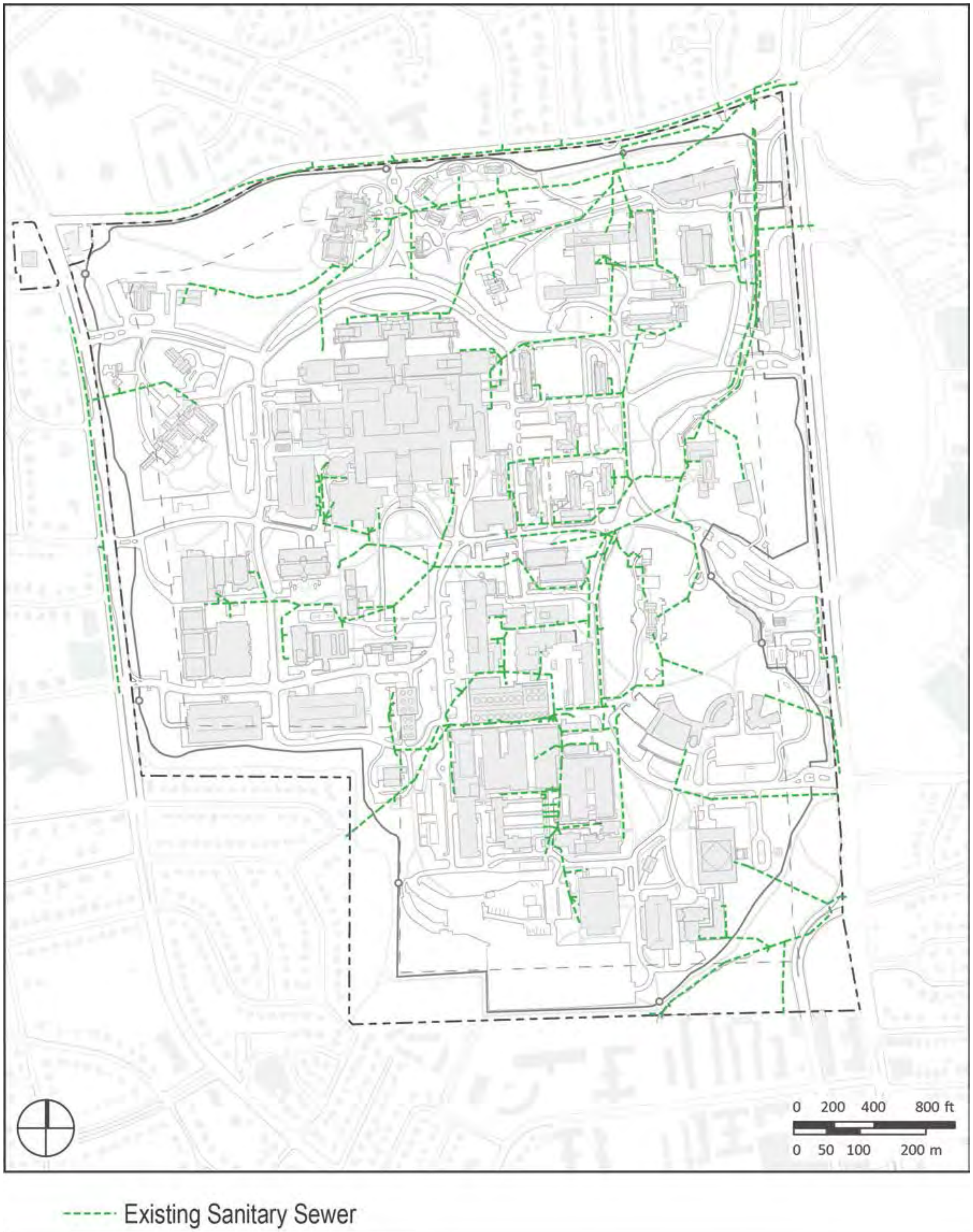

Exhibit 4.4.F. Existing Sanitary Sewer Distribution

----- Existing Storm Water Drainage

Exhibit 4.4.G. Existing Storm Water Drainage

4.4.7 Electrical

(Exhibit 4.4.H.) The NIH campus has three substations that are served by the local utility company, PEPCO, from two 34KV substations (Bethesda Substation 6 and Bells Mills Substation 121). The substations are designated as Building 17 (East Substation), Building 46 (West Substation), and Building 63 (North Substation). The East substation is the original electrical service entrance for the campus. PEPCO provides four 35KV feeders, each connected to a 30 MV A and 3- 20MV A transformers. The electrical power is distributed to the buildings at 13.8 KV. According to the records, the substation has a total of 90 MV A; however, the contractual agreement with PEPCO is 70 MVA. The West Substation was originally constructed to serve the new campus loads for the National Cancer Institute (NCI), Building 34 (old Chiller Plant), and the west vault of the Building 10 complex. PEPCO provides three 35KV feeders, each connected to 3- 20MV A transformers. According to the records, the substation has a total of 60 MV A; however, the contractual agreement with PEPCO is 39 MV A. The electrical power is distributed to the buildings at 13.8 KV. The North Substation was constructed in 2001. NIH owns the entire substation. PEPCO provides two, 35KV feeders, each connected to 2- 30/40 MV A transformers from Bells Mills, PEPCO Substation. During the construction of the North Substation, NIH decided to purchase the third transformer because of the reduce cost. The third transformer does not have a dedicated feeder to date. Planning documents have been submitted to fund a PEPCO study to determine the route, structure, configuration, and cost to obtain the third feeder. Currently, the third transformer is connected to one of the PEPCO feeder, maintenance and operational reasons. According to the design, the substation has a total of 90/120 MV A; however, the available capacity is 60/80 MVA. The electrical power is distributed to the buildings at 13.8 KV via various remote pad mounted transformers, two satellite switching stations (Building 57 and 59) and two satellite substations (Building 52 and 54). The transformers located at 52 and 54 are 13.8KV/208V - 225 KVA and 13.8KV/480V - 3- l000KVA. The electrical distribution consists of approximately 50,000 linear feet of ductbanks and cable.

4.4.8 Signal System

(Exhibit 4.4.I.) The signal system at NIH accommodates the telephone, fire alarm, security and door supervision, and local signal services, as shown in. Concrete-encased fiber, asbestos-cement, and plastic 4-inch conduits connect the underground manhole and hand-hole systems.

Exhibit 4.4.H. Existing Electrical Distribution

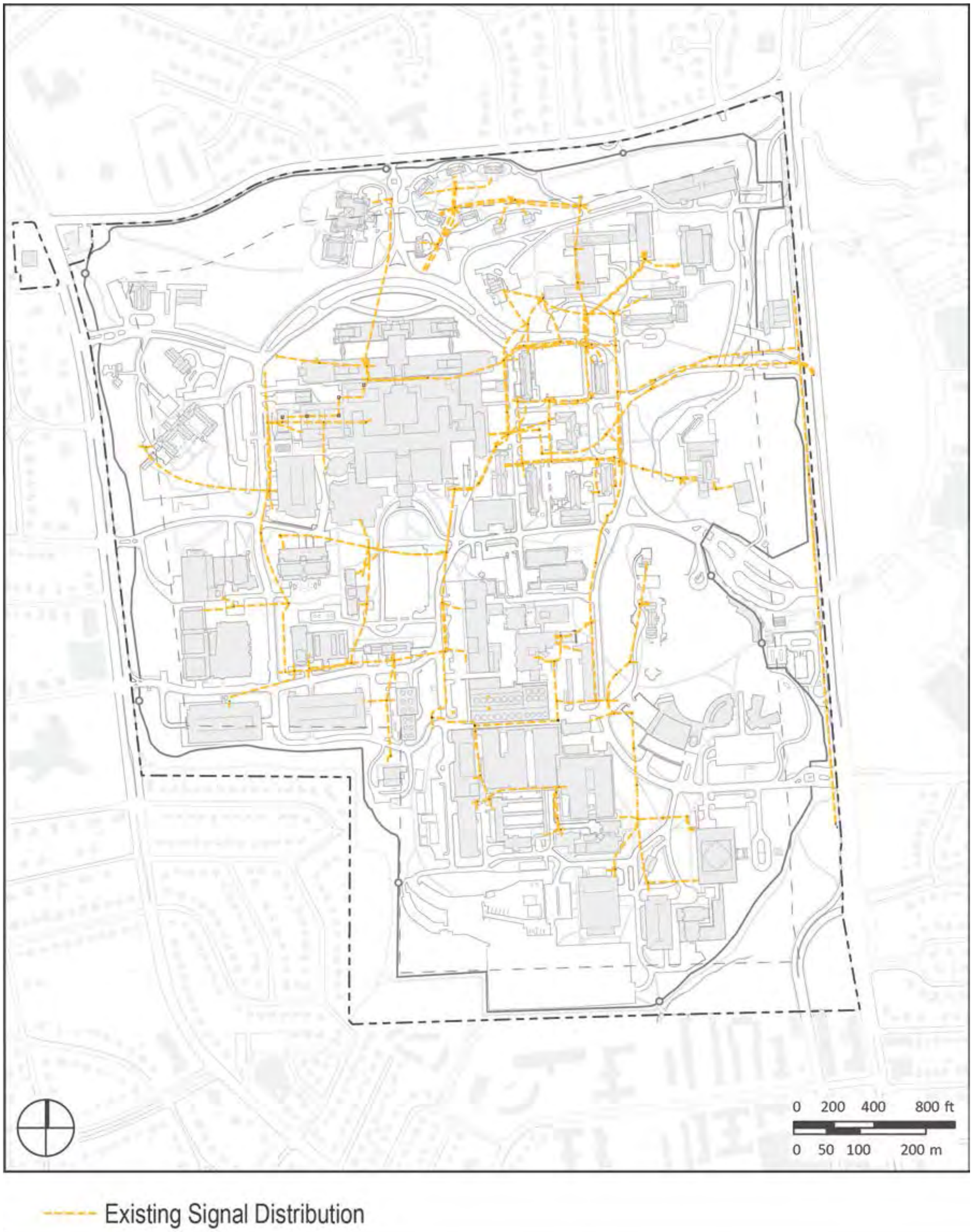

Exhibit 4.4.I. Existing Signal Distribution

4.4.9 Compressed Air: Production and Distribution

(Exhibit 4.4.J.) The CUP houses three air compressors that serve as the central air compressor plant. The compressors are sized as follows: two (2) 1800 (20 years old) and one (1) 3000 cubic feet per minute (CFM) units. The CUP installed two new air-dryers for the compressors in 2009 or 2010.The 3,000 CFM unit was installed in the early 2000s. The compressed air distribution consists of approximately 19,500 linear feet of one and one quarter (1 1/4) to three and one quarter (3 1/4) inch pipes. Several sections and valves were replaced between 2006 and 2008 with heavy plastic lines under Contract No. 263- 95-C-0222. The compressed air demand on the plant is approximate 1,500 to less than 1,800 CFM.

4.4.10 Fuel Oil

The CUP has two (2) 567,000 gallon (nominal) underground tanks that provide a combined storage of 1,134,000 gallons for NIH operations. The two large tanks have an active cathodic protection system. Building 58, located between the two large tanks, serves as a transfer station, which consists of controls, alarms, instrumentation, valves, pumps, etc. that are used to transfer fuel to the day tanks via an underground trench, approximately 1,550 linear feet. On the north side of the CUP, the heating plant is equipped with two (2) underground 10,000 gallon day tanks. The day tanks have a passive cathodic protection system.

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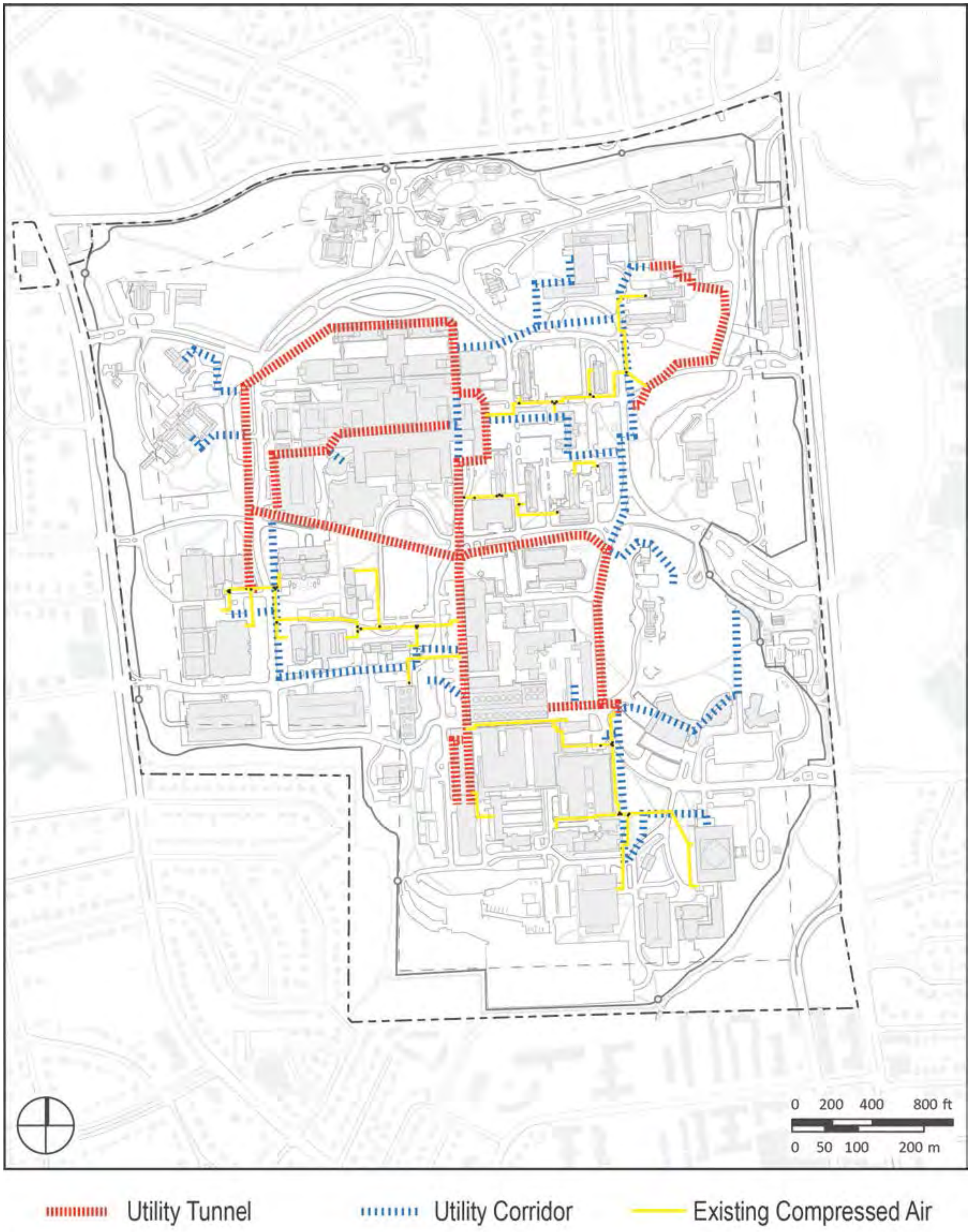

Exhibit 4.4.J. Existing Compressed Air Distribution

4.5 Campus Population

According to the 2011 NIH Census the Bethesda Campus has a population of 20,594 consisting of full time equivalents (FTE), on-site contractors, auxiliary, tenants, and fellows. Not counted in the population are guest researchers, summer students and volunteers.

4.5.1 FTEs

FTEs are federal employees who work in many different capacities ranging from senior scientist to maintenance mechanics. They hold federal appointments such as Senior Executive Service (SES), general schedule (GS) and Wage Grade (WG). In June 2011, when the census was taken, there were 10,472 FTE positions at the Bethesda Campus.

4.5.2 On-Site Contractors

On-site contractors whom have the Bethesda Campus as their duty station are counted in the NIH Bethesda Campus population. These contractors perform the same duties as the federal employees. In June 2011, there were 4,288 on-site contractors assigned to the Bethesda Campus.

4.5.3 Auxiliary

Auxiliary are employees or contractors who provide services such as janitorial, food preparation, retail, etc. who not assigned a desk or a computer. There are 2,349 auxiliary workers assigned to the Bethesda Campus.

4.5.4 Tenants

The Food and Drug Administration occupy three building on the Bethesda Campus and they are schedule to move to White Oak in 2014. FDA employees and contractors are counted as tenants. In June 2011, there were 582 tenants on campus.

4.5.5 Fellows

The NIH Intramural Research Program (IRP) provides training opportunities for scientists from around the world to enhance their research skills in the resource-rich NIH environment. Training and fellowship programs at the NIH include the following programs: Postdoctoral Fellows Program, Post Baccalaureate Program, Graduate Partnership Program, Medical Research Scholars Program, Clinical Research Electives, and the

Clinical Investigators Student Training Forum. In June 2011 there were 2,903 fellows on the Bethesda Campus.

Exhibit 4.5.A June 2011 NIH Bethesda Population Table

Personnel Category	Number of Personnel
FTE Federal Employees	10,472
Contractors	4,288
Auxiliary	2,349
Tenants	582
Fellows	2,903
Bethesda Campus Total	20,594

4.6 Environment

4.6.1 Environmental Management Programs[13]

The National Institutes of Health's (NIH) commitment to responsible environmental management is a natural extension of our mission to learn more about living systems in order to enhance health, lengthen life, and reduce the burdens of illness and disability. NIH is at the forefront of sustainability in the Federal government. Our Environmental Policy serves as the foundation for our sustainability initiatives and aligns with the broader U.S. Department of Health and Human Services (HHS) Strategic Sustainability Performance Plan. We achieve our goals through our NIH Environmental Management System (NEMS), which requires each of our 27 Institutes and Centers (ICs) and every employee to contribute and enable us to reach our goals. NIH has active programs in place to manage all our environmental areas. Through the NEMS and the Strategic Sustainability Performance Plan, NIH coordinates activities related to environmental management at NIH to improve their efficiency and effectiveness. This approach ensures our compliance with legal requirements and also improves our performance on environmental impacts that are not regulated.

[13] NIH Environmental Management System Website. http://nems.nih.gov/programs/Pages/default.aspx. May 4, 2012

4.6.1.1 Environmental Management System

An environmental management system (EMS)[14] is the process used by an organization to manage, review, correct, and improve the organization's approach to business. Employees are asked to consider how they affect the environment every day. An EMS offers a structured way to incorporate environmental considerations into day-to-day operations. It promotes continual improvement of the environment and human health. The NIH EMS was developed as part of the NIH's commitment to the environment. It is implemented in accordance with Executive Order (EO) 13423, "Strengthening Federal Environmental, Energy, and Transportation Management" and is based on the International Organization for Standardization (ISO) 14001:2004 standard for environmental management.

The NIH EMS framework consists of four phases: planning, doing, checking, and acting (or improving). This framework is often referred to as a Plan-Do-Check-Act cycle. This cycle involves setting objectives, tracking progress, and resetting objectives. Because the cycle takes place on an annual basis, the system goes through a continuous evaluation and improvement process.

As the steward of medical research for the nation, the NIH leads the way in pursuit of knowledge to improve health and save lives. Protecting human health and the environment is an important part of the NIH mission. An EMS assists the NIH in considering the environmental impacts of its activities and setting goals for reducing or mitigating those that are adverse. The EMS also complements the NIH mission of improving the health of the nation. Finally, an EMS empowers individual employees to make environmentally friendly decisions in their day-to-day activities.

4.6.2 Climate

The NIH campus is located in west-central Maryland at 39°00' N latitude and 77°22' W longitude, within the temperate continental climate of the United States.

Summers are long, warm and humid due to the dominance of maritime tropical air. Temperatures are almost sub-tropical in character, showing little change from day to day. Winters are relatively cold, however. Frequent air-mass changes occur because of the influence of either maritime tropical or continental polar air.

[14] ORF Division of Environmental Protection. accessed January 1, 2011

4.6.2.1 Temperature

The mean annual temperature is 57° F. temperatures vary little throughout the summer and winter seasons, but they are quite variable through the transition seasons of fall and spring. The January normal high is 43° F and the normal low is 27° F. The June normal high is 88° F and the normal low is 70° F. The number of normal heating-degree-days for the Washington, D.C. area, as reported by the National Weather Service, is 3,988 and the number of cooling-degree-days is 1,432.

4.6.2.2 Precipitation

The maximum seasonal precipitation occurs in the summer, coinciding with the seasonal location of the jet stream. In winter, the location of the jet stream results in large-scale cyclonic storms that originate in the Texas/Gulf of Mexico area and moves northeastward toward the Mid-Atlantic States. The storms' position in relation to the Appalachian range is the controlling factor on the quantity of snow the area receives. The 30-year mean annual precipitation is 39.0 inches for Ronald Reagan Washington National Airport. Snowfall averages 17.3 inches annually.

4.6.2.3 Sunshine/Winds

The total sunshine in January averages from 40% to 50%. In contrast, June through September averages 60% to 70% total sunshine. Predominant breezes are from the north-northwesterly winds in the winter and the southwesterly winds in the summer.

4.6.3 Noise

The dominant noise source in the NIH vicinity is traffic on Rockville Pike and Old Georgetown Road. Exterior traffic noise dominates noise levels for about 500 feet to either side of these roadways. Traffic generated by the Master Plan implementation will not appreciably impact the surrounding neighborhoods. It is estimated that traffic noise levels will remain unchanged or increase by 1-dBA, which is not perceptible to the human ear, over the next 20-years regardless of growth at NIH.

Within the core of the campus, typical daytime noise levels range from 55-60 dBA. Among NIH facilities the dominant noise sources are the roof top cooling towers associated with chillers located in Buildings 11 and 34. Noise from cooling towers is seasonal, with noise levels in summer months when temperatures exceed 90^{o} F increasing sharply. Cooling tower noise is most obvious at night when background noise levels fall.

NIH has committed to mitigating chiller plant nighttime summer noise to 55 dBA. A sound attenuation screen has been installed along the full length of the south side of Building-11 to reduce noise levels generated by the cooling towers on the roof. Adjacent neighborhoods will 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.

Individual building exterior or roof-top air exhaust fans and emergency electric power diesel generators are additional campus noise sources. New facilities should abate and mitigate excessive noise and vibration impacts to nearby NIH facilities and the neighborhoods surrounding the campus. Mitigation can be achieved through physical shielding equipment silencers or project design configuration. Maximum building operational noise levels should meet the Maryland and Montgomery County noise criteria described in the EIS.

4.6.4 Air Quality

There are three emissions sources, which may affect the air quality of the NIH, including vehicular traffic on roadways, vehicles at parking structures, and central Power Plant boiler stack emissions.

The National Ambient Air Quality Standards (NAAQS) pollutant concentration most likely to be exceeded by vehicular traffic generated emissions is carbon monoxide (CO). On a regional level, the NIH Master Plan traffic will have little or no influence on CO levels. On a local or micro scale level, projected NIH-generated traffic at the worst case scenario locations, the intersections of Rockville Pike with West Cedar Lane and Jones Bridge Road, will not exceed the NAAQS. The parking location with greatest potential impact is at MLP-6 and MLP-8 because of their proximity to Edgewood/Glenwood. However, analysis indicates that existing and future Master Plan CO concentrations at the residences along the north side of McKinley Street are well below the NAAQS limits.

The main point source of emissions on the NIH campus is the central boilers housed in Building-11. The existing boilers have been upgraded to dual gas-oil fuel-feed with low N_2O burner technologies. These improvements have resulted in significant reductions in sulfur dioxide (SO2), particulates, volatile organic compounds (VOC), and nitrogen dioxide (NO_2).

Summer ozone concentrations in the Washington metropolitan area exceed the NAAQS, (i.e. the region is in non-attainment for ozone). In January 2003, the U.S. EPA downgraded the area’s non-attainment classification from “serious” to “severe”, and required regional attainment in 2005. Regional officials must identify additional abatement or control measures that may be needed. These measures have not been determined yet.

Emission requirements for new boilers or energy sources are established when project implementation occurs through Maryland Department of the Environment permit processes. Separate permits are required to construct, test, and operate new facilities. Requirements for future NIH boiler emissions will be determined at the time of implementation within the context of regional conditions. NIH will use appropriate technologies for emission control to meet permit requirements.

4.6.5 Waste Disposal

Waste generated at NIH is classified according to federal and state regulations, which define procedures for storage, transport, and disposal. Classifications of waste generated at NIH include solid or general waste, medical/pathological waste, radioactive waste, chemical waste, and multi-hazard/mixed waste.

NIH rigidly controls waste generated by biomedical research. The Division of Environmental Protection (DEP) is responsible for all aspects regarding the management of waste, including the training of personnel in these areas. NIH manages waste from generation to ultimate disposal. Non-radioactive general, medical/pathological, chemical, and mixed waste is managed by the Waste and Resource Recovery Branch. The NIH Division of Radiation Safety manages radioactive materials and waste. Specially trained and qualified private contractors transport chemical, radioactive, and multi-hazard/mixed wastes off-site.

Emphasis is placed on minimization of waste generation at NIH. Advisory services in the DEP are available to researchers in developing experiments and waste minimization protocols. Waste is strictly segregated in hospital, clinical, and research spaces to avoid creating unnecessary amounts of multi-hazard/mixed waste. Wide assortments of appropriate waste containers, which are defined and specified by federal and state regulations, are provided to researchers. The researcher labels the container for date, source, constituents, and potential hazard. Accumulated waste is temporarily stored in cabinets or secure areas in research spaces away from the general public and with easy employee access.

For chemical, radioactive, and multi-hazard/mixed waste, contractor personnel inspect and remove the wastes, and transport them to the waste marshaling facility located in Building-21. At Building-21 these wastes are segregated by different regulatory categories. If necessary, waste is treated to render it non-hazardous, reduce hazard, reduce volume, or convert multi-hazard/mixed waste to a single classification. Waste may be bulked for subsequent shipment and disposal by consolidation of multiple small containers of compatible waste materials to fewer containers. This controlled waste is shipped weekly to off-site waste management facilities. NIH keeps a permanent disposal record of all disposed wastes.

4.6.5.1 Solid or General Waste

General waste includes waste that is not contaminated with chemical, infectious, or radioactive materials and is not suitable for recycling. Examples of general waste include office waste, disposable products, animal bedding which is not contaminated, dining facility waste, campus maintenance waste, and building renovation waste.

General waste is collected and placed in dumpsters located throughout the campus. A private contractor transports general waste to the Montgomery County Transfer Station. NIH generated 9,600 metric tons of general waste in 2010. Records indicate that about 55% of this total was classified as office/institutional waste.

4.6.5.2 Medical/Pathological Waste (MPW)

Medical/pathological waste (MPW) is defined as waste that, due to actual or perceived presence of pathogenic agents, requires containment or treatment to prevent occupational or environmental exposure. To ensure compliance with all State and Federal regulations, NIH has merged the applicable definitions into the single category of MPW. Examples of MPW include microbiological cultures, clinical specimens, tissue cultures, and waste from surgical suites, contaminated animal bedding, “sharps”, and contaminated disposable clothing or absorbent materials.

MPW is packaged at the point of generation into opaque bags placed in cardboard containers. MPW boxes are labeled for source and content and then stored under refrigeration in designated pickup locations inside buildings around the campus. This waste is marshaled at Building-25 and transported from the site by contractor for approved treatment and disposal.

NIH has reduced MPW generation by 45% since 1990 even though the number of researchers on the campus has increased significantly in the interim, and additional future reductions are possible. Future MPW generation levels are not expected to increase at full Master Plan build out.

4.6.5.3 Radioactive Waste

Radioactive waste is any waste that contains or is contaminated with radioactive materials, such as contaminated paper, glass and plastic containers, liquids and fluids, experimental or cleanup materials, and contaminated medical pathological wastes including patient care wastes. Nearly all radioactive material used at NIH involves very low levels of radioactivity. Most of these materials have a half-life of less than 100 days.

NIH is licensed by the U.S. Nuclear Regulatory Commission (NRC) to use, store, and dispose of radioactive materials. The NRC inspects all NIH facilities for compliance with applicable regulations on a regular basis. All NIH personnel involved in handling, transporting, and/or using radioactive materials are trained in accordance with NRC requirements. Training emphasizes minimization of low-level radioactive waste.

Radioactive wastes are marshaled for disposal or treatment in Building-21. Some radioactive wastes which have a short half-life may be stored until they are no longer classifiable as radioactive, and only then disposed of as non-radioactive waste. Over the last five years, annual radioactive waste generation has ranged from 78 to 154 metric tons.

Building-21 also contains laboratories designed for the use of radioactive materials with quantities of radioactivity higher than typically used in a standard laboratory. NIH also operates three cyclotrons in the Clinical Center Complex, which produce isotopes that have half-lives measured in terms of minutes or hours, and thus effectively do not produce long-term radioactive waste.

Radioactive waste amounts have dropped significantly in recent years and that trend should continue under the Master Plan. The NIH has a rigorous radioactive waste minimization program. Experimental protocols are reviewed to determine if alternative methods not using radioactive materials are available. If not, then the absolute minimum amounts of radioactive materials are used.

4.6.5.4 Chemical Waste

Chemical wastes that is not regulated under federal or state regulations as hazardous, but which have toxic or hazardous characteristics are also considered to be hazardous waste by the NIH. Multi-hazard waste is an NIH definition for a waste that meets the definition and properties of more than one of the restricted types of waste, including MPW, radioactive waste, and chemical waste. These types of waste are subject to strict waste minimization and segregation procedures.

The Master Plan assumes a larger net area per researcher in new research space than in some existing space, but the projected number of researchers on campus is only expected to increase moderately over the next twenty years. Further, a greater proportion of the research is expected to be at the microbiological level, which, in general, produces lesser quantities of chemical waste. For these reasons, chemical waste is expected to remain relatively constant under the Master Plan. NIH generated 193 metric tons of chemical waste in 2011. Chemical and multi-hazard waste will continue to be picked up by a contractor at multiple locations on the campus (from leased facilities off-site) and delivered to the corresponding waste management facilities for treatment, processing, or packaging for subsequent disposal.

4.6.5.5 Multi-hazard/Mixed Waste

Multi-hazard waste is an NIH definition for waste that meets the definition and properties of more than one of the restricted wastes (MPW, radioactive waste, and chemical waste). Mixed waste is combined chemical and radioactive waste, and is therefore a subset of multi-hazard waste. Volumes of multi-hazard and mixed wastes generated are included within the chemical and radioactive waste totals. When possible, multi-hazard and mixed wastes are converted to a single classification before treatment or disposal.

4.6.5.6 Animal Waste

Animal waste is classified as solid waste, MPW, or sanitary waste as determined by waste management procedures and it is disposed of according to its assigned category. It consists of animal bedding with animal droppings that are eliminated by daily cleaning of animal holding areas and cages. Wash-down from areas housing healthy animals is routed to the sanitary sewer. Bedding material and animal droppings from diseased animals are managed as MPW or processed 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. General animal bedding is collected in NIH dumpsters. Animal bedding is shipped composting where possible in lieu of standard solid waste disposal. It is assumed that there will be little or no growth in animal waste generated at NIH Bethesda. However, the system of separation and disposal will remain the same.

4.7 Sustainability

4.7.1 Federal Sustainability Mandates, Laws and Orders

The federal government has become increasingly concerned with the environmental impacts of its facilities and ongoing operations, particularly their impacts on the Nation's energy and water resources and Greenhouse Gas emissions. In an attempt to mitigate the impacts of its facilities and operations, the Federal Government has put forth a series of Federal Sustainability Mandates and Laws over the past 5 years in particular to deal with these issues.

The main purpose of these regulations and mandates is to require integration of sustainability considerations into site planning, design, construction, and maintenance of federal facilities.

- Energy Policy Act of 2005
- Guiding Principles (GP) Memorandum of Understanding
- Executive Order 13423
- Energy Independence and Security Act 2007
- Executive Order 13514
- HHS 2011 Strategic Sustainability Performance Plan

To meet these requirements, and using guidance provided by the Office of Management and Budget (OMB), the Office of the Federal Environmental Executive (OFEE), and the Federal government's Interagency Sustainability Working Group (ISWG), the Department of Health and Human Services (HHS) developed a HHS 2011 Strategic Sustainability Performance Plan, which the NIH has committed to meeting.

The sustainability goals laid out in the HHS 2011 Strategic Sustainability Performance Plan are briefly summarized below as they relate to the NIH, with the focus of reducing greenhouse gas emissions and develop new technologies that can both improve health and meet other sustainability goals such as reduction in energy and water use.

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- GOAL 1: Scope 1 & 2 Greenhouse Gas Reduction
- GOAL 2: Scope 3 Greenhouse Gas Reduction and Develop and Maintain the Greenhouse Gas Inventory
- GOAL 3: High-Performance Sustainable Design / Green Buildings and Local and Regional Planning
- GOAL 4: Water Use Efficiency and Management
- GOAL 5: Pollution Prevention and Waste Elimination
- GOAL 6: Green Purchasing (Sustainable Acquisitions)
- GOAL 7: Electronic Stewardship and Data Centers
- GOAL 8: Agency Innovation

4.7.2 Environmental Sustainability Considerations

For more detailed discussion of topics in this section, refer to Chapter 6 and the EIS for the NIH Master Plan, Bethesda Campus.

4.7.2.1 Regional and Local Sustainable Goals

NIH is required to consult with NCPC and local and metropolitan planning organizations regarding the impact, or potential impact, of Federal actions on local transportation infrastructure and local development plans into existing policy and guidance.

Requirements for such consultations are in accordance with HHS guidance and policies. The existing HHS NEPA process already includes consultation on these impacts and plans.

The master plan is aligned to increase effectiveness of local planning efforts regarding transportation, energy resources and the environment. This plan ensures that planning for new federal facilities increases the effectiveness of local planning efforts regarding transportation, energy resources and the environment, including consideration of sites that are pedestrian friendly and accessible to public transit.

The Environmental Impact Statements (EIS's) required for the NIH Bethesda Master Plan under the National Environmental Policy Act (NEPA) for proposed new or expanded Federal facilities, and as appropriate, will identify and analyze impacts associated with energy and climate change.

4.7.2.2 High-Performance Sustainable Design / Green Buildings Goals

The HHS Sustainable Buildings Plan requires all projects and lease actions to consider the Department of Transportation, Housing and Urban Development, the Environmental

Protection Agency and the General Services Administration's "Recommendations on the Sustainable Siting of Federal Facilities," issued April 5, 2010.

The largest environmental impacts from NIH mission activities are associated with siting, construction and operation of building assets. To help mitigate those impacts, HHS has incorporated the high-performance sustainable design requirements of the "Guiding Principles for High Performance and Sustainable Buildings" (GP) in the HHS Facilities Program Manual. HHS Policy for Sustainable and High Performance Buildings was issued in September 2006 and incorporated into the HHS "Sustainable Buildings Implementation Plan." The SBIP was updated in April 2011 (as the "Sustainable Buildings Plan" (SBP)), to incorporate Executive Order 13514 requirements.

Attainment of the goals and targets in the SBP will significantly reduce energy, water and materials use, greenhouse gas (GHG) emissions and waste generation. Additionally, HHS is developing science-based indoor environmental quality (IEQ) criteria that will supplement the current GP and LEED® requirements. Each sub-goal below includes a description of current SBP targets and/or focus, along with gaps the Department intends to address in the next year.

Beginning in FY2020, all new Federal buildings that enter the planning process are to be designed to achieve zero-net energy by FY 2030. NIH will comply with this requirement in new buildings. The definition of zero-net energy buildings has been added to the HHS SBP, as have interim targets (based on EISA) for increasing energy efficiency and reducing fossil-fuel generated energy use. See the April 2011 HHS SBP for more information.

NIH will comply with the "Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings" in all new construction, major renovation or repair and alteration of Federal buildings. Under the scope of this policy, HHS defines major renovation projects as improvement projects which have a total project cost equal to or greater than $10 million and/or impacting 40% or more of the overall floor area. Construction and improvement projects with a total project value equal to or greater than $10 million and improvement projects impacting 40% or more of the overall floor area require third party certification that meets the requirements of a multi-attribute green building standard or rating system developed by an ANSI-accredited organization. Requests for waivers, based on life-cycle costs, operational feasibility or technical application, must be approved by the HHS Senior Real Property Officer. All existing owned buildings will be assessed and compliance with the GP. See the April 2011 HHS SBP for more information.

NIH will use cost-effective, innovative building and sustainable landscape strategies to minimize energy, water and materials consumption. Requirements for cost-effective, innovative building and sustainable landscape strategies to minimize energy, water and material consumption through sustainable design practices and requirements are being implemented.

NIH will optimize the performance of the it's real property portfolio, dispose and consolidate excess and underutilized property, co-locate field offices, consolidate across metropolitan and regional locations, as funds become available.

The NIH Bethesda Master Plan ensures the use of best practices and technology in rehabilitation of historic Federal properties. Historic NIH properties will be conserved, rehabilitated, and reused, using current best practices and technology.

Where possible, and in cooperation with regional and local official, NIH will work towards increased location efficiency and reduction in GHGs associated with all of our operations. To promote consolidation, HHS has established an updated utilization rate policy for office and office support space at 170 useable square feet per person on average.

4.7.2.3 Energy Conservation

In accordance with Executive Order 13123, the NIH prepares annual Energy Management and Implementation Plans that focus on its accomplishments and future objectives toward meeting the 20% energy reduction per gsf goal established for laboratory facilities at federal facilities when compared to 1990 consumption rates.

The NIH has already taken measures to significantly reduce the rate of energy consumption per building square foot. The 5,000-ton chillers installed in Building-11 requires 32% less electric power than the chillers they replaced to generate a ton of refrigeration. The COGEN turbine delivers power generated directly to the PEPCO substation in Building-34, eliminating the distribution line power losses incurred between outside power stations and the campus. Executive Order 13123 also calls for reductions in greenhouse gas emissions. Through modernization of the boiler plant and the switch from fuel oil to natural gas in 1992 stack nitrogen oxides and volatile organic carbon emissions have been reduced by approximately 80%.

Over the course of the Master Plan period, overall energy demand will increase as campus building space increases. Energy use per square foot will also increase, because a greater proportion of campus space will be used for research (i.e. laboratories and animal care or holding). Research space requires about six times more steam per square foot than general or office space. Research space uses more than three times the chilled water, and nearly double the amount of electric power than general use or office space uses.

The reasons for this are twofold. First, in addition to heating and cooling, biomedical research space uses steam and chilled water for direct or process uses such as at the laboratory bench and cleaning animal holding spaces. Second, national biosafety codes and ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) requirements for laboratories and AAALAC (Association for Assessment and Accreditation of Laboratory Animal Care) codes for animal care facilities require a high rate of building air exchange per hour compared to other building uses. The typical air exchange in a commercial building is about five or six per hour. Laboratories require 6 air changes per hour and animal holding spaces require 10 to 15 exchanges per hour. Building air, which must be heated or cooled from ambient outdoor temperatures, is therefore resident in research or animal spaces for only three or four minutes.

The above implies that, while the building envelope is still important, the most cost effective energy conservation measures are those applied to the air stream flowing through the research building. Building designers should evaluate measures that conserve or reuse the energy within the building exhaust airflow. Examples are energy recovery heat wheels, or heat exchangers.

However, there are also opportunities to offset this increase by implementing energy conservation measures for the approximately 1.6 million gsf of new or renovated space which is proposed to be constructed over the twenty year period. To help the NIH meet and/or exceed its conservation goal, the following energy conservation project and measures will be implemented as identified under the Energy Management Plan:

- energy efficient designs for building envelopes and fenestration components, including establishment of energy design criteria such as required insulation values;
- installation of energy monitoring and control systems to provide for night time and off-peak hour energy cutbacks to non-critical areas;
- sub-metering of steam, chilled water, and electrical distribution systems for evaluation of implemented energy savings measures;
- computerized control and monitoring of steam and chilled-water production and distribution systems;
- installation of low-energy or low-wattage light fixtures. Design of interior spaces to utilize task lighting concepts;

- installation of new lighting controls to automatically trigger on-off switches or adjust light levels to accommodate daylight contributions.

Other recommendations or current actions for the conservation of energy include:

- siting and orientation of buildings to take maximum advantage of day-lighting and climatic conditions;
- use of landscaping to provide direct shade to reduce building heat gain, and to reduce ambient air temperatures by shading large paved areas;
- design of building fenestration to provide thermal insulation and shading to manage solar heat gain in summer and capture passive solar heating in winter;
- replacement of existing steam lines as necessary to solve leakage problems as recommended by the MUP;
- installation of new energy efficient chillers to replace older, less efficient equipment as proposed in the MUP;
- efficiency improvements in chilled water distribution temperature differentials, as proposed in the MUP;
- conversion or replacement of the NIH vehicle fleet with alternative fuel vehicles;
- use of fuel-cells under economically feasible applications;
- establishment of public relations program to educate consumers on how to conserve energy.

4.7.2.4 Water Conservation

In an effort to reduce impacts on regional water resources and comply with Energy Policy Act of 1992, all new construction and renovation at the NIH Bethesda campus should employ water conservation technologies in plumbing and mechanical systems. All campus buildings should be considered for retrofit with low-flow fixtures. Additionally, NIH currently recycles ground water pumped from excavations for landscaping irrigation, and the Master Plan recommends the use of drought-tolerant plant materials and limiting high-maintenance landscape areas in an effort to conserve water

4.7.2.5 Waste and Recycling

Waste of many types is generated on the NIH Bethesda Campus. The NIH tightly controls the monitoring, control, collection, and disposal of waste in accordance with federal and State of Maryland regulations through its Division of Environmental Protection and Division of Radiation Safety. In many cases, procedures developed by the NIH are used throughout the U.S. biomedical industry. For all of the types of waste listed below, NIH will continue to assess ways to effectively prevent or reduce the generation of such waste as a first step in preventing pollution. The means of safe recycling, treatment and disposal of waste is discussed below. All new projects should include a waste minimization assessment as part of their environmental analysis.

4.7.2.5.1 Solid Waste

At the NIH, solid waste is composed of general waste, yard waste, and construction waste. General waste is composed of general trash, garbage, and refuse. General waste is collected by contractors at about 60 dumpsters around the site and hauled to the Montgomery County Transfer Station by a private contractor. Over the last five years, the average general waste generated at NIH Bethesda is approximately 6,100 tons per year. The NIH has a very successful recycling program. This program diverts waste materials for recycling or reuse. In calendar year 2010 the NIH diverted 3,270 tons of material for recycling or reuse. In 2011 the recycling program expanded to include materials diverted for composting. In late 2011 animal bedding and cafeteria kitchen food wastes were diverted for composting, which results in the production of an organic solid amendment product. Tree and brush trimmings are taken to a County facility where the materials are converted to mulch.

Construction debris from renovation projects is collected and recycled though the NIH solid waste contact. Mixed loads of debris are collected and processed at area recyclers. In 2010 the NIH Bethesda Campus recycled 5,611 tons of construction debris. This is a construction debris recycling rate of approximately 90%.

4.7.2.5.2 Recycling/Building Materials

The Master Plan recommends that all new construction provide sufficient loading dock spaces for roll-off containers to separate, compact, and store recyclable materials and provide rooms adjacent to the loading docks to further process recyclables and store related materials, as was provided in the construction of Buildings 45 and 49. Areas within the buildings to locate recycling collection containers should also be designated. The Master Plan also recommends that building materials used for new construction or renovation be selected with the following criteria in mind.

- increase the purchase of EPA–designated items with recyclable content, except when not available competitively at reasonable prices or that do not meet performance standards
- low energy consumption in manufacture or production of materials
- limited use of non-renewable resources

- energy conservation characteristics of the material or application selected;
- life-cycle cost and maintenance characteristics of material or application selected that reduce energy consumption for the planned building
- all building related goals established in Executive Orders 13514 and 13423, "Greening the Government through Leadership in Environmental Management"

4.8 Historical and Archeological Features

NIH acknowledges its responsibilities under Section 110 of the National Historic Preservation Act to identify and evaluate buildings that are over 50 years of age. NIH has been working and will continue to work in conjunction with the Maryland Historical Trust (MHT) and the Maryland State Historic Preservation Office (SHPO) to determine which resources on the NIH campus are eligible for listing in the "National Register of Historic Places" as either individual resources or as contributing elements to a larger historic district. NIH's historic properties and archaeological sensitive sites are depicted in Exhibit 4.8.A.

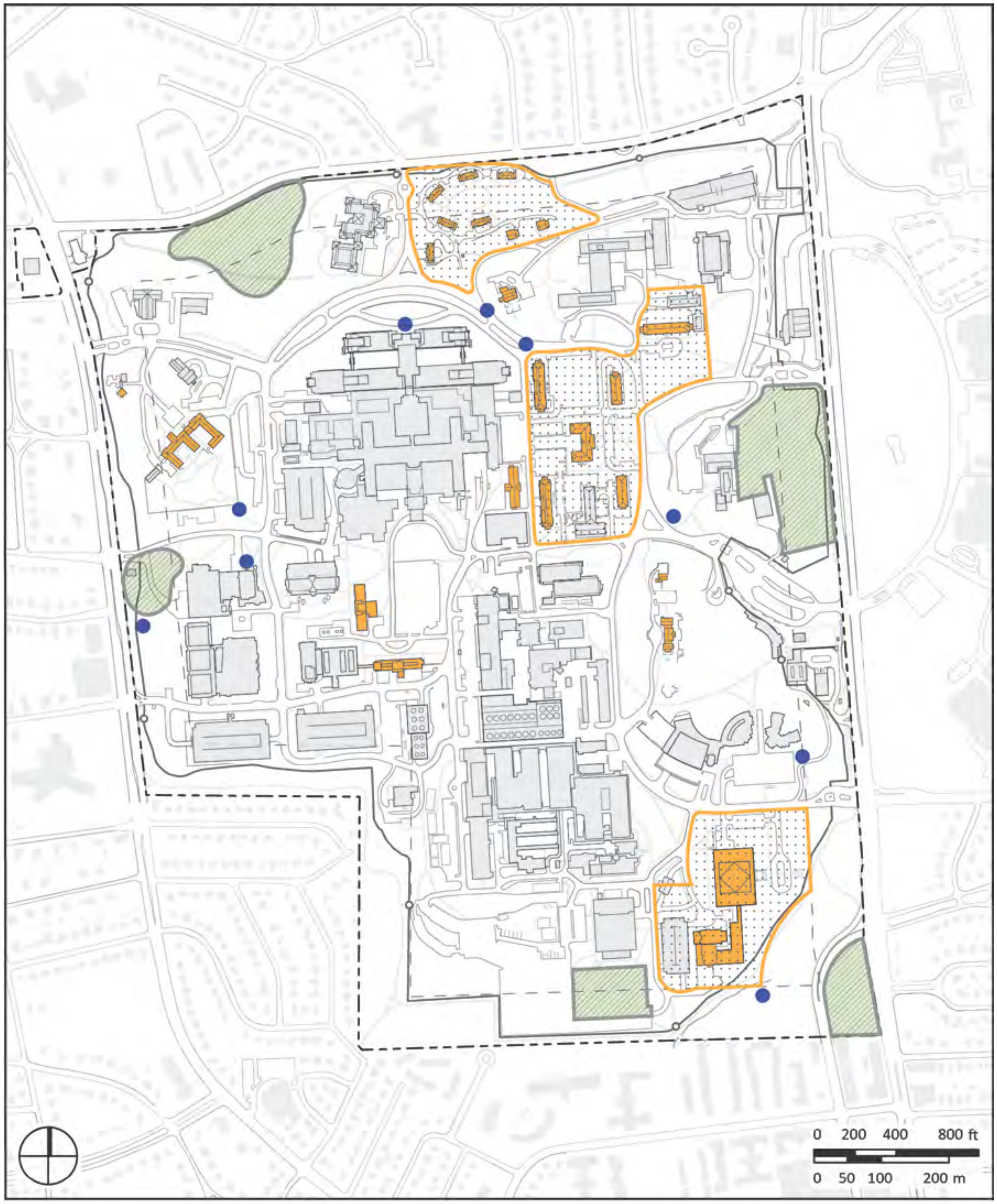
4.8.1 NIH Historic Preservation Planning and Management

NIH has had a historic preservation plan since 1993. The current plan titled "Historic Preservation Narrative and Listing of Architectural Attributes for NIH, Bethesda Campus"[15] was developed in May 1997 and last updated July 2004. It described all properties that were eligible for listing in the National Register for Historic Places at that time.

NCPC requires all agencies within the National Capital Region to consult with the State Historic Preservation Officers (SHPO) when undertaking new construction. When new construction is proposed, NIH makes a determination of effect on historic property and prepares a "106-Report" to send to the SHPO. The buildings on the NIH Bethesda Campus that have been determined eligible for listing in the National Register for Historic Places include Building (x): 1, 2, 3, 4, 5, 6, 7, 15B1/15G2, 15H/15I, 15K, 16, 16A, 38 and 60.

NIH has executed several bilateral or trilateral Memorandums of Agreements (MOA) with the SHPO and the National Advisory Council on Historic Property to mitigate adverse effects on historic property. These MOAs include renovations on Buildings 2, 3 and 6 and the demolition of Building-15A and Building 7.

[15]Compiled by: Herring, Ricardo C., NIH, "Historic Preservation Narrative and Listings of Architectural Historic Attributes for NIH's Bethesda Campus.", May 1997



Eligible Historic Buildings

Evaluated Archaeological Sites

Eligible Historic Districts

Archaeologically Sensitive Sites

Exhibit 4.8.A. NIH Historic Properties and Archaeologically Sensitive Sites

4.8.2 Pre-NIH Properties

4.8.2.1 Building-60, the Convent of the Visitation

Building-60, The Convent of the Visitation is currently the Mary Woodard Lasker Center for Health, Research, and Education. It was constructed in 1922-23 as a self-sufficient, cloistered convent for the Roman Catholic "Order of the Sisters of the Visitation". Building-60 remained in use for its original purpose until 1982. Designed by A.B. Mullet and Company, with Marsh and Peter as associated architects, the building reflects Georgian Revival characteristics popular during its era of construction. Romanesque elements, strongly associated with ecclesiastical architecture, were used to articulate the chapel wing.

During the 1980s, the building was renovated for use as the "Mary Woodard Lasker Center for Health, Research, and Education". At that time, a residential addition was constructed and linked to the original portion of the building by a modern glass entrance area.

4.8.2.2 Building-15K, The Wilson Estate ("Tree Tops")

Building-15K, Tree Tops, is the last remaining building and principal residence of the Wilson Estate. The Wilson's, both members of prominent merchandising families, were responsible for the major donations of land in Bethesda to NIH. These donations of land were responsible for locating NIH on the site and changing the character of Bethesda from an area with large estates to a densely built area with a prominent medical community.

Predating NIH's occupation of the site, the Wilson Estate was constructed in 1926 to be the principal residence of Luke and Helen Woodward Wilson. Tree Tops is attributed to architect Edward Clarence Dean, and is a skillful blend of Tudor Revival and Craftsman elements. Other buildings (15A) that were a part of the Wilson Estate were removed in 1997 to make way for the CRC.

4.8.2.3 Building-16 and 16A, The George Freeland Peter Estate and Caretaker's Residence:

Constructed in 1930, the "Stone House" (originally known as the "Peter House") is currently used as the "Fogarty International Center" (Building-16). It is an excellent example of the Colonial Revival style designed by architect Walter G. Peter, brother of the original owner. The building exemplifies many of the qualities found in the large early twentieth-century estates that were constructed along Rockville Pike during that era. George Peter sold the estate to the federal government in 1949. The "Caretaker's Residence" (Building-16A), designed in the style of the main house, is also present on the site. The Montgomery

County Master Plan for Historic Preservation includes the property in its list of county landmarks.

4.8.3 The NIH Historic Core District

Buildings 1, 2, 3, 4, 5, and 6 are collectively contributing resources and have been determined eligible for listing in the National Register of Historic Places. Building-8 is also in the historic district, but it is not a contributing resource.

Building-1, the "Administration Building and Central Power Plant", Building-2, the "Industrial Hygiene Laboratory", and Building-3, the "Public Health Methods and Animal Unit Building" were completed in 1938. Buildings 1, 2, and 3 are the earliest buildings to be Congressionally authorized and constructed at NIH's Bethesda campus. Collectively with Buildings 4, 5, and 6, these buildings form the Historic District and are typical examples of the Georgian Revival style of architecture. In addition to their architectural merits, these buildings helped to establish NIH as one of the world's foremost biomedical research centers. Louis A. Simon (Supervising Architect of the US Treasury Department) designed the buildings, with J. Winthrop Wolcott, Jr., serving as the consulting architect. The George A. Fuller Company of Bethesda was responsible for their construction.

Building-6, "The National Cancer Institute" was constructed in 1939, just one year after Buildings 1, 2, and 3. Building-6 is a Georgian Revival building consistent with the earliest NIH buildings. Built to house the National Cancer Institute, Building-6 was believed to be one of few structures designed solely for research in a specialized field. Two additions have been made to Building-6. Building-6A was added to the east portion of the building in 1976. Building-6B was added to the north side of the building in 1988.

Building-4, "Institute of Experimental Biology and Medicine" and Building-5, the "Microbiological Institute" were constructed in 1941 as identical buildings. Constructed in the same Georgian Revival style previously used for Buildings 1, 2, and 3; building-4 was initially used as laboratory and research space. During1948 it became the primary location for the "Institute of Experimental Biology and Medicine". Other institutes housed in Building-4 have included the "National Institute of Dental Research", and the "National Institute of Arthritis and Metabolic Diseases" (which later became the National Institute of Arthritis, Diabetes, and Digestive and Kidney Diseases). Building-5 initially housed researchers in infectious diseases and was home to the "Microbiological Institute" (later renamed the "National Institute of Allergy and Infectious Diseases"). Because of the nature of this work, Building-5 was constructed with a sophisticated exhaust system that prevented the spread of infectious diseases from room to room within the building. The Charles H. Tompkins Company constructed Buildings 4 and 5.

4.8.4 Officer's Quarters Historic District

Buildings 15B1/15G2 and 15H/15I, the "Officers' Quarters" are contributing resources within the Officer's Quarters Historic District and are eligible for listing in the National Register of Historic Places. The Quarters are a collection of eight red-brick Georgian Revival duplexes and detached houses constructed in 1940 to serve as housing for junior officers so that they would be on the NIH site at all times. There are two large single family homes for Flag Officers (the US Surgeon General and the Director of NIH). These houses are contributing resources to the historic district. The Officers' Quarters historic district is an excellent example of the "Radburn" principle of planning with residences sited around a common green. Constructed in a wooded area with gently sloping topography the Quarters are linked together via a series of walking paths. Louis Simon served as the architect for the buildings. The Charles H. Tompkins Company was awarded the construction contract.

4.8.5 Building-7, Memorial Laboratory

Completed in 1946, Building-7 was originally known as "Memorial Laboratory" to honor scientists who had died while researching dangerous diseases. Building-7 represents a break in the traditional use of the Georgian Revival style of architecture at NIH. Although it retains elements of the style, such as massing and materials, the distinguishing characteristics of Building-7 are its architectural planning and engineering details relating to its use as a state-of-the-art laboratory with the mission of providing a safe working environment for scientists engaged in highly dangerous research. Among its sophisticated features is an advanced air-flow system that insures the decontamination of exhaust to the outside of the building, the installation of rooms of various levels of germ decontamination, and triple-sealed windows with exterior shades to avoid the collection of dust on the interior of the building. All of these features were in use to insure the proper handling of potentially infectious diseases.

4.8.6 Building-38,The National Library of Medicine

The "National Library of Medicine", which houses one of the world's largest collections of medical literature, has been determined eligible for listing in the National Register of Historic Places. Although the Library was constructed in 1962 and has not yet reached 50 years of age (a period of time that is generally necessary for a building to be evaluated in the greater historic context of its time), the Library displays several areas of exceptional architectural significance. Concerns relating to the threat of nuclear war influenced the choice of a location outside of downtown Washington for the National Library of Medicine, as well as the design features thought to protect the building from an atomic bomb blast. Three of its five stories are below grade and its distinctive hyperbolic parabolic roof shape was thought to dissipate the potential effects of a blast. Additionally, many progressive features of library design were incorporated into the interior planning of the building in an attempt to manage the extensive holdings of the Library. The New York firm of Robert B. O'Connor and Walter H. Kilham was the architects for the building, with Dr. Keyes Metcalf serving as the library consultant for the project. The structural engineering firm of Severud, Elstad and Krueger, one of the preeminent authorities on bomb-blast-proof construction, served as engineers for the structural design of the Library.

4.8.7 Building 29 Center for Biologics Evaluation and Research (Biologics Laboratory)

Built in 1960 for the National Institutes of Health, Building 29, originally called the Biologics Laboratory Building, is nationally significant to the history of science under Criterion A because within its research laboratories scientific investigators successfully applied biomedical research principles and techniques to conquer some of the most crippling infectious diseases that had for centuries scourged populations in this nation and elsewhere. Leading this public health crusade were stalwart civil servants and renowned research doctors. Some of the nation's Illustrious scientists who worked in this building's laboratories, first for the US National Institutes of Health and later for the US Food and Drug Administration read like a who's who of twentieth century science, Margaret Pitman, Ruth Kirschstein, Harry Meyer, Jr. Paul Parker, and Kathryn Zoon. Because of its direct association with the important findings of these individuals, this building also qualifies for listing in the National Register also under Criterion B.

4.8.8 Building 30 National Institute of Dental Research

Constructed in 1961 for the National Institute of Dental Research (NIDR), Building 30 is nationally significant to the history of medicine and public health under Criterion A because within its research laboratories scientists conducted seminal investigations that catapulted sweeping advances and new technologies that have propelled the practice of dentistry and dental sciences into the mainstream of biomedical research. Research into the effects of fluoridation of the public water supply, consistently noted as one of the most important public health achievements of the 20th century, was conducted by NIDR in the Building 30 laboratories. Pioneering NIDR scientists like H. Trendley Dean, Francis A. Arnold, Seymour Keshover, Ron Dubner, Abner Notkins and Harold Slavkin led laboratories that clarified the causes and nature of complex diseases such as dental caries, physical and sensory pain, herpes simplex virus type 1, oral cancer and periodontal diseases studies. Because of Building 30's direct association with the important findings of these individuals, this building also qualifies for listing in the National Register also under Criterion B.

4.8.9 Building 38A Lister Hill

The Lister Hill National Center for Biomedical Communications, an integral component of the National Library of Medicine (1962, National Historic Landmark eligible), was constructed in 1981 with the specific purpose of facilitating the international dissemination of biomedical information and imagery by employing state of the art engineering, audiovisual, computer and interactive communication technology. Planned by the same architects as the adjoining NLM and executed in similar materials as a distinctly complementary composition with a linking courtyard and adjacent structured parking facility, this complex is nationally significant under National Register criterion A and C.

4.8.10 Archeological Sites

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.

Nearly the entire campus surface has been disturbed by NIH and prior occupants. Prior site use includes crop farming, residential estates, a convent, and a golf course. Much of the central portion of the campus is located on the filled-in valley of the NIH Stream with the stream running as deep as 35 feet below the surface. Archeological field investigations, which at least include Phase-I surveys, have been conducted at eight sites on the Bethesda campus. None are eligible for listing on the National Register of Historic Places.

Four areas of the campus have been designated as "archeologically sensitive" areas, in that they have not been investigated or assessed. The largest of these occur in undisturbed areas at the periphery of the campus. If development is proposed for these areas, appropriate survey measures will need to be taken. The eight recorded archeological sites and four archeological sensitive areas have been identified.

4.9 Built Environment

4.9.1 Building Patterns

Buildings on the NIH Bethesda Campus are laid out predominantly on an orthogonal grid, which is derived from the formal quadrangle created by the original buildings (Buildings 1-6). A few structures do not conform to the grid, including the "Convent Building" (Building-60,whose construction predates the NIH Bethesda Campus), the William H. Natcher Building (Building-45, which responds to the curve of Center Drive), the residential buildings at the north end of the campus, the "East Child Care Facility" (Building-64) and the "Visitors Center" (Building-66) along Rockville Pike, and the Fire Station (Building-51 in the northwest corner campus). Building patterns on the NIH site do not relate to building patterns of the surrounding area.

While there is no formal concept which relates all campus buildings to each other (such as a central lawn or mall), buildings on campus tend to be organized in clusters. These groups of buildings are related by formal spatial structure, shared open space, or common uses. Due to its very large scale, the Clinical Center Complex is considered a building group.

Within the overall structure of the grid there are important axes, which relate to significant buildings. These include the axial relationship between the Central Administration Building (Building-1) and the tower of the WRNMMC across Rockville Pike, the orthogonal relationship of the buildings within the historic core (Buildings 1-6), the axis created by the symmetrical composition of the original Clinical Center (Building-10, particularly toward the southern part of the campus), and the panoramic view from the Stone House (Building-16) over the entire campus.

4.9.2 Landscape Pattern

The existing site landscape patterns are shown in Exhibit 4.9.A. At the macro scale the campus landscape falls into two distinct categories: the "Landscape Dominant Zone" of the perimeter of the campus and the "Building Dominant Zone" of the interior.

The Landscape Dominant Zone is characterized by natural rolling topography and mature woodland cover of varied age and density. The buildings that are set within this zone are generally "visually absorbed" by the landscape. The campus's four corners, which distinguish themselves from each other and from the interior landscape, anchor the Landscape Dominate Zone. In the northeast area of the site the NIH Stream create a quiet, picturesque setting. In the southeast corner, open landscape, rolling turf, and groupings of mature trees allow open vistas into the campus. The southwest corner provides a commanding site on high ground with long views to the north from the adjacent public "Trolley Trial". Its aged, gnarled sycamores and continuous sweep of lawn create a classic park-like setting. The northwest corner is dominated by an impressive woodland stand of mature tulip poplars trees.

The Building Dominant Zone on the interior of the campus is characterized by terraced topography and planted landscapes typified by street trees, parking lot plantings, and defined ornamental plantings for walkways, sitting areas and building entrances.

4.9.3 Places and Open Spaces

There are relatively few identifiable "outdoor places" on campus as such. Much of the open space on the campus is "residual" in nature with the design emphasis placed on buildings as objects in the landscape rather than the design focus on the formal spatial sequence between buildings. Where spatially well-defined outdoor places exist on campus, they usually form a relationship to a significant building, building entrance or building cluster.

4.9.4 Building Heights

Building heights on campus range from 15-feet± one-story structures, such as the Animal Facility Complex (Buildings 14, 18 and 32T), to 200-feet± of the Clinical Center Complex. As a general pattern depicted in Exhibit 4.9.B, lower buildings (0-35 feet in height) are located at the perimeter of the campus, while medium height buildings (35-100 feet) occupy the center of the site. The taller of these medium height buildings include Buildings 37 and 49, Building-11, and Building 45.

Because the site has such varied topography, building heights in relation to site elevation can be an important factor in the perception of building masses. Low buildings occupy most hilltop sites on campus. Many buildings in the center of the campus are not highly visible from outside areas because they are at lower elevations than the perimeter landscaping, while structures on the western edge of the site (research Buildings 35 (PNRC), 36, 37, and 49) appear to be taller from inside the campus because of their higher topographical elevations.

Exhibit 4.9.A. Existing Landscape Character

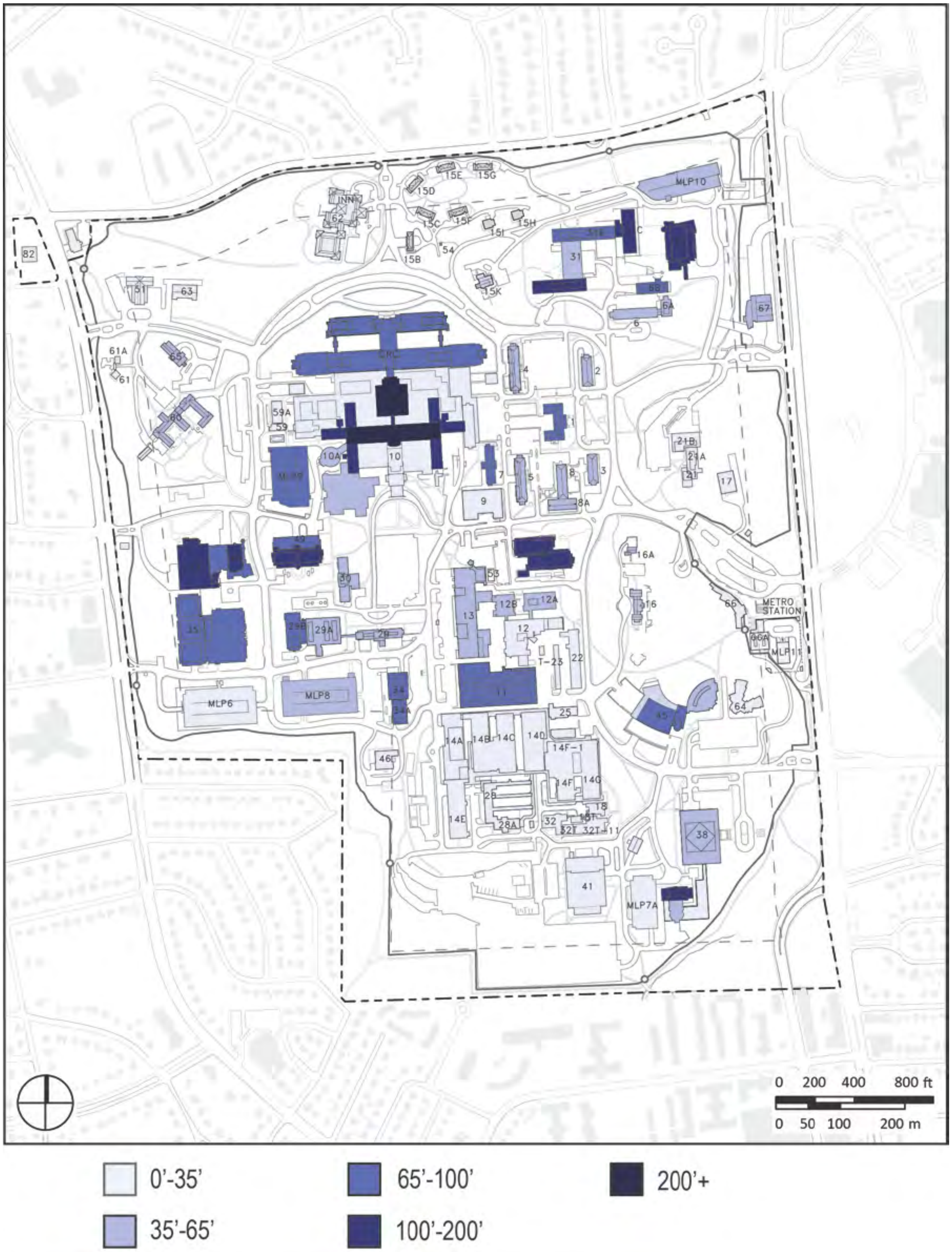


Exhibit 4.9.B. Existing Building Heights

4.9.5 Views and Prominent Features

Manmade prominent features are structures which act as landmarks because of their height, size, age, or location. The most prominent structure is the Clinical Center Complex. Other significant buildings include the “Convent Building” (Building-60), the “Stone House” (Building-16), the “Lister Hill National Center” (Building-38A), the “General Office Building” (Building-31), “Central Administration” (Building-1), the “William H. Natcher Building” (Building-45), and the “National Library of Medicine” (Building-38). The “National Library of Medicine” is the most prominent campus building visible from outside the site.

An analysis of views around the site is shown in Exhibit 4.9.C. It illustrates that most views into the center of campus from surrounding streets and neighborhoods are blocked by topography and landscape. Major views into the site tend to occur at the corners of the campus, at the “Porter Neuroscience Research Center” (Building-35), on the Old Georgetown Road side, and along the south edge of the site. Axial views are created between the Central Administration Building (Building-1) and the tower of the WRNMMC, and to the Clinical Center Complex primarily from the south end of the campus. There are also panoramic vistas over the entire campus from the elevated areas in front of Building-16, Building-38A/41 and behind Building-60.

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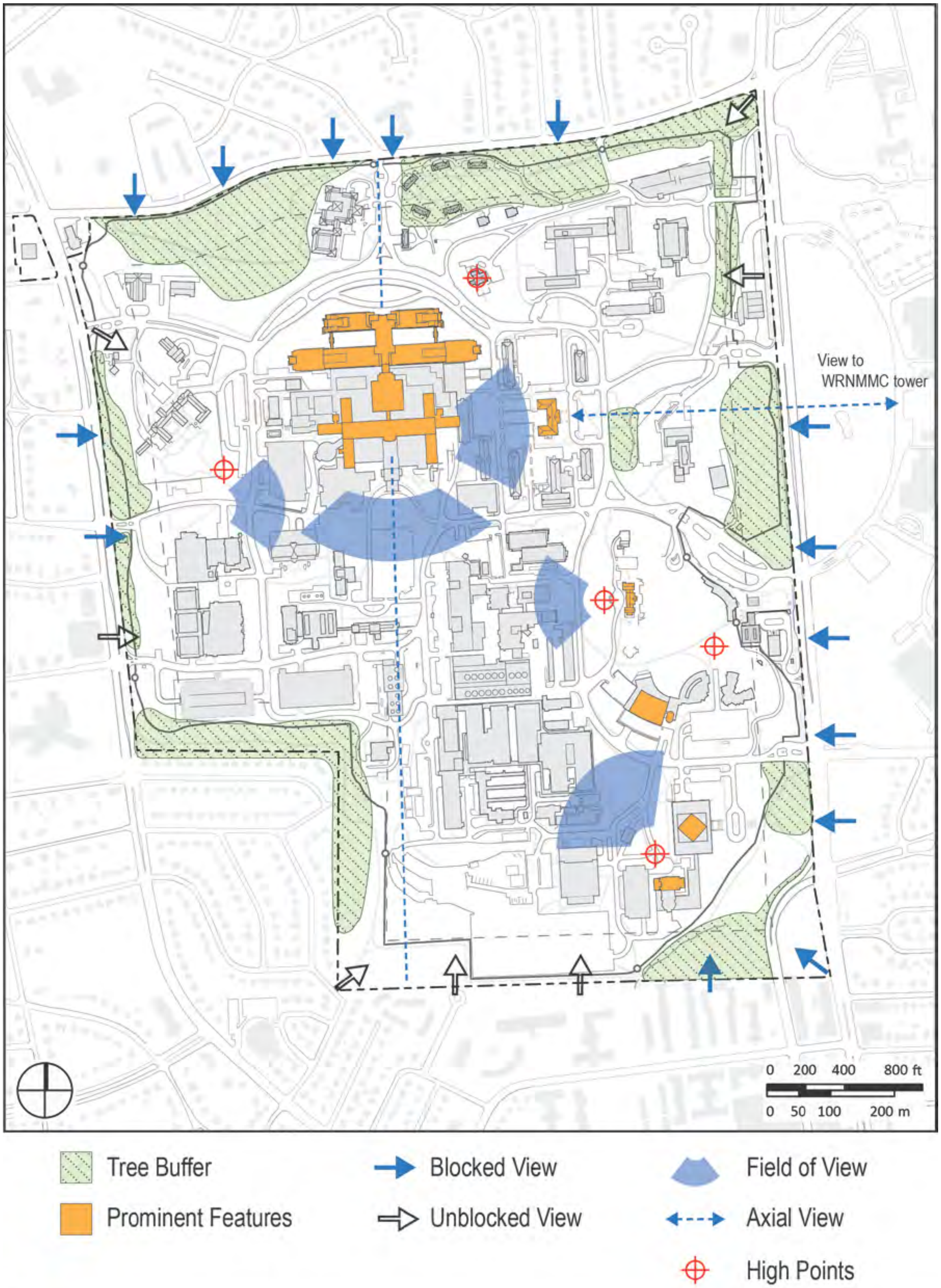

Exhibit 4.9.C. Existing Views and Prominent Features

4.9.6 Architectural Style and Character

The architectural style and character of the Bethesda campus buildings reflects the time of their design and construction. The campus has evolved over a 75-year period of time when many varied architectural styles were employed in the design of public buildings. As a result, there is no unifying architectural theme for the Bethesda Campus. Several of the older buildings have additions that vary in context in relation to their original architecture. However, it should be noted that they reflect the style that was popular at the time of their construction. The buildings are described below and building styles are summarized in Exhibit 4.9.F at the end of this section.

4.9.6.1 Pre NIH (1922 to 1930)[16]

There are four pre-NIH structures on the NIH Bethesda Campus. In chronological construction date they are: Buildings 60, 15K, 16 and 16A. All of these buildings are eligible for listing in the National Register for Historic Places.

4.9.6.1.1 "Convent of the Sisters of the Visitation" (Building-60)

The original Convent of the Sisters of Visitation was constructed in 1922-23 as a cloistered convent for the Roman Catholic Order of the Sisters of the Visitation. The Convent is an example of Neo-Georgian architecture that was popular in the 1920s and 1930s. Romanesque elements, which have clear associations with the Roman Catholic Church architecture; were used to articulate the chapel wing to differentiate it from the less sacred areas of the Convent. The building was designed by A.B. Mullet and Company in association with Marsh and Peter.

The original Convent is a 2½ story building with a raised basement consisting of approximately 43,000 gsf. In 1984 a major addition was constructed to house the Mary Woodward Lasker Center for Health Research and Education. The convent now consists of 67,500 gsf. The addition was designed to be sympathetic to the original Convent in material, massing and scale.

4.9.6.1.2 "Tree Tops" (Building-15K)

Tree Tops is the only remaining building of the Wilson Estate. It was constructed in 1926. Tree Tops is an 11,670 gsf, 2-½ story residence. It is a brick masonry structure with a

[16] Herring, Ricardo C., Historic Preservation Narrative and Listing of Historic Architectural Attributes for NIH's Bethesda Campus, May 1993, Updated July 2004

stucco exterior finish decorated in stone, brick and half timbers, configured in an L-shaped plan. The house features long steep gable roofs, and multi-pane casement windows. The architectural features are reminiscent of English Gothic (Tudor) vernacular. The architect was Edward Clarence Dean. The building is currently used for administrative functions.

4.9.6.1.3 "Stone House" (Building-16 and Building-16A)

The Stone House is a 17,480 gsf, two-story (with basement and attic) former residence designed by Walter Gibson Peter. Built in 1930 in the Colonial Revival Style, the house is typical of the estates that were constructed along Rockville Pike during that period. It is a masonry and steel structure with wood framed partitions. The exterior of the house is un-coursed ashlar blocks of locally quarried blue-stone, with corner quoins and wood trim. The house features steep slate roofs that are accented with pediment dormers. The building is currently used for biomedical research education.

4.9.6.2 Georgian Revival Period (1938 to 1947)[17]

The original Georgian Revival "Historic Core" is located in the heart of the NIH campus. The Historic Core consists of Buildings 1, 2, 3, 4, 5, and 6. All of these buildings have been determined eligible for listing in the National Register for Historic Places. Buildings 1, 2, and 3 are the original NIH buildings that were constructed in 1938. Building-6 was completed in 1939 and Buildings 4 and 5 were completed in 1941.

The Georgian Revival vernacular is carried throughout the Historic Core of the campus. Notable design features includes the use of a dominant full-height portico supported by Ionic columns (Building-1) and paired, double-end chimneys (Buildings 2, 3, 4, and 5). The building façades are strongly symmetrical, balanced beneath slate hip-roofs.

The focus of the Historic Core is Building 1 (which was originally called the Administration and Power Plant Building). It is flanked by Building 2 (originally called the Industrial Hygiene Laboratory) and Building 3 (originally called the Public Health Methods and Animal Unit Building). Buildings 4 and 5 are located west of Buildings 2 and 3 and complete the symmetrical Historic Core composition. Building-6, though separated from the main group by Center Drive, is still linked visually to the Historic Core by the Original NIH Architectural Order.

[17] Ibid

All of the original NIH buildings have the following architectural characteristics: hip-dormers, boxed-cornices with dental molding, Ionic capitals, brick jack-arch window heads, brick pilasters, cut-stone window sills, first floor windows recessed in a shallow arch, wrought-iron railings, and a limestone belt-course or water-table.[18] The Original NIH Architectural Order is depicted in Exhibit 4.9.D.

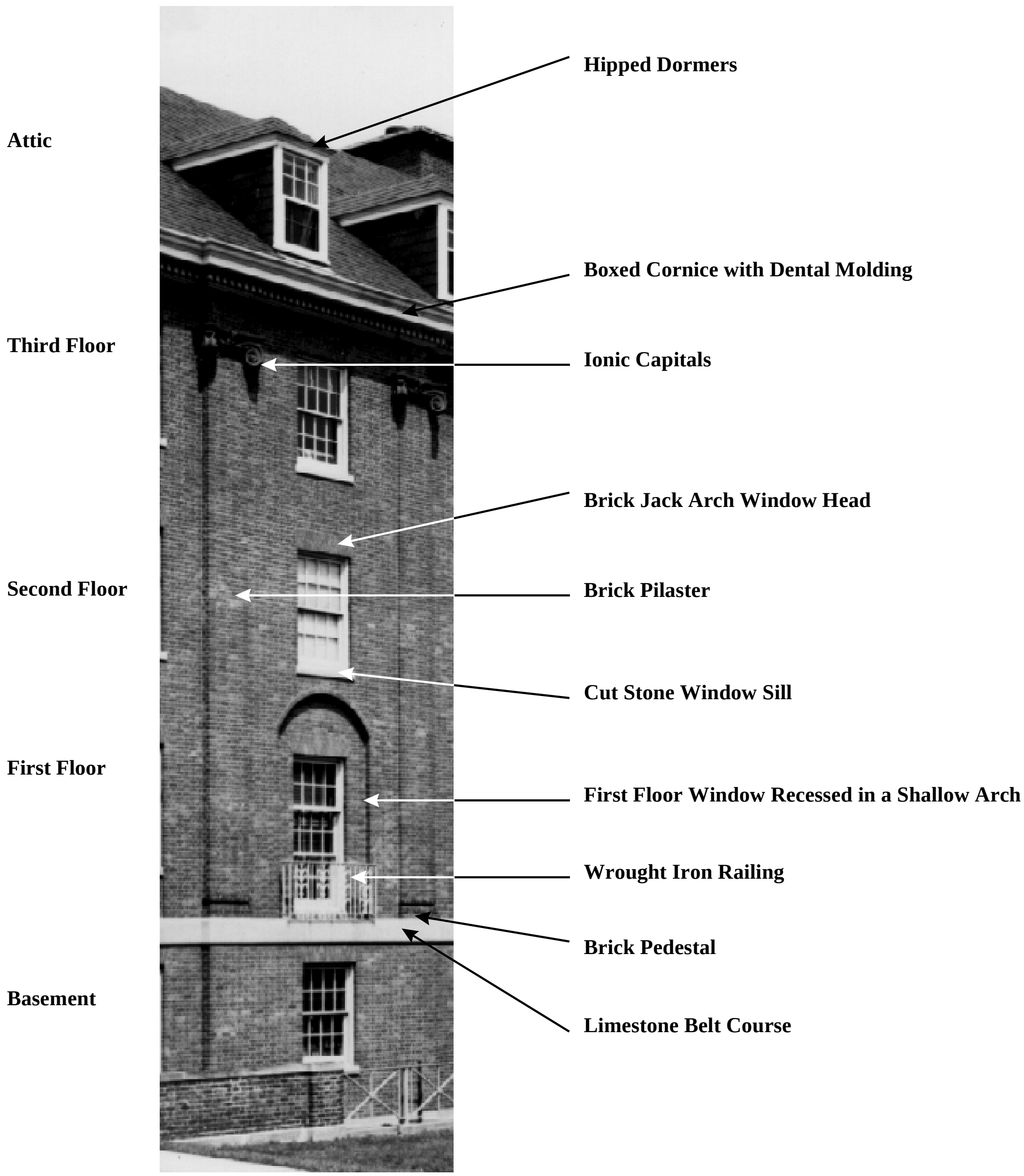

Exhibit 4.9.D. NIH Architectural Order

[18] Ibid

4.9.6.2.1 Building 1,2,3,4 and 5

Building-1 (1938), Building-2 (1938), Building-3 (1939), Building-4 (1941), Building-5 (1941), Building 6 (1938) are all Georgian Revival building designed by the US Department of the Treasury's Office of the Supervising Architect (Louis A. Simon, Supervising Architect).

- Building 1 is a three story building with attic, basement, and two sub-basements consisting of 95,948 gsf. Currently the building is used for administrative functions.
- Building-2 is a three-story building with attic, basement and sub-basement consisting of 47,979 gsf. Currently the building is used for administrative functions.
- Building-3 is a three-story building with attic, basement and sub-basement consisting of 48,860 gsf. Currently the building is under renovation and will be used for administrative functions.
- Building-4 is a three-story building with attic, basement and sub-basement consisting of 103,157 gsf. The building is currently used for biomedical research laboratory functions.
- Building-5 is a three-story building with attic, basement and sub-basement consisting of 103,157 gsf. The building is currently used for biomedical research laboratory functions.
- Building-6 is a three story building with attic, basement and sub-basement consisting of 84,347 gsf. The building is currently used for biomedical research laboratory functions.

4.9.6.2.2 Building-7

Building-7 is a transition between Georgian Revival and modern architecture. It was design by the Public Building Administration and constructed in 1946. Building 7 may be the first containment laboratory in the United States. Because of disease prevention concerns the laboratory design was not suitable for a pure Georgian Revival Building. It is a 3-story building with raised basement consisting of 48,460 gsf. The building is currently vacant and has been decontaminated. NIH has executed a Memorandums of Agreements (MOA) with the Maryland Historic Trust and the National Advisory Council on Historic Property to mitigate adverse effects of the demolition of this historic property. Funding is currently being sought for demolition.

4.9.6.2.3 Building-8 and Building-8A

Constructed in 1946, Building-8 is a 3-story building with a basement consisting of 35,200 gsf. The building is used for biomedical research laboratories. In the 1980's the entire building was modernized to create state-of-the-art laboratories. This modernization program renovated the interior and altered the exterior. Two additional floors of research space were added along with a major addition (Building-8A). The floor additions to Building-8 are sympathetic to the design of the other buildings within Historic Core. The major architectural vernacular of the Building-8A addition is not in keeping with Georgian Revival style. However the building's scale is in keeping with the Historic Core.

4.9.6.2.4 Building-9[19]

Building-9 is a one-story (with basement) 32,500 gsf, masonry load-bearing structure. It was constructed in 1943 for small animal breeding for the institutes. It is a very simple utilitarian design.

4.9.6.2.5 Officers' Quarters

Officers' Quarters Buildings 15 B1 through 15 G2 are located near the north boundary of NIH and are grouped in a semi-ellipse around Zelkova Lane. They were designed by US Department of the Treasury's Office of the Supervising Architect (Louis A. Simon Supervising Architect). The design of these identical duplex homes complements the established NIH Georgian Revival architectural vernacular and is a typical mid-twentieth-century suburban house type. They each are 8,065 gsf, two-story brick buildings with basements and attics that are rectilinear in plan, and symmetrical in form.

4.9.6.3 Modern Architecture

Modern architecture is characterized by simplification of form and the creation of ornament from the structure and theme of the building. Buildings 10, 11, 12, 13, 14, 21, 22, 28, 29, 30, 31, and 38 (The National Library of Medicine) were designed by the US General Services Administration in the "modern" architecture style.

4.9.6.3.1 Building-10[20]

The Warren G. Magnuson Clinical Center (Building-10) is a 14-story building (with a basement and sub-basement). The original 1,246,837 gsf Clinical Center was designed by

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[19] NIH, N.I.H. Buildings and Ground Manual Vol. 1, August, 1 1959

[20] Herring, Ricardo C., NIH Historic Resources Form for Clinical Center, NIH, January 1996

the US General Services Administration. Construction was completed in 1953. Since 1953, Building-10 has had 11 major additions and currently consists of 3,142,583 gsf, (about 250 percent larger than the original structure). Building-10 is the largest and most imposing structure on the NIH campus.

The plan of Building-10 (depicted in Exhibit 4.9.E) is an “H-plan” composed of a central spine and flanking wings typical of institutional architecture popular at the end of World War II to the late 1950's. This type of plan lends itself to flexibility and expansion. The axis of the building’s “central-spine” is from east to west. The central-spine is 14-stories high from the ground level and measures 780 feet x 84 feet. Branching from the central-spine are six wings ranging in height from 5 to 11-stories. The central-spine is divided lengthwise into three functional areas separated by two corridors. The patient rooms were on the south, nursing services in the middle, and clinical investigation laboratories on the north. The plan envisions two patient care-units per floor. These care-units were separated by a waiting room and solarium. On the first floor of the Clinical Center there is an auditorium, administrative offices, and other essential support facilities and services.

4.9.6.3.2 Surgical Addition

The surgical wing is a four-story addition with a basement. It was completed in 1961 (45,000 gsf). The addition is a modern style reinforced concrete-frame structure with a glass and porcelain-enameled steel curtain-wall exterior[21]. The surgical wing is no longer utilized as originally intended. It has since been adapted and reused as an animal holding facility since 1989.

4.9.6.3.3 Library, Cafeteria and G-Wing Addition

The library is a single story addition with a basement and sub-basement. The cafeteria is expanded at the basement level, but can be seen on the south façade. The G-Wing is a two-story addition on top of the existing four-story G-Wing. These 102,000 gsf additions were completed in 1966 and in keeping with the modern style.

[21]NIH Record, New Building Taking Shape Rapidly, NIH, September 13, 1960

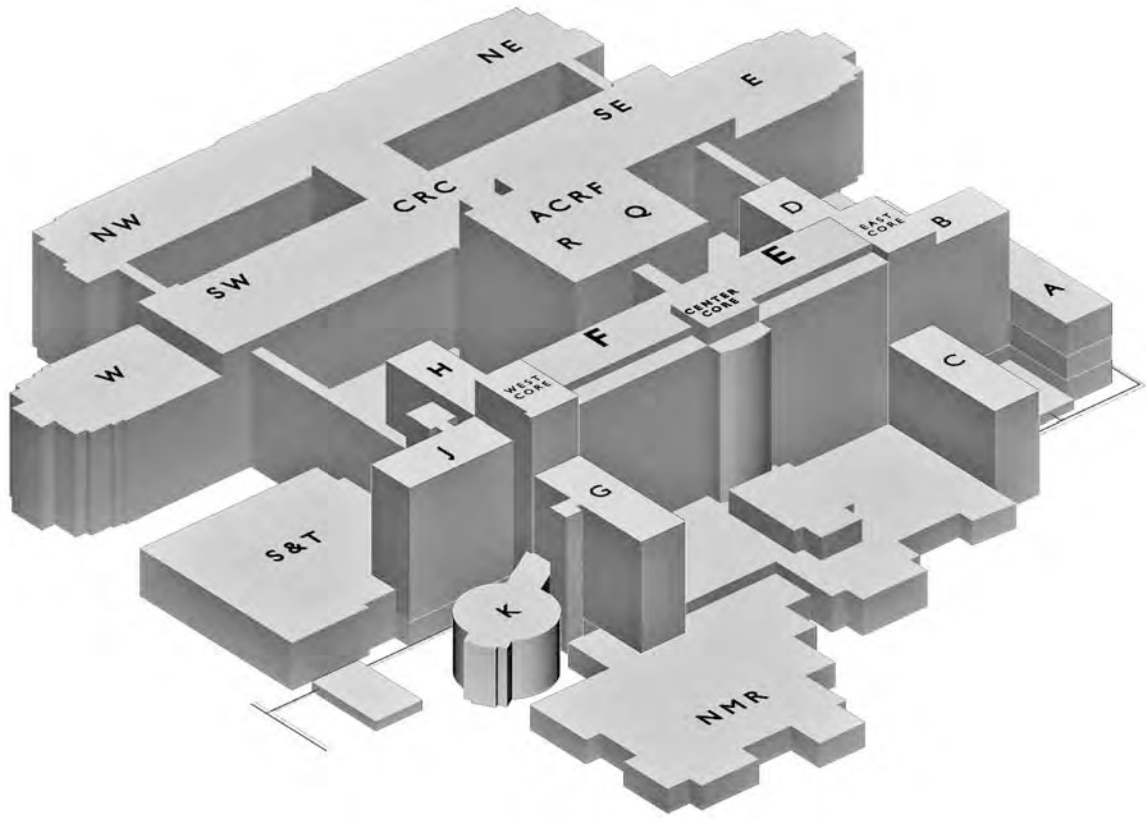

Exhibit 4.9.E. Clinical Center Complex

4.9.6.3.4 Second G-Wing and Elevator Tower Addition

The second G-Wing addition is a three-story construction on top of the earlier 1966 addition. The elevator tower runs the entire height of the building. These additions were completed in 1972 and totaled 28,000 gsf. The elevator tower is a brick utilitarian structure located at the intersection of J and H-wings.

4.9.6.3.5 Radiation Oncology Addition

Radiation Oncology is a 38,000 gsf underground addition located on the south side of the Clinical Center. Parts of the Radiation Oncology addition protrude at the surface to connect to the C wing of the Clinical Center and stair tower for egress purposes. The architectural style is modern, typical of the local architectural styles popular during the 1970's.

4.9.6.3.6 Cyclotron Addition

Constructed in 1982, the Cyclotron is an underground 10,000 gsf addition constructed on the north side of Building 10. The facility houses instrumentation for nuclear medical research.

4.9.6.3.7 NMR Research Center Phase-I

Completed in 1986 the NMR Research Center Phase-I is an 11,000 gsf one-story addition on the south side of the Clinical Center. The NMR Research Center is a steel-framed structure with a brick exterior. The purpose of the facility is to house large magnets for biomedical imaging research.

4.9.6.3.8 Surgery/Transfusion Medicine

The 37,000 gsf Surgery/Transfusion Medicine addition is a two-story addition on the west side of the Clinical Center. It was constructed in 1990. The Surgery/Transfusion Medicine addition is a concrete-frame structure with a brick exterior. The purpose of this facility is state-of-the art surgical procedures such as gene therapy and blood aspect.

4.9.6.3.9 NMR Research Center, Phase-II

The NMR Research Center, Phase II is a one-story addition on the south side of the ACRF contiguous with the NMR Phase-I addition. It was completed in 1991 (10,000 gsf). The NMR Research Center is a steel-framed structure with a brick exterior. The architectural character is utilitarian. The purpose of the facility is to house large magnets for imaging research.

4.9.6.3.10 Building-11

The NIH Power Plant is a modern four-story reinforced concrete-frame building with a basement and mezzanine consisting of 150,000 gsf at the time of construction. The exterior material is brick with metal trim. The building was completed in 1954.

4.9.6.3.11 Building-12

Building-12 is a modern one-story reinforced concrete-frame building with a basement (52,140 gsf at the time of construction). The exterior material is brick with cut-stone trim. Building-12 was constructed in 1950 to provide maintenance, overhaul, and storage facilities for NIH vehicles, and to provide general storage space. A major portion of the building has been converted to office and machine space for data processing and computer operations.

Over the years there have been two major additions to Building-12. They are Buildings 12A and 12B. Building-12A, constructed in 1965 (72,309 gsf) was authorized to permit expansion of data processing and computer operations. Building-12B was constructed in the 1980's (33,027 gsf) and is used for administrative space, cafeteria and snack bar.

4.9.6.3.12 Building-13

Building-13 is a modern three story reinforced concrete-frame building with a basement (52,140 gsf at the time of construction). The exterior material is brick with cut-stone trim. A small addition was constructed on the northeast side of the building to house a passenger elevator and elevator lobbies on each floor.

Building-13 was originally constructed in 1952 to house the shops for maintenance and repair, warehouse storage (including refrigerated food storage), scientific apparatus manufacturing, and laundry and dry cleaning. Today it houses administrative functions, warehouse for construction and maintenance supplies, and biomedical engineering (scientific apparatus manufacturing). The entire basement, second floor and third floors have been significantly altered over the years.

4.9.6.3.13 Building-14 Complex

Buildings 14A through D were constructed in 1953 to provide housing and breeding holding space for small animals, storage of animal food and bedding, and cage washing/sterilization. In 1953, Building-14E was constructed to house monkeys for polio research. Building-14A is an 81,210 gsf, two story structure with a basement. Buildings 14B thru E are one-story structures which contain a total of 109,165 gsf.

Building-14 F and 14G were designed by the US General Service Administration and constructed in 1957. 14 F is a one-story, 32,975 gsf building. 14G is a one-story, 26,376 gsf building. Building-14 H was constructed in 1982. It is a 10,184 gsf, one-story building with partial basement. These buildings are currently used for animal research functions

4.9.6.3.14 Building-21

Building-21 was constructed to provide segregated working area for the use of radio-isotopes. Constructed in December 1949, it is a one-story reinforced concrete and steel-frame structure with a structural brick exterior (10,825 gsf). Today Building-21 has an addition (21N), that has increased the total size of Building-21 to 36,123 gsf. It is used as a mixed-waste transfer station with research space for the Division of Radiation Safety.

4.9.6.3.15 Building-22

Building-22 was constructed to house Grounds Maintenance staff and equipment. Constructed in September 1952, it is a one-story steel-frame structure with a structural brick exterior (15,810 gsf).

4.9.6.3.16 Building-25

Building-25 was constructed in 1953 for chemical storage. It is a one-story reinforced concrete structure with a structural brick exterior including precast concrete (5,329 gsf).

4.9.6.3.17 Building-28 Complex

Building-28 is a one-story reinforced concrete structure with a structural brick exterior (8,652 gsf). It was constructed in 1954. Wing-28A, 28B, 28C and 28D total 17,849 gsf. They are all one-story masonry load-bearing structures with a structural brick exterior. Wing-28B was constructed in 1954. Wings 28A, 28C and 28D were constructed in 1958. The Building 28 Complex was constructed to house the dog kennels and animal support space including operating rooms and procedure space.

4.9.6.3.18 Building-29

Building 29 was constructed in 1959. It consists of five-stories with two basement levels housing biological research laboratories, support space and offices (90,000 gsf). Building-29 is a concrete frame structure with brick masonry exterior and punched-windows. The building is used for biomedical research laboratories.

4.9.6.3.19 Building-29A

Building-29A was constructed in 1963. It is a three-story structure with a full basement level (106,694 gsf. Floors one, two and three contain research laboratories and lab office space. The basement contains support space, including an animal facility, freezer farms, and two mechanical spaces. Building-29A is connected to Building-29 via a pedestrian bridge and to Building-29B through corridors at each level. The basement levels of all three buildings are also interconnected. A loading dock addition serving both 29A and 29B was added to the south side of 29A in the mid-1990s.

4.9.6.3.20 Building-30

Building 30 was constructed in 1961. It is a five-story building with basement (110,241 gsf). The building is concrete frame structure with a brick exterior. The building is currently used for biomedical research laboratory functions[22]. A cage-wash and animal research addition was added in 1998.

4.9.6.3.21 Building-38, The National Library of Medicine[23]

Building 38 was constructed in 1954. It is a two–story limestone faced structure with three levels underground (234,555 gsf). The main elevation faces east, over an expanse of lawn, toward Rockville Pike. It is seven bays wide, with a central entrance bay. Each bay consists of twenty-five sheer limestone blocks, which are set off in a grid-like format by narrow limestone borders. This subtle patterning of the elevation provides some variation in the building's imposing appearance; as part of the design, these border stones are slightly recessed, "in such a way as to emphasize shadow lines."' Narrow vertical windows, located between each bay, punctuate the elevation every 42-feet. The building's most distinctive feature is a concrete hyperbolic parabolic roof shell. The roof shell is elevated on four piers, providing space for bowed, multi-paned clerestory windows. Building 38 was designed to protect the nation's biomedical research library. The structure has been design to withstand a nuclear bomb blast. This building has been determined eligible for listing in the National Register for Historic Places.

4.9.6.3.22 Building-41

Building 41 was constructed in 1968[24]. It is a one-story building with interstitial space (138,270 gsf). The building is a concrete frame structure with a precast concrete panel exterior. The building is currently used for biomedical research laboratory functions.

4.9.6.3.23 Building-34

Building 34 was constructed in 1968[25]. It is a 25,867 gsf, one-story building with a brick and reinforced concrete exterior. The building was built as a district refrigeration plant. It is currently not in use but a study is underway for future renovation.

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[22] NIH Record, New Building Taking Shape Rapidly, NIH, September 13, 1960

[23] Herring, Ricardo C., Historic Preservation Narrative and Listing of Historic Architectural Attributes for NIH's Bethesda Campus, May 1993

[24] DuBois, Kathleen, Construction Projects Near Completion, 900,000 Square Feet of Space Added, NIH Record, April 16, 1968.

[25] Ibid

4.9.6.3.24 Building-18

Building 18 was constructed in 1976. It is a 5,176 gsf, one-story concrete frame structure with a brick exterior. The building is currently used for biomedical research laboratory functions.

4.9.6.3.25 Building-6A

A major laboratory addition (Building-6A) was added to the east side of Building-6 in 1976. Building-6A is a four-story building with a basement (24,641 gsf). The building is a reinforced concrete frame structure with a brick exterior currently used for biomedical research laboratory functions.

4.9.6.4 International Style

The International Style was a major architectural style that emerged in the 1920s and 1930s, the formative decades of Modernist Architecture. The focus of this style was on the stylistic aspects of Modernism.

4.9.6.4.1 Building-31

Building-31 was designed by the Washington, DC architectural firm Keyes, Lethbridge and Condon. Building-31 consists of three office blocks and a connector that houses office space for most Institute Directors, their immediate staffs, and NIH supporting central services including the cafeteria, convenience store and Recreation-Welfare store. The first wings, Buildings 31A and 31 B, were constructed in 1962. Building 31A is an 11-story building with basement (593,000 gsf). The building is a reinforced concrete frame structure with a precast concrete and brick exterior. The second wing, Building-31B, is a seven-story reinforced concrete frame structure with a curtain-wall exterior. The third wing, Building-31C is a nine-story building with basement. Constructed in 1968 the building is a reinforced concrete frame structure with a precast concrete exterior.

4.9.6.4.2 Building-37

Building 37 was designed by the Detroit architectural/engineering firm Smith, Hinchman and Grylls, constructed in 1968 and renovated in 2005. It is a six-story building with basement (322,677gsf). The building is a concrete frame structure with a precast concrete grid exterior, currently used for biomedical research laboratory functions.

4.9.6.4.3 MLP-6

MLP-6 is a four-level parking structure (31,134 gsf) constructed in 1969. The building is a reinforced concrete frame structure with a reinforced concrete exterior.

4.9.6.4.4 Building-38A Lister Hill Building

Building 38A was designed by J. Roy Carroll, Jr. & Partners and constructed in 1979. It is a 200,000 gsf, 10-story building with basement which connects to Building 38. The building is a concrete frame structure with a glass and limestone curtain-wall exterior. It is currently used for biomedical research education functions.

4.9.6.4.5 MLP-7

MLP-7 is a three-level parking structure (137,578 gsf) constructed in 1979. The building is a reinforced concrete frame structure with a reinforced concrete exterior.

4.9.6.4.6 Building-10, Ambulatory Care Research Facility (ACRF)

The Building 10 ACRF is a 15-story, 1,308,000 gsf addition to the Clinical Center for ambulatory care with three-levels of underground parking. The ACRF was completed in 1980. The addition is a reinforced concrete-frame structure with a black steel and glass exterior. A two-story brick base runs the entire length of the original Clinical Center with a black steel and glass cube sitting on top of it. The massing of the base and its fenestration is of monumental proportions.

The addition is constructed on the north side of Building 10 and is slightly larger than the original building. A new entry to the Clinical Center was created by this addition. The original integrity of the entry to the Clinical Center Complex was lost by the construction of the ACRF addition as well as many of the architectural features of the north side of the building.

4.9.6.4.7 Building 10 A-Wing Addition

The building 10 A wing addition is a four-story addition that sits on top of an existing four-story A-Wing. It was completed in 1992 and provided 56,000 gsf of laboratory space for research use. The addition is a steel-frame structure with a black steel and glass exterior.

4.9.6.5 Postmodern Architecture

Postmodern architecture began as a counterpoint to the formalism and sparse detailing of the International Style. It did not become a widely practiced design movement until the late 1970's. It continues to influence present-day architecture. Post modernity in architecture is generally thought to be heralded by the return of "wit, ornament and reference" to past architecture in response to the formalism of the International Style of modernism.

4.9.6.5.1 Building-6B

Building-6B is a Postmodern building design by AEPA Architects/Engineers and completed in 1990. It is a four-story building with basement and a sub-basement (58,816 gsf). The building is a concrete frame structure with a brick exterior. The laboratory building is currently used for biomedical research functions.

4.9.6.5.2 Building-65, "The Family Lodge"

A Postmodern building designed by Amy Weinstein, FAIA with LSY and constructed in 2005. It is a three-story building with basement (26,118 gsf). The building is a masonry load-bearing wall structure with a culture-stone exterior. The building features a double gable roof. The building is currently used for lodging functions for patients, relatives and friends

4.9.6.6 Contemporary Architecture

Contemporary architecture is, generally speaking, the architecture of the present time. The term contemporary architecture is also applied to a range of styles of recently built structures and space which are optimized for current use.

4.9.6.6.1 Building-62, "The Children's Inn"

Building 62 was designed by Robert Greenberg and constructed in 1990. It is a two-story building, 70,447.73 gsf masonry load-bearing structure with a stone and wood shingle exterior. The building features a mansard roof. It is used for lodging functions for pediatric patients and their families.

4.9.6.6.2 Building-49, "The Silvio Conte Building"

Building 49 was designed by TKLP (Phillip Chin, FAIA, design principal) and constructed in 1992. It is a six-story, 274,509 gsf building, with basement and sub-basement. The building is a reinforced concrete frame structure with a brick exterior. It features flat and barrel roofs. The laboratory building is used for biomedical research functions.

4.9.6.6.3 MLP-8

MLP-8 was designed by TKLP (Phillip Chin, FAIA, design principal) and constructed in 1993. It is a seven-level, 465,276 gsf parking structure. The building is a pre-stressed concrete frame structure with a reinforced concrete and brick exterior.

4.9.6.6.4 Building-29B

Building-29B is a five-story, 102,700 gsf structure with a basement and penthouse, designed by TKLP, and constructed in 1993. Each of the five floors is divided into two wings with offices located in the northern third and laboratories located in the southern two thirds of the building. The basement contains vivarium space, building support staff space, and mechanical and electrical utility space. A central utility corridor provides utility and service access to all laboratory modules. The first floor of Building-29B includes a conference area. The exterior walls are a combination of brick, aluminum and glass curtain wall with precast concrete panels.

4.9.6.6.5 Building-45, “The Natcher Building”

Building 45 was designed by the St. Louis architecture firm HOK and constructed in 1994. It is a six-story building with basement and underground parking (537,015 gsf). The building is a steel frame structure with a precast concrete and glass curtain-wall exterior. The building is currently used for conference and administrative functions.

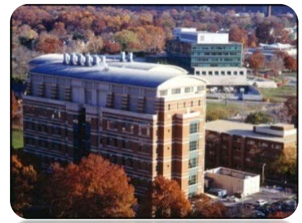
4.9.6.6.6 Building-32

Building-32 is a Contemporary Style building constructed in 1996. It is a one-story, 23,380 gsf building. The building is a masonry load-bearing structure with a brick exterior. It is currently used for biomedical research laboratories.

4.9.6.6.7 Building-40, “The Dale and Betty Bumpers Vaccine Research Center”

Design by HLM, Building 40 was constructed in 2000. It is a five-story building with interstitial space and basement (141,396 gsf). The building is a reinforced concrete frame structure with a precast concrete exterior. This building is currently used for biomedical research.

4.9.6.6.8 .Building-50, "The Louis Stokes Laboratories"



Building 50 was design by HLM and constructed in 2001. It is a six-story building with interstitial space and basement (565,459 gsf). The building is a pre-stressed concrete frame structure with a brick exterior and is currently used for biomedical research functions.

4.9.6.6.9 Building-64, "The East Child Care Center"

Building-64 is a one-story building with basement (15,448 gsf) design by McKissack and McKissack and constructed in 1991. The building is a masonry load-bearing structure with "ground-faced" concrete masonry unit exterior. It is used for employee child care.

4.9.6.6.10 Building-51, "The NIH Fire Station"

Building-51 was constructed in 2003 to house the NIH Fire Department. It is a two-and-one-half-story, 21,724 gsf building with a steel frame structure with a brick exterior.

4.9.6.6.11 Building-10, "The Mark O. Hatfield Clinical Research Center"

The Mark O. Hatfield Clinical Research Center (CRC) was opened in September of 2004. The facility contains nursing units with inpatient beds, day hospital stations and research laboratories. The CRC connects to the ACRF and to Building 10; together, they form the Clinical Center Complex.

The CRC has a total floor area of 1,779,729 gsf that houses 250 inpatient beds and 100 day-hospital stations and clinical research laboratories. The facility was design to be highly flexible and adaptable to respond to changing scientific protocols and new healthcare initiatives. This is supported by modular space layout and interstitial space.

Two research laboratory blocks (three stories each) connect the inner most patient blocks. The research space totals approximately 250,000 gsf. Four wings contain the patient units. These four brick and pre-cast wings paired around two landscaped courtyards flank a glass-enclosed, eight-story public atrium. Various corridors connect with the ACRF and two pedestrian bridges connect with Building 10. The building was design by ZGF.

4.9.6.6.12 MLP-10

MLP-10 is a 10-level, 375,000 gsf parking structure constructed in 2004. The building is a pre-stressed concrete frame structure with a reinforced concrete and brick exterior.

4.9.6.6.13 Building-35 Phase-1, “The Porter Neuroscience Research Center”

Building-35 was design by Raphael Viňoly and constructed in 2004. It is a four-story building with interstitial space and basement (473,442 gsf). The building is a steel frame structure with a metal and glass exterior. The building is currently used for biomedical research laboratory functions.

4.9.6.6.14 MLP-9

MLP-9 is a seven-level, 351,034 gsf, parking structure constructed in 2005. The building is a pre-stressed concrete frame structure with a precast concrete exterior.

4.9.6.6.15 Building-33, “The C.W. Bill Young Center”

Building 33 was designed by CUH2A and constructed in 2006. It is a three-story building with interstitial space and basement (84,000 gsf). It is a concrete frame structure with a brick exterior and is currently used for biomedical research laboratory functions.

4.9.6.6.16 .Building-66, “The Gateway Center”

Building-66 was designed by IDB Architecture Inc. and constructed in 2007. The 12,325 gsf, one-and-one-half-story building is the visitor screening entrance at the South Drive entrance to the campus. It is a concrete frame structure with a limestone exterior and features a partial “green roof”.

4.9.6.6.17 MLP-11

MLP-11 is a three-level, 118,334 gsf, visitor parking structure constructed in 2007. The building is a pre-stressed concrete frame structure with a precast concrete exterior.

4.9.6.6.18 Building-67, “The Commercial Vehicle Inspection Station”

Building 67 was constructed in 2007 as a screening facility for commercial vehicles entering the NIH campus. It is a one-story 18,000 gsf steel frame structure open to the exterior.

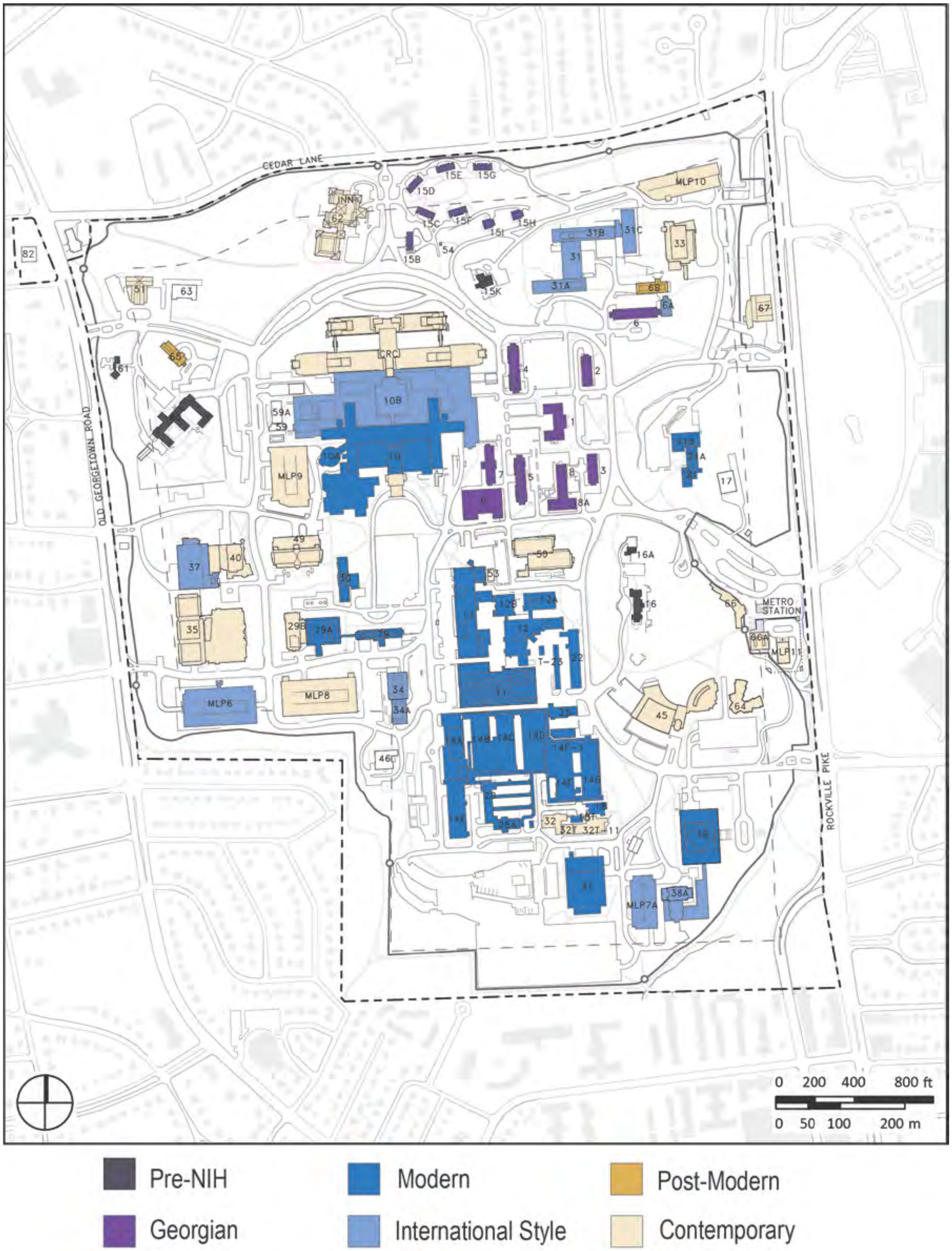


Exhibit 4.9.F. Existing Architectural Style and Character

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4.10 Campus Amenities

4.10.1 Natural Amenities

In the process of development, much of the natural rolling topography of the site has been retained. The undulating topography contributes to the variety of excellent views and vistas of the campus and its structures.

There are about 28-acres of medium-density woodlands on campus, primarily located in the northwest corner of the site as well as along the eastern exposed course of the NIH Stream. These natural woodlands, in conjunction with the large extent of open space and landscaping, help contribute to and establish the “campus-like” character of NIH. The stream areas on site offer a naturalistic and quiet respite from the development of surrounding areas.

4.10.2 Signage

The current campus exterior signage system was developed in 1976 as a hierarchical system with several categories of sign types as follows:

- A—major entry
- B—limited access entry
- C—general vehicular directional
- D—specific directional
- E—building identification
- F—regulatory
- G—directory

In general, signs on the Bethesda campus are poorly located and in bad condition. Many of the original campus signs are faded, deteriorating, or out-of-date as a result of recent construction and other physical changes on campus. Moreover, campus signage tends to be oriented to vehicular traffic rather than to pedestrian movement. Traffic control signs are typical street and highway signs that follow the guidelines contained in the Federal Highway Administration’s Manual on Uniform Traffic Control Devices for Streets and Highways. In addition, there are a limited number of outdated campus directory maps on-site.

The Bethesda campus does not have a comprehensive signage system that promotes the desired image of NIH. To address these issues NIH is considering a comprehensive way-finding and signage system that will make it easier for those who live, work, or visit the

Bethesda Campus to access and move around the site. The first portion of that project was implemented in 2009. It included new signs at the perimeter of the campus that identify the employee, visitor, patient and commercial vehicle entrances. The second phase of the project, which will address interior campus signage and building numbers, is in development.

4.10.3 Site Furnishings

Site furnishings include items such as lighting, seating, waste receptacles, bicycle storage, paving, and other freestanding objects. In general, there is not a coordinated site furnishings plan for the Bethesda Campus. Chapter 6 of this document provides guidelines to create consistency for future street furnishing.

4.10.4 Recreation Areas

Recreation areas on campus are both indoor and outdoor. Indoor recreation includes the fitness center in Building-31, and an aerobics/dance facility in temporary Building-T-39 on the south side of campus.

Active recreation areas include playgrounds, volleyball courts, exercise areas, and places where people play informal games such as Frisbee and soccer. The campus has minimal active recreation areas. The playgrounds on campus have been created for patients and patients families in the vicinity of the Clinical Center and the Children's Inn. There are also playgrounds associated with the on-campus childcare centers. There is a basketball half-court on one of the roofs in Building 10 and a volleyball court on the grounds of the Convent. A portion of the "South Lawn" (south of parking lot 41) is used as an informal soccer field.

Passive recreational areas are places where people go to sit and relax, read, or eat lunch. Passive areas are generally more secluded, and tend to have natural landscape or garden qualities. There are many small passive recreation areas on the Bethesda Campus. The most popular of these areas are associated with dining facilities.

Ceremonial areas tend to have a more formal character. The quadrangle in front of Building-1 serves this function.

4.10.5 Employee Amenities

Federal Regulation allows for the following employee amenities:

- Child Care Centers: In accordance with 40 USC 590b, Federal agencies can allot space in Federal buildings to individuals or entities that will provide childcare services to Federal employees.
- Fitness Centers: In accordance with 5 USC 7901, Federal agencies can allot space in Federal buildings for establishing fitness programs
- Federal Credit Unions: In accordance with 12 USC 1770, Federal agencies may allot space in Federal buildings to Federal credit unions without charge for rent or services:
- Federal Employee Health Units: The provision for establishing health programs for Federal employees is contained in P.L. 7-658 (5 USC 7901).
- Concessions: Concessions activities are those that sell a commodity or perform a service at an established price. These include but are not limited to: barber and beauty shops, taxi stands, vending stands and machines, commissaries, mobile vending stands, canteens, soda fountains, lunch counters, and cafeterias.
- Vending Stands for the Blind: The Randolph Sheppard Vending Stand Act (20 USC § 107 et seq.) provides priority for blind persons in the location and operation of vending facilities on Federal property.

Employee and campus visitor amenities are dispersed throughout the site, as shown in Exhibit 4.10.A, and include:

- Financial Services in Buildings 10, 31 and 45.
- Health clinic in Building 10.
- Convenience retail in Buildings 10, 31, 12B, and 38A.
- Concession stands, dining centers and coffee bars in Buildings 1, 10, 12B, 31, 38A, 40, 45, and 50.
- Fitness centers in Buildings 10, 31, and T-39.

Other services include personal services associated with the hospital function of the Clinical Center Complex. There is also an automated postal facility located in Building-10.

Many services are provided by businesses within the Bethesda Central Business District (CBD). Although walking distances between campus and the CBD are lengthy, public transportation is available to transport employees to the area.

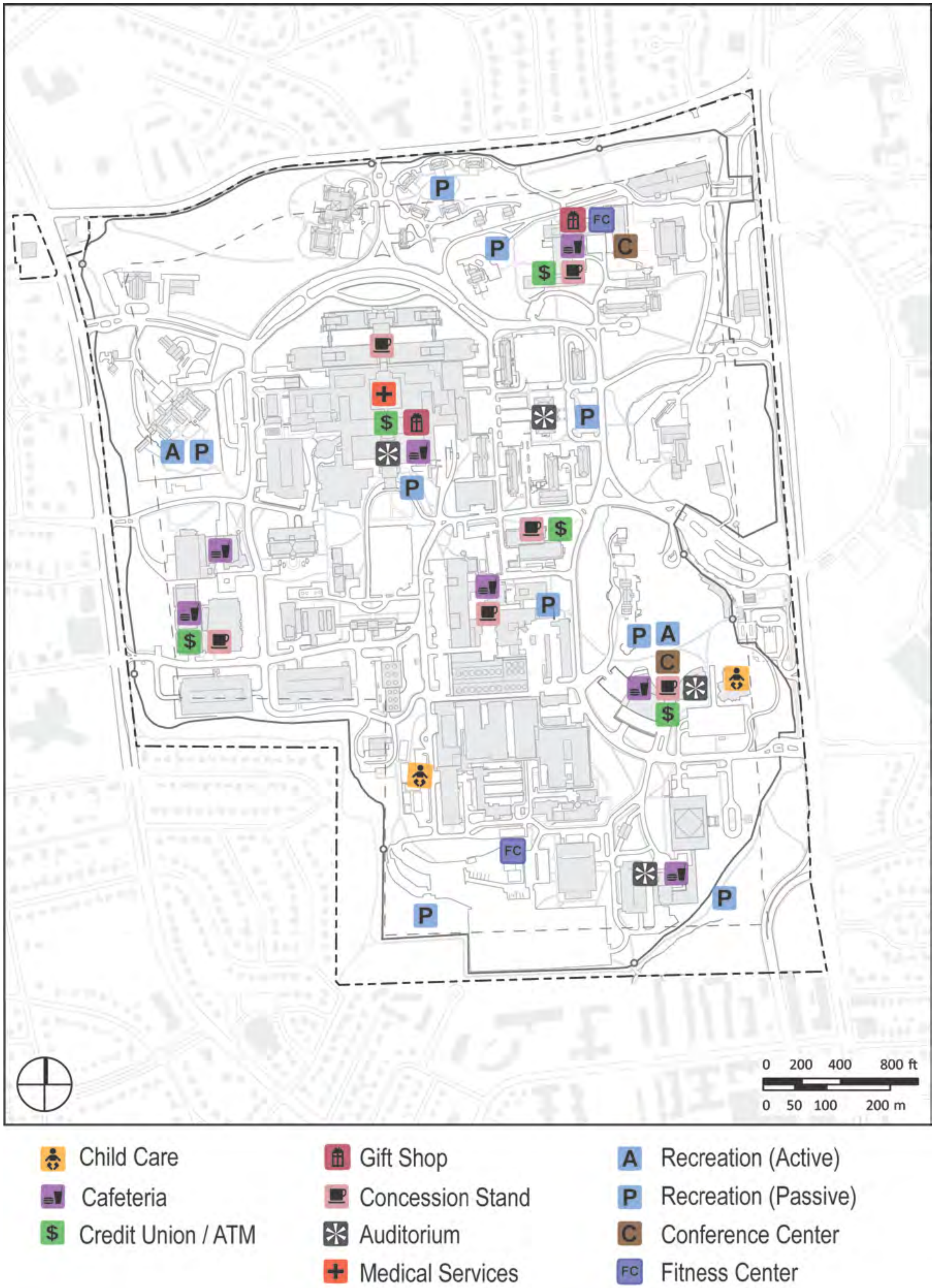

Exhibit 4.10.A. Existing Campus Amenities

4.11 Performance Measures

4.11.1 Federal Real Property Councils Performance Measures

On February 4, 2004, "Executive Order (EO) 13327 Federal Real Property Asset Management" was issued "to promote the efficient and economical use of federal real property resources in accordance with their value as national assets and in the best interests of the nation". HHS utilizes the following mandatory performance measures in the management of real property assets:

- mission dependency
- facility condition index
- utilization rate
- operating cost
- disposal of unneeded assets

Current building performance metrics are summarized for each building on NIH Bethesda Campus at the end of this section in Exhibit 4.11.K and discussed in detail herein.

4.11.2 Mission Dependency:

NIH evaluates the functions within each of its real property assets, categorize the asset, and enter the category into the NIH asset inventory system using the following designations:

- "Mission Critical" - Without the constructed asset or parcel of land, the NIH mission is compromised.
- "Mission Dependent" - The asset does not fit into "Mission Critical" or "Not Mission Dependent" categories. The asset's primary function supports the Mission.
- "Not Mission Dependent" - The NIH mission is unaffected.

Exhibit 4.11.A shows that 9,597,314 gsf (76-percent) of NIH facilities are "mission critical". 2,861,919 gsf (23-percent) of NIH facilities are "mission dependent" and 101,790 gsf (1-percent) are not "mission dependent". These facilities are categorized as indicated in Exhibit 4.11.B.

4.11.3 Condition Index (CI)

The Condition Index (CI)[26] links real property condition and stewardship to the Real Property Asset Management decision-making process. It sets performance goals relative to facility condition, assessment, prioritization of repair needs, and construction. It requires the consideration of these goals in budget decision making.

The CI is calculated using the following formula:

CI = (1 – ((repair needs) / (plant replacement value))) x 100

There are two components of funding:

- Sustainment: to maintain real property inventory from deteriorating
- Improvement: to address deferred maintenance backlog and improve conditions.

Sustainment consists of maintenance and repair activities necessary to keep the inventory of facilities in good working order. However, in order to improve the CI there must be a decrease in the backlog of maintenance and repairs (BMAR).

By 2017 NIH is required to have a CI =90 or above for all its buildings. Currently 7,082,061 gsf or 64-percent of NIH Bethesda campus buildings meet or exceed CI = 90, as shown in Exhibit 4.11.C and Exhibit 4.11.D. 46-percent of the NIH Bethesda campus building must improve to CI = 90 by 2017.

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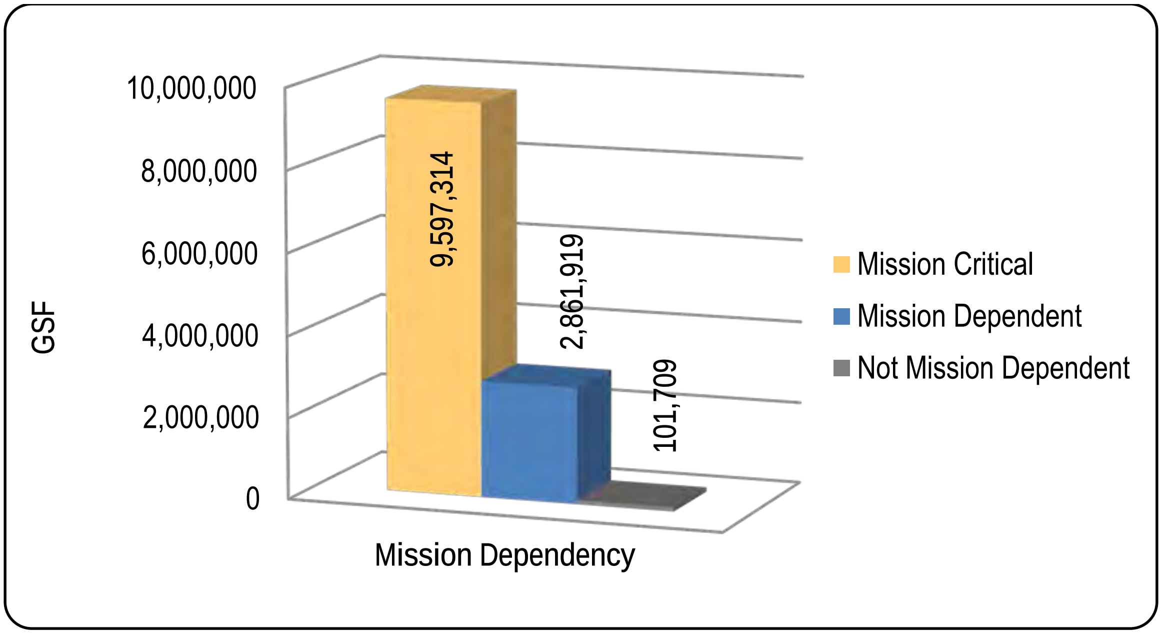
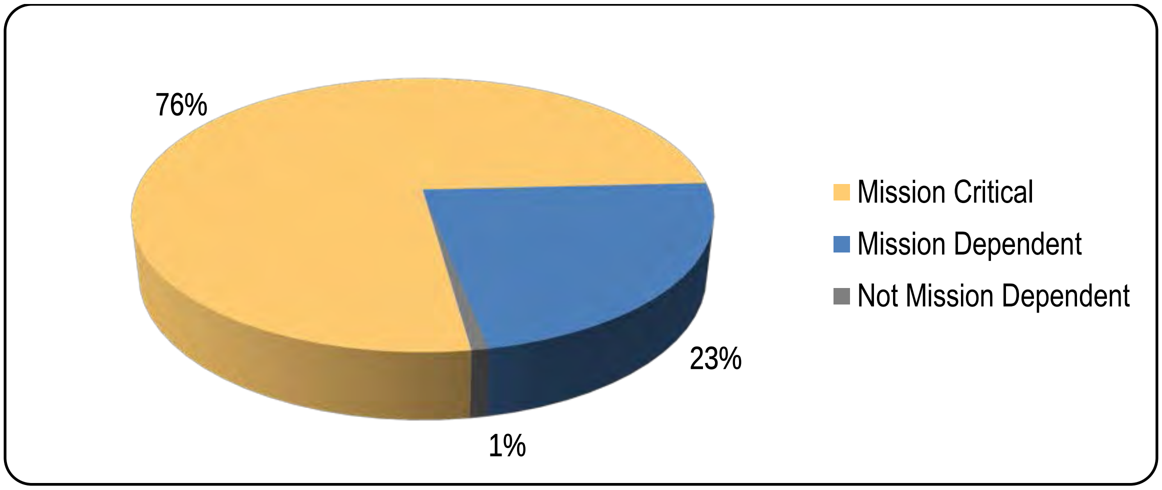
[26] United States Department of Health and Human Services, 2008 Update HHS Real Property Asset Management Plan, April 22, 2008.

Exhibit 4.11.A. Mission Dependency Charts





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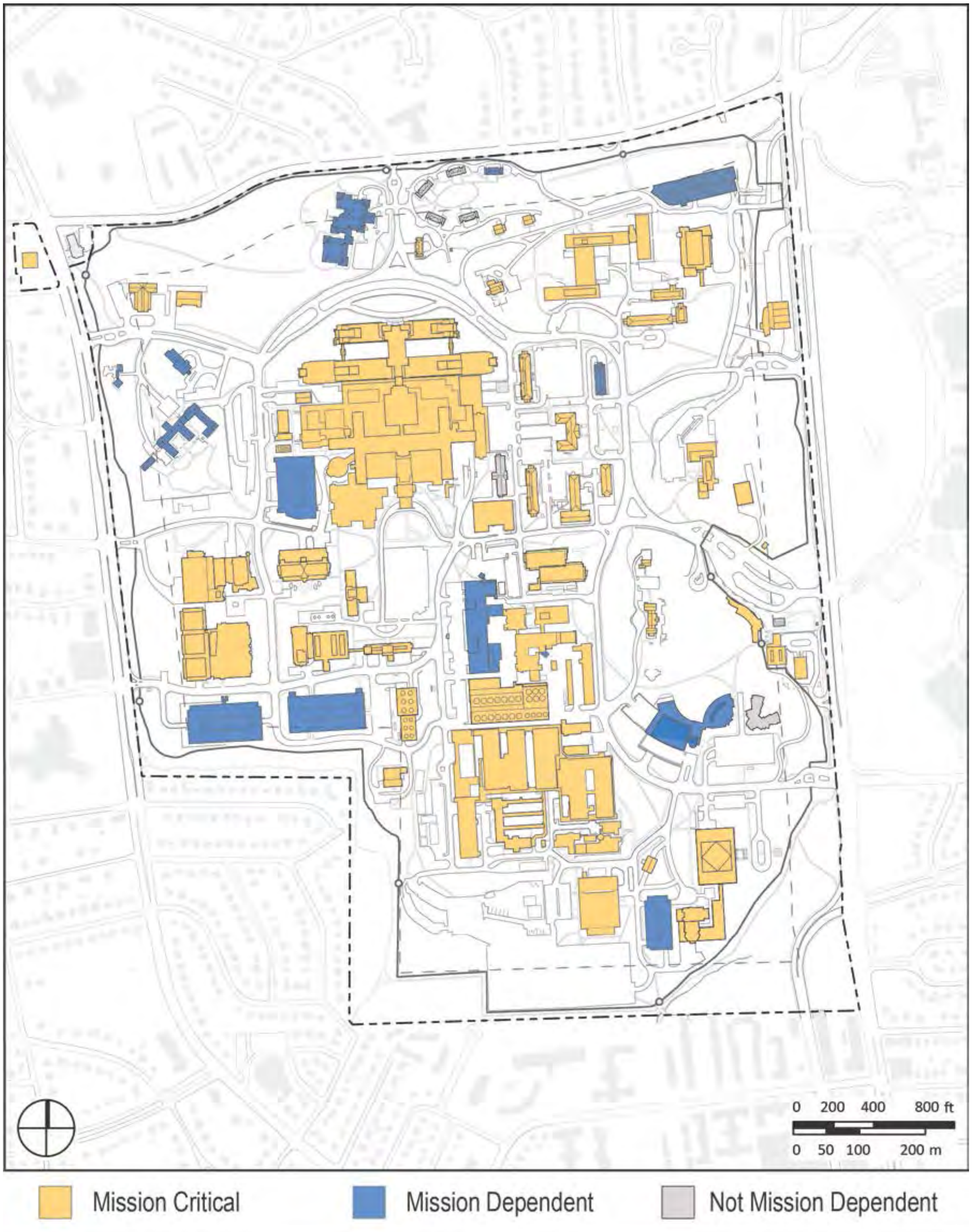
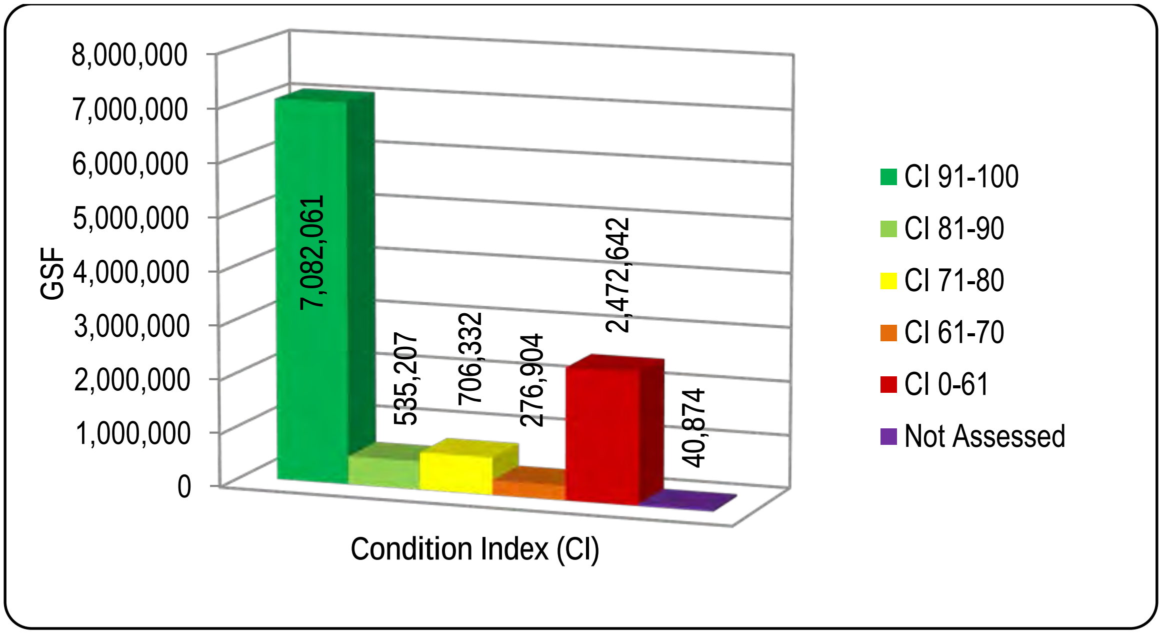
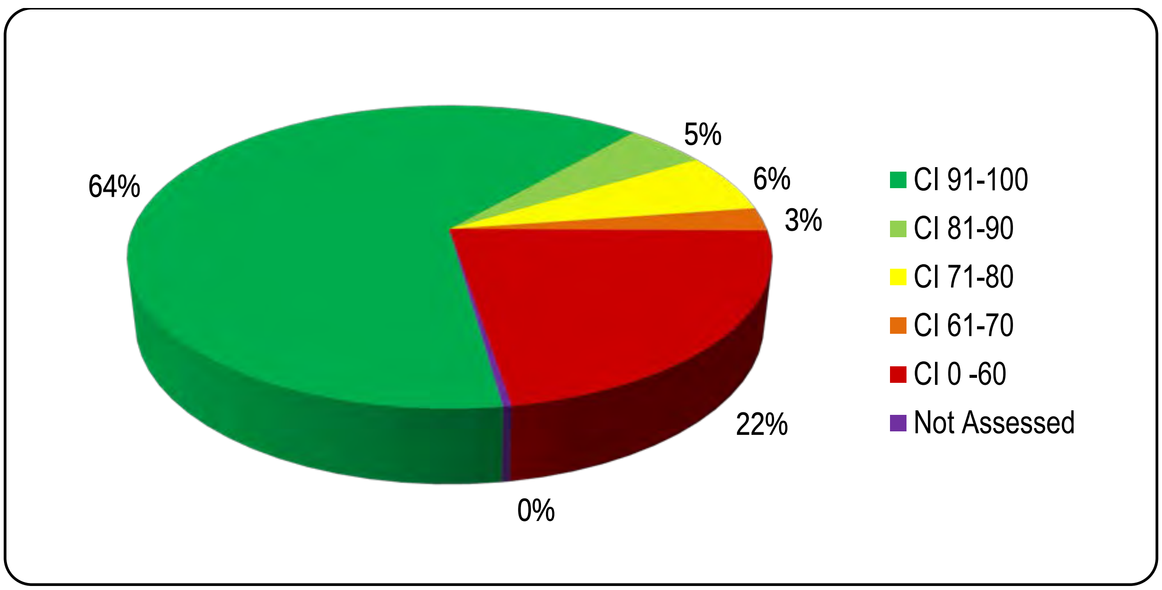


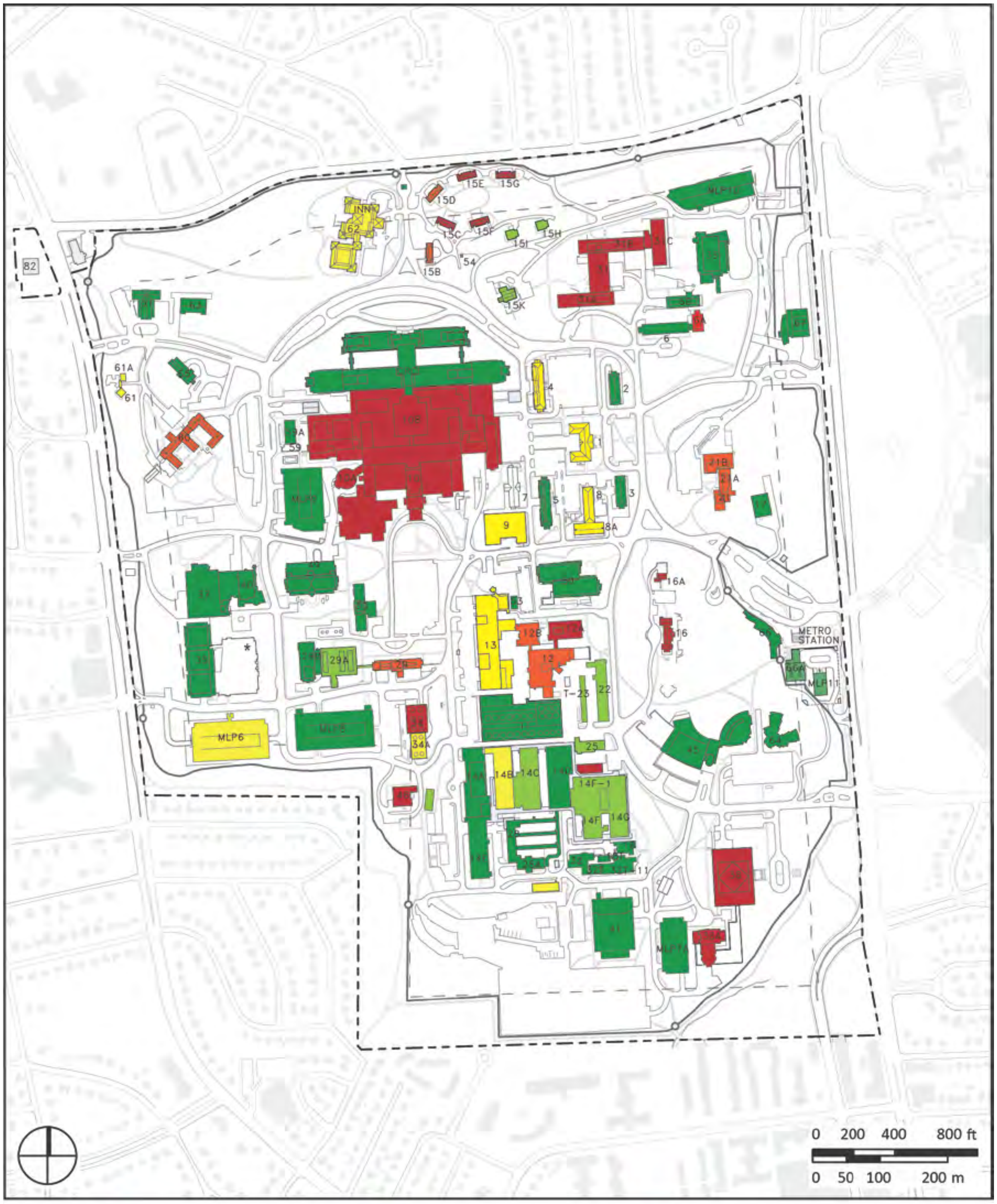
Exhibit 4.11.B. Mission Dependency

Exhibit 4.11.C. Condition Index Table and Charts

Condition Index	Gross Square Feet	Percentage
CI 91-100	7,082,061	64%
CI 81-90	535,207	3%
CI 71-80	706,332	6%
CI 61-70	276,904	5%
CI 0-60	2,472,642	22%
Not Assessed	40,874	0%







CI = 91-100
CI = 81-90
CI = 71-80
CI = 61-70
CI = 0-60
*Porter Phase II under construction

Exhibit 4.11.D. Condition Index

4.11.4 Facility Utilization

NIH bases its facility utilization measurement on an annual census taken every June. The census counts each staff person who occupies NIH facilities. Staff includes NIH employees (FTEs), contractors, guest researchers, research fellows, tenants (such as day-care centers and retail space employees), and volunteers. No distinction is made between part-time and full-time employees, each of whom is counted as a whole number. The census counts people in all facilities, both leased and owned.

4.11.4.1 Offices

Offices are defined as buildings primarily used for office space. The utilization measure for offices is based upon the usable square footage (USF) currently being occupied relative to the total number of occupants in the space.

The maximum space allowable for space planning and occupancy is 170 useable square feet (USF) per person, on average. The USF includes all office, office support space and a pro-rata share of any joint use space that is included in each tenant's assigned useable square feet. This standard applies to total space. Within the total space, offices greater than 250 USF are reserved for agency heads or equivalents, or department level officials (Deputy Assistant Secretary or higher). No private office shall exceed 350 USF.

4.11.4.2 Warehouses

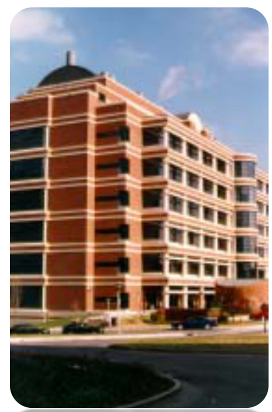
HHS warehouses generally operate as a centralized receiving, distribution, and stores operation. Their functions include, but are not limited to, the following: receiving, bar-coding, staging, distributing accountable property, providing short-term storage (not to exceed six months), and staging surplus property for disposal and/or reutilization; and packaging, palletizing, and staging shipments as necessary. The utilization of warehouse space will be measured by the ratio of occupied area to gross square feet. The formula for warehouses will consist of the area (square feet) currently occupied for storage, as a percentage of the total gross area (square feet) of the warehouse. The formula is:

Actual Utilization (%) = ((Occupied Units) / (Design Capacity)) X 100.

- Occupied Units: the area (square feet) or number of units that are occupied.
- Design Capacity: can include any unit of measure based upon the material being stored or used. Examples include gross square feet, rental area, total number of units, total number or bins, etc.

4.11.4.3 Laboratories

The design capacity for HHS research laboratory for planning and occupancy purposes shall not exceed 460 net assignable square feet (nasf) per scientist.



Research laboratory (e.g. “wet laboratory”) space includes: laboratory (based on a standard module of 11’x33’), laboratory support, and laboratory related offices. Laboratory personnel who are housed within the identified space are defined as budgeted FTEs including vacancies for which recruitment has been approved and applies to all acquisitions not already advertised, as well as to new construction and renovations not yet at an approved final design stage. It does not include building and floor common areas (public elevator lobbies, corridors, restrooms) and GSA or HHS joint-use areas. Many HHS laboratories are unique because of the diverse missions of the Centers for Disease Control and Prevention, the Food and Drug Administration, and the National Institutes of Health.

The following laboratory functions are excluded and will be measured separately from HHS standard laboratory utilization rate:

4.11.4.3.1 Centralized Support

Centralized laboratory stand-alone support facilities, such as centralized freezers, glass-wash facilities, and computer centers, are determined by use of appliances, equipment and instruments to support research on a centralized basis. Net assignable square feet per person will not be employed to determine the utilization rate for shared and centralized support laboratory spaces. Centralized support space exists to support research; therefore, they are utilized so long as there is research.

4.11.4.3.2 Instrument or Special Purpose Laboratories, High Containment Laboratories and Clinical Research

Special purpose and instrument laboratories are determined by size of equipment and instruments. Net assignable square feet per person will not be employed to determine the utilization of special purpose or instrument laboratories. Special purpose laboratories are utilized or not utilized. Likewise high containment laboratories (BLS-4) and clinical research space will be utilized or not utilized.

4.11.4.3.3 Animal Research Facilities (Vivariums)

The utilization of animal housing is based on the requirements in the "Guide for the Care and Use of Laboratory Animals (NIH publication 85-23)". The utilization of the related animal research facility support functions are determined by research protocols and species housed, including: necropsy, surgery, procedure room, cage-wash, quarantine area, sterilizer room, isolation, locker room, feed and bedding storage, X-ray, treatment room, behavioral testing room, microinjection room, transgenic lab suite, diagnostic lab suite, environmental experiment room, cage decontamination area, surge cage storage, field equipment room, material decontamination/entry, incinerator, tissue digester, food preparation kitchen, automatic watering system room, CVAC system support room shared space for records, locker rooms, animal irradiator, analgesic inhaler device, and waste disposal are determined by research protocols and species housed. Animal research facility support spaces are utilized or not utilized.

- HHS laboratory spaces that are less than 200 usf/scientist,[27] on average, are over utilized.
- HHS laboratory spaces that are between 200 and 460 usf/scientist are utilized.
- HHS laboratory spaces that are greater than 460 usf/researcher, on average, are underutilized.

[27] Research at the National Institutes of Health is similar to a university biomedical research program that utilizes a large number of Post Doctorate Fellows in their research laboratories and therefore their density would be higher. The Centers for Disease Control and Prevention and the Food and Drug Administration biomedical research pro-grams are more aligned with industry and their density would be lower.

4.11.4.4 Housing

NIH provides staff housing, including a house for the U.S. Surgeon General. The utilization performance of housing will be measured based on percentage of occupancy of dwelling units per site specific location.

- NIH dwelling units of a specific site location that are occupied between 85% and 100% are utilized.
- NIH dwelling units of a specific site location that are occupied below 85% are under utilized.

4.11.4.5 Summary of Facility Utilization

The initial categorization for each facility will be entered into the OPDIV's or other HHS component's building inventory system using the designations in Exhibit 4.11.E. Current NIH Bethesda Campus Facility Utilization ratings are indicated as a whole in Exhibit 4.11.F and for each building in Exhibit 4.11.G.

Exhibit 4.11.E. Facility Utilization Designators Table

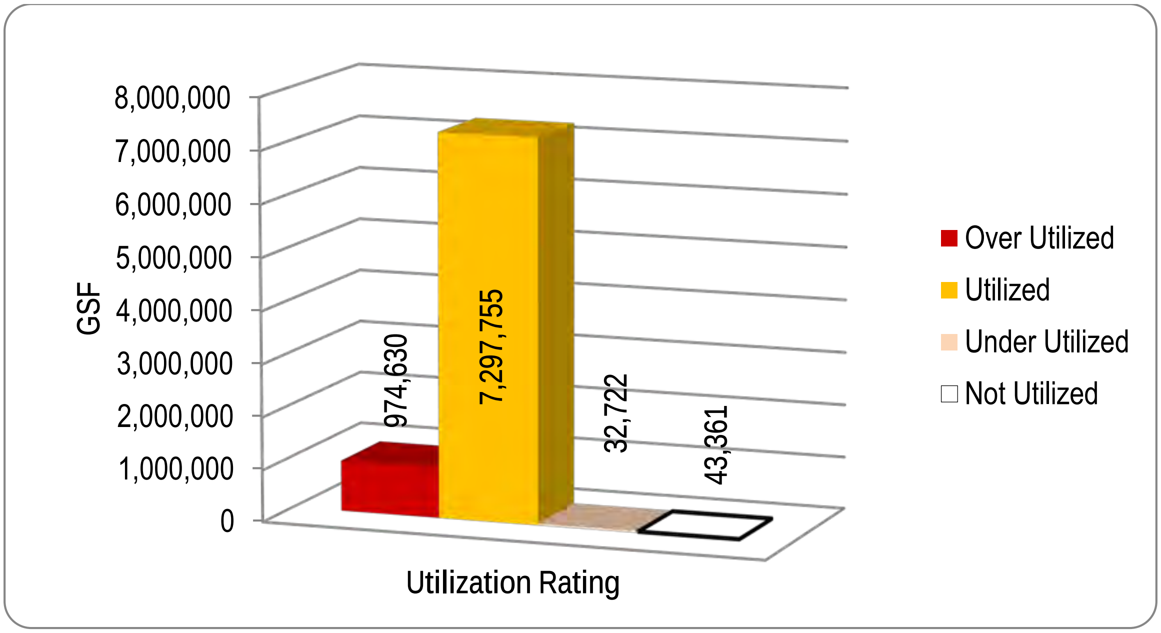
Rating	Designator	Office	Warehouse	Laboratory	Housing
Over Utilized	O	< 128 usf	>85%	< 200 usf	N/A
Utilized	U	128-170 usf	50-85%	200 – 460 usf	85-100%
Under Utilized	N	> 170 usf	10-50%	> 460 usf	<85%
Not Utilized	V		<10%		

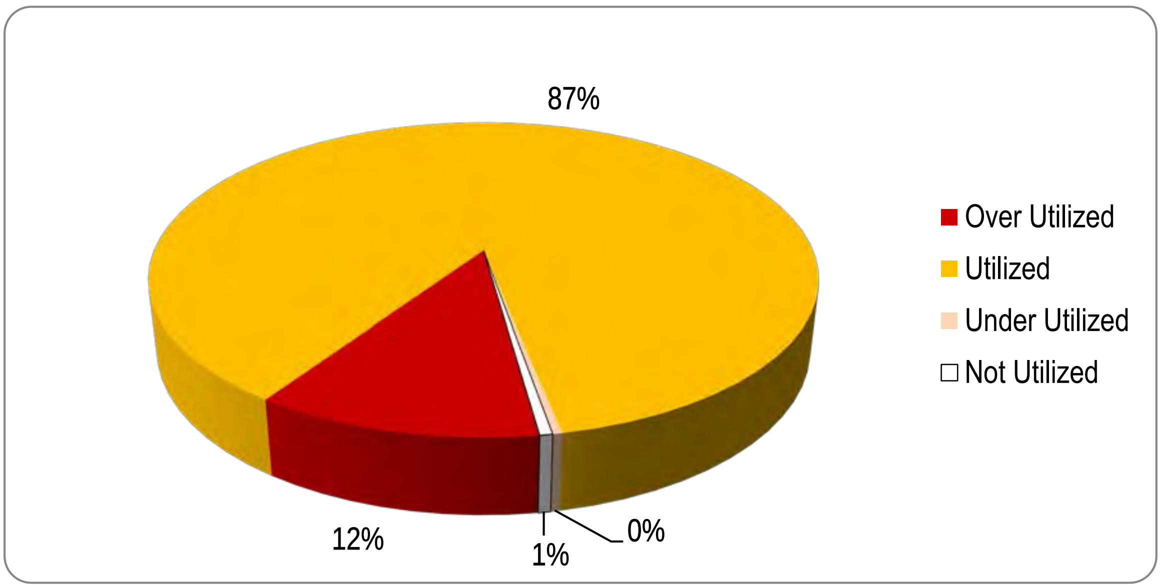
4.11.5 Building Functional Suitability

Functional suitability is based on the ability of a particular structure to continue to be used effectively for the activity assigned to it. In some cases, buildings which are judged to be in fairly good structural condition may no longer meet the functional requirements of the uses they house, or may not have a high reuse potential for other uses. Buildings deemed to be obsolete could not practically be reused because of inadequate mechanical systems, inflexible structural systems, building configuration, or cost factors.

Most buildings on campus are considered to be functional for the uses they currently house, as shown in Exhibit 4.11.H and Exhibit 4.11.I. Marginal buildings include older research buildings, whose structural systems and configurations cannot readily be updated to accommodate current research layout and mechanical systems requirements. The following structures are deemed to be obsolete: Buildings 7, 9, 12, 14/28 and 22.

Exhibit 4.11.F. Facility Utilization Charts





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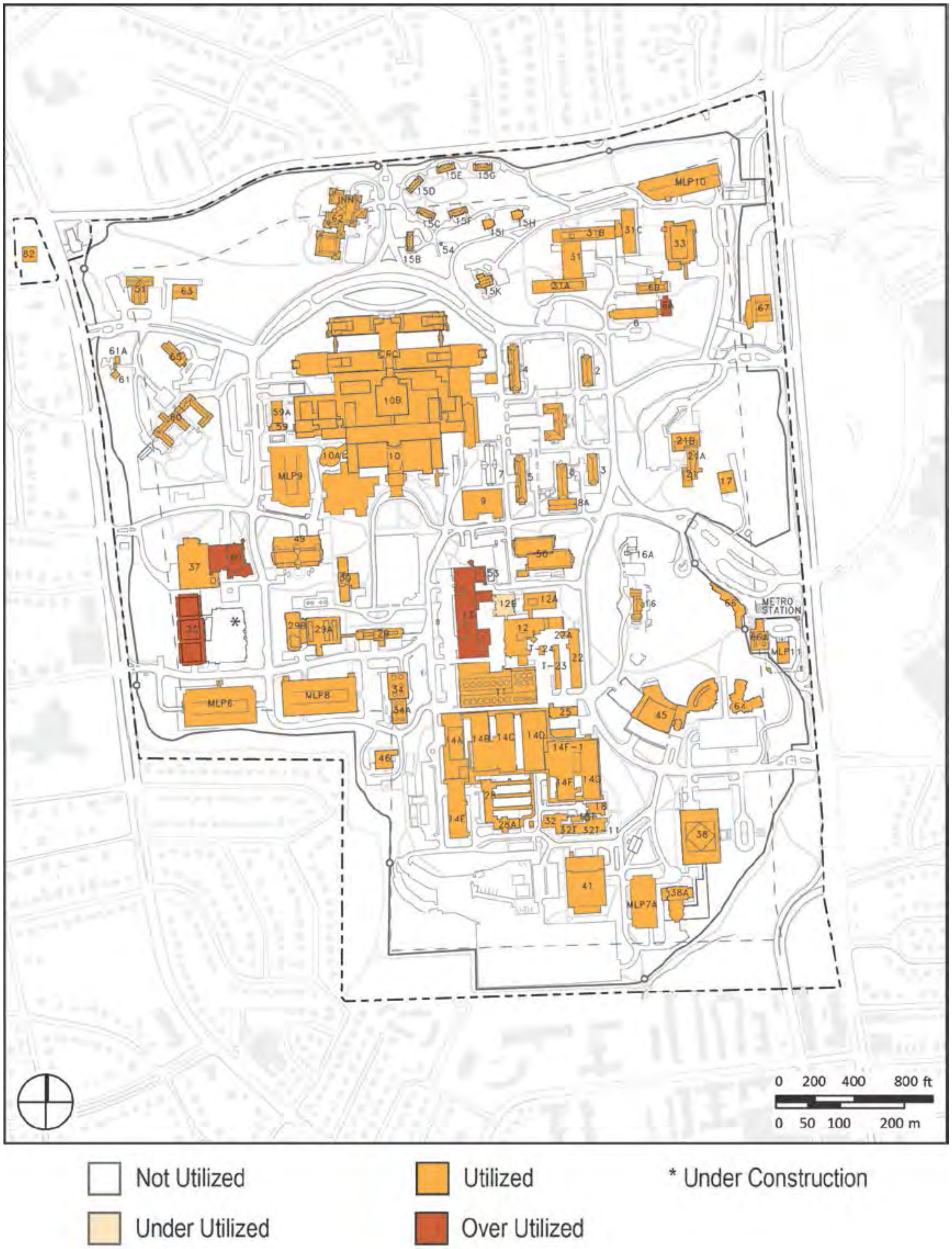
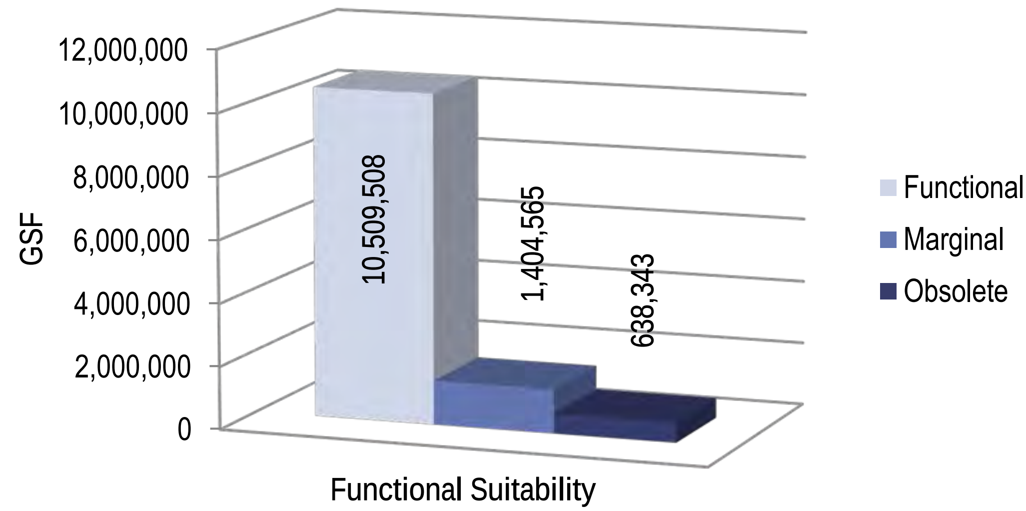
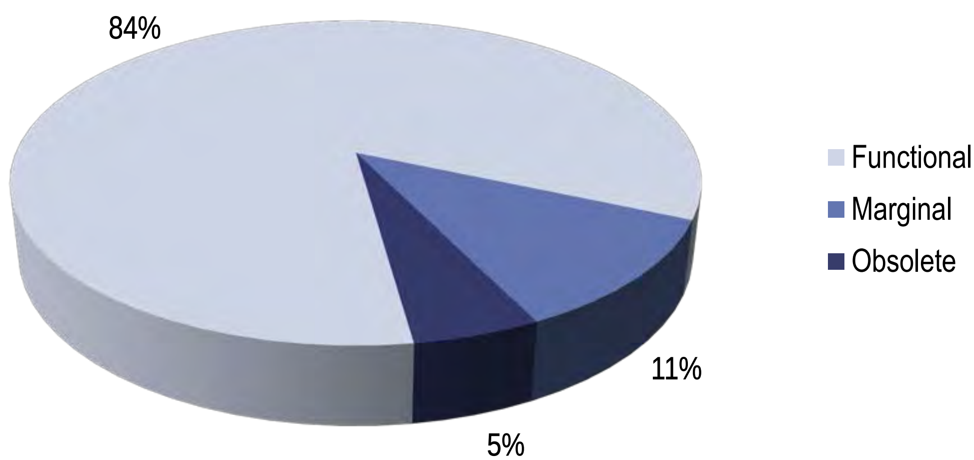


Exhibit 4.11.G. Facility Utilization

Exhibit 4.11.H. Building Functional Suitability Charts





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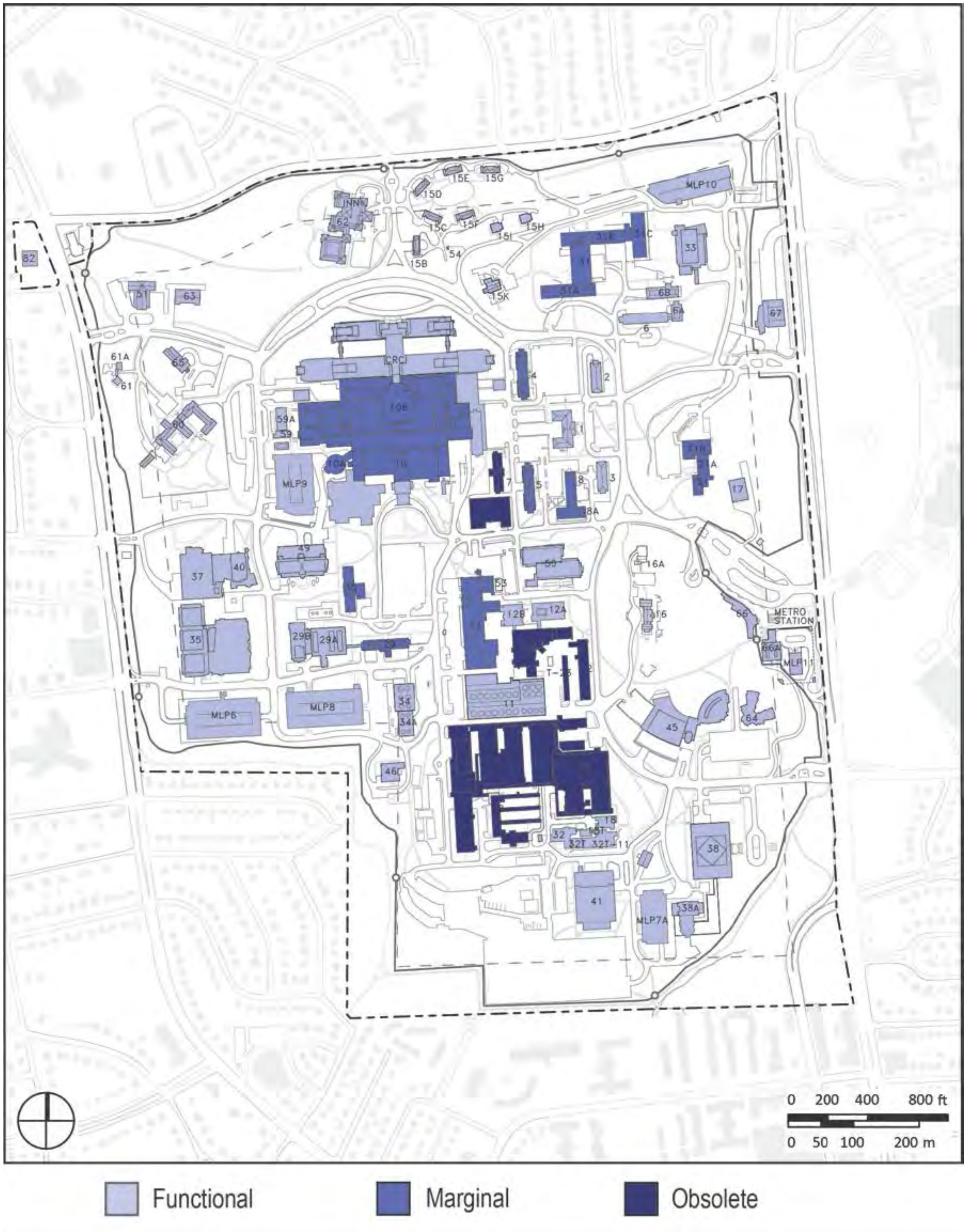


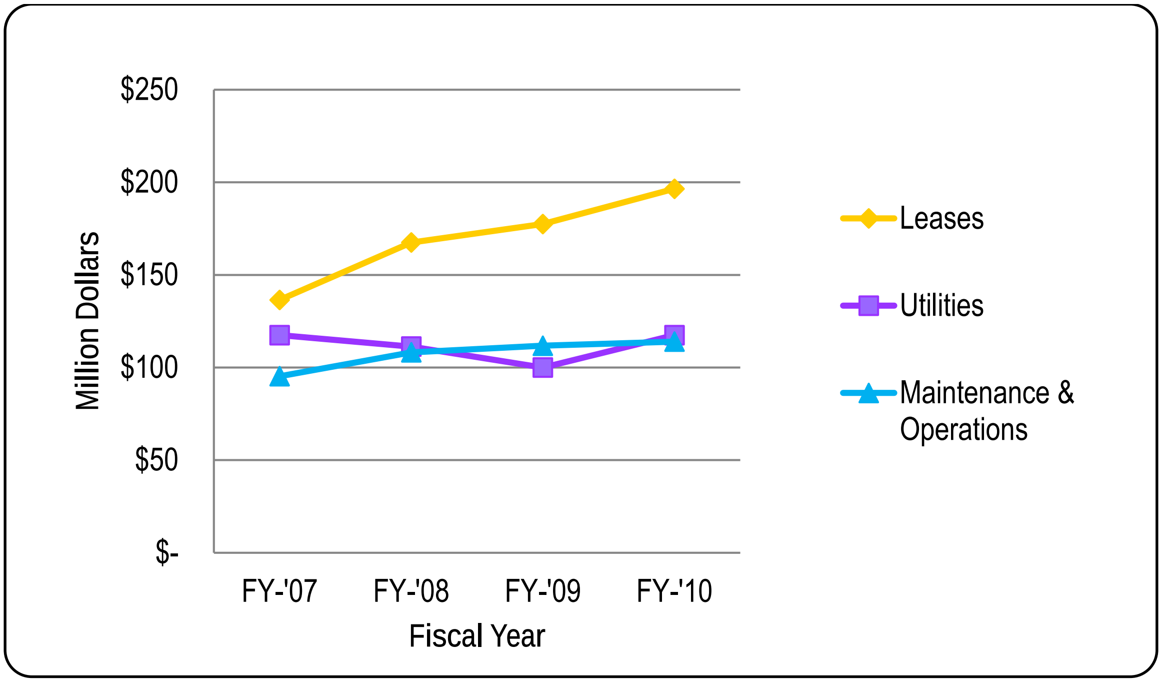
Exhibit 4.11.I. Building Functional Suitability

4.11.6 Operating Cost

Total operating costs are depicted in Exhibit 4.11.J and categorized as follows:

- Lease Cost: NIH lease costs increased over the last 4 years from $136.5 million to $196.5 million in FY 2010. Most of NIH leases are in Montgomery County due to rapidly expanded scientific programs at the Bethesda Campus. Lease costs are trending upward and are NIH's most expensive operating cost.
- Utilities: Utilities in FY 2007 cost NIH $117.5 million, the cost dipped to $100.0 million in FY 2009, and trended upward to $117.5 million in FY 2010.
- Maintenance and Operations Costs: Operating costs are measured on a cost per gross square foot (gsf) basis and include recurring maintenance and repair costs, utility costs, cleaning and janitorial costs, and grounds maintenance costs. NIH overall maintenance and operating costs have increased from $95.3 million in FY 2007 to 114.0 million in FY 2010.

Exhibit 4.11.J. Operating Costs Chart



4.11.7 Disposal Performance Measures

NIH operates on campuses that contain little or no land available for expansion or construction of new facilities to meet demand. NIH evaluates existing buildings with life cycle cost analyses that compare major renovation to replacement costs. Where it is economically advantageous, obsolete assets are demolished and replaced with new state-of-the-art buildings capable of functioning at the highest level. Where the life cycle cost analyses reveals that renovation yields the best economic returns to the agency, the assets are renovated to provide further service.

- Disposal of Leases: NIH utilizes leases managed by GSA, as well as leases managed directly by NIH. NIH begins discussing plans for existing leases approximately 24 months in advance of the lease expiration, based on a review of the user's business plans and future space needs. There are some cases where the long-term housing plans call for NIH to relinquish leases back to GSA or a third-party landlord. In such a scenario, the NIH group works closely with GSA to minimize leasing and moving costs by tracking the lease terms against the target move-in date for the new space.
- Disposal of Owned Assets: HHS policy regarding retention of owned assets lays out conditions in which real property may be retained and directs NIH to dispose of properties that do not meet those conditions. HHS policy also clearly enumerates steps to be taken to dispose of excess properties or properties that otherwise do not meet the conditions for retention.

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Exhibit 4.11.K. Current Building Performance Metrics Summary Table

Building Number	Predominant Use	Occupants	Employees	NSF	Condition Index	Operating Cost	Mission Dependency	Utilization	Disposal Remediation Opportunity (Y/N)
1	Admin	OD	206	76,792	70	$ 1.61M	Critical	Utilized	N
2	Admin	OD	158	36,128	97	0.55M	Dependent	Utilized	N
3	Admin			41,794	100		Critical	Utilized	N
4	Lab	NIAID	189	78,775	76	2.10M	Critical	Utilized	Y
5	Lab	NIDDK	162	80,963	93	2.11M	Critical	Utilized	Y
6	Lab	NEI, NICHD, NIDDK	142	65,077	100	1.73M	Critical	Utilized	N
6A	Lab	NICHD	76	20,579	56	0.55M	Critical	Over Utilized	Y
6B	Lab	NIAMS, NICHD	154	47,488	93	1.26M	Critical	Utilized	N
7	Vacant						NMD[28]	Not Utilized	Y
8	Lab	NIDDK	179	81,491	73	2.17M	Critical	Utilized	Y
9	Lab	CC, NCCAM, NEI, NHGRI, NIA, NIBIB, NICHD, NIDDK, NIEHS	105	36,998	74	0.98M	Critical	Utilized	Y

[28] NMD means Not Mission Dependent

Building Number	Predominant Use	Occupants	Employees	NSF	Condition Index	Operating Cost	Mission Dependency	Utilization	Disposal Remediation Opportunity (Y/N)
10	Clinical Research	CC NCCAM, NCI, NEI, NHGRI, NHLBI, NIAAA, NIAID, NIAMS, NIBIB, NICHD, NIDCD, NIDCR, NIDDK, NIEHS, NIMH, NINDS, NINR, OD, ORF, and ORS	5,235	2,213,652	26	49.48M	Critical	Utilized	N
10 CRC	Clinical Research	CC, NCCAM, NCI, NEI, NHGRI, NHLBI, NIAAA, NIAID, NIAMS, NICHD, NIDCD, NIDCR, NIDDK, NIEHS, NIMH, NINDS, NINR, NLM, and ORS	2,321	1,042,087	95	22.08M	Critical	Utilized	N
11	Utility	ORF	90	185,171	99	$1.94M	Critical	Utilized	N

Building Number	Predominant Use	Occupants	Employees	NSF	Condition Index	Operating Cost	Mission Dependency	Utilization	Disposal Remediation Opportunity (Y/N)
12	Support	CIT, OD, ORS	64	59,521	63	1.23M	Critical	Utilized	Y
12A	Admin	CC, CIT, NHGRI, NIDDK, ORF, and ORS	295	66,197	54	1.05M	Critical	Utilized	Y
12B	Admin	CIT, NCI, ORS	6	28,728	64	0.42M	Critical	Utilized	Y
13	Admin	NIAID, NIBIB, NICHD, OD, ORF, and ORS	1,060	225,823	78	3.51M	Dependent	Over Utilized	Y
14A	Animal	CC, NHLBI, NIDDK, and ORS	29	72,362	93	1.37M	Critical	Utilized	Y
14B	Animal	NIAID, ORS	19	32,992	79	0.88M	Critical	Utilized	Y
14C	Animal	ORS	36	24,713	82	0.65M	Critical	Utilized	Y
14D	Animal	CBER, NCI, ORS	30	36,328	90	0.95M	Critical	Utilized	Y
14E	Animal	ORS	27	25,915	88	0.69M	Critical	Utilized	Y
14F	Animal	ORS	23	30,688	87	0.67M	Critical	Utilized	Y
14G	Animal	ORS	34	24,551	81	0.57M	Critical	Utilized	Y
14H	Animal	ORS	8	7,974	16	0.49M	Critical	Utilized	Y
15B1	Admin	NIAID	8	2,521	54	0.06M	Critical	Under Utilized	Y
15B2	Resident	ORF	N/A	2,521	63	0.04M	NMD	Utilized	Y
15C1	Resident	ORF	N/A	2,521	46	0.04M	NMD	Utilized	Y
15C2	Resident	ORF	N/A	2,521	39	0.04M	NMD	Utilized	Y
15D1	Resident	ORF	N/A	2,521	70	0.04M	NMD	Utilized	Y
15D2	Resident	ORF	N/A	2,521	62	0.04M	NMD	Utilized	Y
15E1	Resident	ORF	N/A	2,521	60	0.04M	NMD	Utilized	Y
15E2	Resident	ORF	N/A	2,521	51	0.04M	NMD	Utilized	Y
15F1	Resident	NIAID	N/A	2,501	60	0.03M	NMD	Utilized	Y

Building Number	Predominant Use	Occupants	Employees	NSF	Condition Index	Operating Cost	Mission Dependency	Utilization	Disposal Remediation Opportunity (Y/N)
15F2	Admin		4	2,500	59	0.04M	Critical	Under Utilized	Y
15G1	Resident	ORF	N/A	2,521	59	0.04M	NMD	Utilized	Y
15G2	Admin	ORS	15	2,521	39	0.04M	Dependent	Utilized	Y
15H	Resident	ORF	N/A	1,711	81	0.06M	Critical	Utilized	Y
15I	Resident	ORF	N/A	1,711	82	0.06M	Critical	Utilized	Y
15K	Admin	NIMH	56	11,695	88	0.06M	Critical	Utilized	Y
16	Admin	FIC	36	14,588	18	0.22M	Critical	Utilized	N
16A	Vacant[29]	FIC	N/A	3,994					
17	Utility	ORF/PE PCO	N/A	7,651	98	0.13M	Critical	Utilized	N
18	Lab	NICHC	34	4,858	98	0.13M	Critical	Utilized	Y
21	Support	CC, ORF and ORS	74	32,785	66	0.87M	Critical	Utilized	Y
22	Support	ORF	66	15861	81	0.29M	Critical	Utilized	Y
25	Support	ORF	35	6,300	84	0.12M	Critical	Utilized	Y
28	Animal	ORS	48	26,217	95	0.67M	Critical	Utilized	Y
29	Lab	CBER	164	75,815	67	2.20M	Critical	Utilized	Y
29A	Lab	CBER	148	94,166	82	2.50M	Critical	Utilized	Y
29B	Lab	CBER	156	51,954	98	2.40M	Critical	Utilized	Y
30	Lab	NIDCR	236	93,151	93	2.43	Critical	Utilized	Y

[29] Under Construction

Building Number	Predominant Use	Occupants	Employees	NSF	Condition Index	Operating Cost	Mission Dependency	Utilization	Disposal Remediation Opportunity (Y/N)
31	Admin	CSR, FIC, NCI, NIMHD, NCRR, NEI, NHLBI, NIA, NIAAA, NIAID, NIAMS, NIBIB, NICHD, NIDA, NIDCD, NIDDK, NIEHS, NINDS, NINR, OD, OHR, ORF, and ORS	1,899	516,923	30	7.75M	Critical	Utilized	Y
32	Lab	NICHD	86	22,351	91	0.59M	Critical	Utilized	Y
33	Lab	NIAID	257	142,709	99	3.62M	Critical	Utilized	N
34	Utility	ORF	N/A	46,680	48	0.83M	Critical	Utilized	N
34A	Utility	ORF	N/A	25,867		0.46M	Critical	Utilized	N
35	Lab	NEI, NHGRI, NICHD, NIDCD, NIMH, NINDS, and ORS	613	213,764	99	6.60M	Critical	Over Utilized	N
37	Lab	NCI, NINDS	859	281,166	99	7.50M	Critical	Utilized	N
38	Library	NLM	433	227,71	52	2.93M	Critical	Utilized	N
38A	Admin	NLM, ORS	676	188,179	65	2.96M	Critical	Utilized	N

Building Number	Predominant Use	Occupants	Employees	NSF	Condition Index	Operating Cost	Mission Dependency	Utilization	Disposal Remediation Opportunity (Y/N)
40	Lab	NIAID, ORF, ORS	228	35,051	99	1.77M	Critical	Over Utilized	N
41	Lab	NCI, NIAID,	133	130,302	98	3.43M	Critical	Utilized	Y
45	Admin	NIGMS, NLM, OD, ORF, and O	873	265,644	98	4.09M	Dependent	Utilized	N
46	Utility	ORF/PE PCO	N/A	11,526	0	0.19M	Critical	Utilized	N
49	Lab	NEI, NHGRI, NICHD, NIMH, NINDS, ORF and ORS	572	241,659	95	6.40M	Critical	Utilized	N
50	Lab	NCI, NEI, NHGRI, NHLBI, NIAID, NIAMS, NIDCD, NIDDK, ORF, and ORS	607	260,704	92	6.89M	Critical	Utilized	N
51	Fire Station	ORS	33	19,073	98	0.34M	Critical	Utilized	N
52	Utility	ORF	N/A	581	86	0.01M	Critical	Utilized	N
53	Utility	ORF	N/A	1,790	98	0.08M	Critical	Utilized	N
54	Utility	ORF	N/A	168	98	0.01M	Critical	Utilized	N
58	Utility	ORF	N/A	57	23	0.01M	Critical	Utilized	N
59	Utility	ORF	N/A	2,321	99	0	Critical	Utilized	N
60	Lodging	FAES, FNIH and HHMI	22	61,746	69	0.72M	Dependent	Utilized	N
61	Admin	CC	13	2,224	80	0.03M	Dependent	Utilized	N
61A	Admin	CC	5	900	74	0.01M	Dependent	Utilized	N

Building Number	Predominant Use	Occupants	Employees	NSF	Condition Index	Operating Cost	Mission Dependency	Utilization	Disposal Remediation Opportunity (Y/N)
62	Lodging	CINIH	48	65,816	73	0.71M	Dependent	Utilized	N
63	Utility	ORF	N/A	8,000	100	0.13M	Critical	Utilized	N
64	Child Care	ORS	37	14,771	96	0.16M	NMD	Utilized	N
65	Lodging	CC	7	23,526	97	0.27M	Dependent	Utilized	N
66	Visitors Center	ORS	4	11,059	100	0.16M	Critical	Utilize	N
66A	Utility	ORF	N/A	8,377	100	0.03M	Critical	Utilized	N
67	Inspection Station	ORs	1	5,411	100	0.09M	Critical	Utilized	N
68	Inspection Station	ORS	N/A	702	100	0.01M	Critical	Utilized	N
MLP-6	Parking	ORS	N/A	208,206	73	3.04M	Dependent	Utilized	N
MLP-7	Parking	ORS	N/A	137,578	95	1.49M	Dependent	Utilized	N
MLP-8	Parking	ORS	N/A	465,276	92	5.05M	Dependent	Utilized	N
MLP-9	Parking	ORS	N/A	351,034	100	0.33M	Dependent	Utilized	N
MLP-10	Parking	ORS	N/A	364,016	100	4.07M	Dependent	Utilized	N
MLP-11	Parking	ORS	N/A	117,849	100	3.04M	Dependent	Utilized	N

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4.12 Opportunities and Constraints

4.12.1 Opportunities

Over the next 20 years there are many opportunities (summarized in Exhibit 4.12.A) to transform the Bethesda Campus into a more efficient and vibrant place. The Facilities Working Group in August 2010 decided to replace Building 31 with new construction on the site of Building 21, which provides opportunities to develop sites close to Metro.

- The NIH biomedical research mission can be enhanced by moving research program from functionally obsolete facilities and constructing new facilities that support the creation of "Centers of Science". These "Centers of Science" would organize the campus into discrete zones that supports clustering of research activities and in turn supports scientific collaboration.
- There is an opportunity to improve internal circulation by embracing and re-establishing the campus' orthogonal grid. With the orthogonal grid there are opportunities to make Center Drive "Main Street" of the campus which would create a vibrancy and street life to encourage informal interaction.
- There are opportunities to make the campus more sustainable by implementing the HHS 2011 Strategic Sustainability Performance Plan as outlined in section 4.6.5.2. There are also opportunities to adapt and reuse older historic laboratories into administrative space.

4.12.2 Constraints

Constraints are a synthesis and summary of the existing conditions information presented in this chapter. Constraints are areas that may limit development and, if developed, need to be carefully studies and executed. Significant lead-time may be necessary to address regulatory requirements. The constraints detailed below are summarized in Exhibit 4.12.B.

- Neighborhood Compatibility: The campus is bounded on the north, west, and south by residential neighborhoods, requiring sensitivity in building location, heights, and uses near these areas.
- Natural Features/Topography: Steep slopes occur around the periphery of the campus, particularly along the north and east sides. There are several significant areas of mature specimen trees and woodlands around the periphery of the campus.

- Buffer Zones: A 250-foot wide buffer zone exists around the perimeter of the site. Buildings are restricted in this area.
- Streams and Floodplains: There are two streams with associated floodplains on campus: the "NIH Stream" with its "North Branch" in the northeast sector and "Stoney Creek" in the southwest corner. New development should be placed outside of their respective floodplains. To meet Maryland State storm water management criteria, storm water drainage and retention should be addressed by an Institutional Storm Water Management Plan.
- Important Views and Axes: There are strong visual axes created by the relationship of The Central Administration Building (Building-1) to the tower of the WRNMMC as well as the axis created by the symmetrical nature of the existing Clinical Center (Building-10). Additionally, there are important views into the campus, primarily at the corners of the site.
- Historic Resources: There are two historic districts and several buildings on the NIH Bethesda Campus eligible for listing on the "National Register for Historic Places" including "The Historic Core District", (Buildings 1-6), "The Officers' Quarters Historic District" (Buildings 15B -15J), "The Wilson Estate" (or "Tree Tops", Building-15K), "The Peter Estate" (Buildings 16 and 16A), "The National Library of Medicine" (Building-38), and "The Convent" (Building-60). These buildings should be retained and their settings respected by new development.
- Archeologically Sensitive Sites: Four areas of the campus have been designated as "archeologically sensitive" areas, in that they have not been disturbed. The largest of these occur in undisturbed areas at the periphery of the campus. If development is proposed for these areas, appropriate archaeology surveys will need to be conducted.
- Utilities: There are several utility tunnels and many existing utility distribution lines on campus. The location of new buildings should avoid utility tunnels and be coordinated with existing utility lines.

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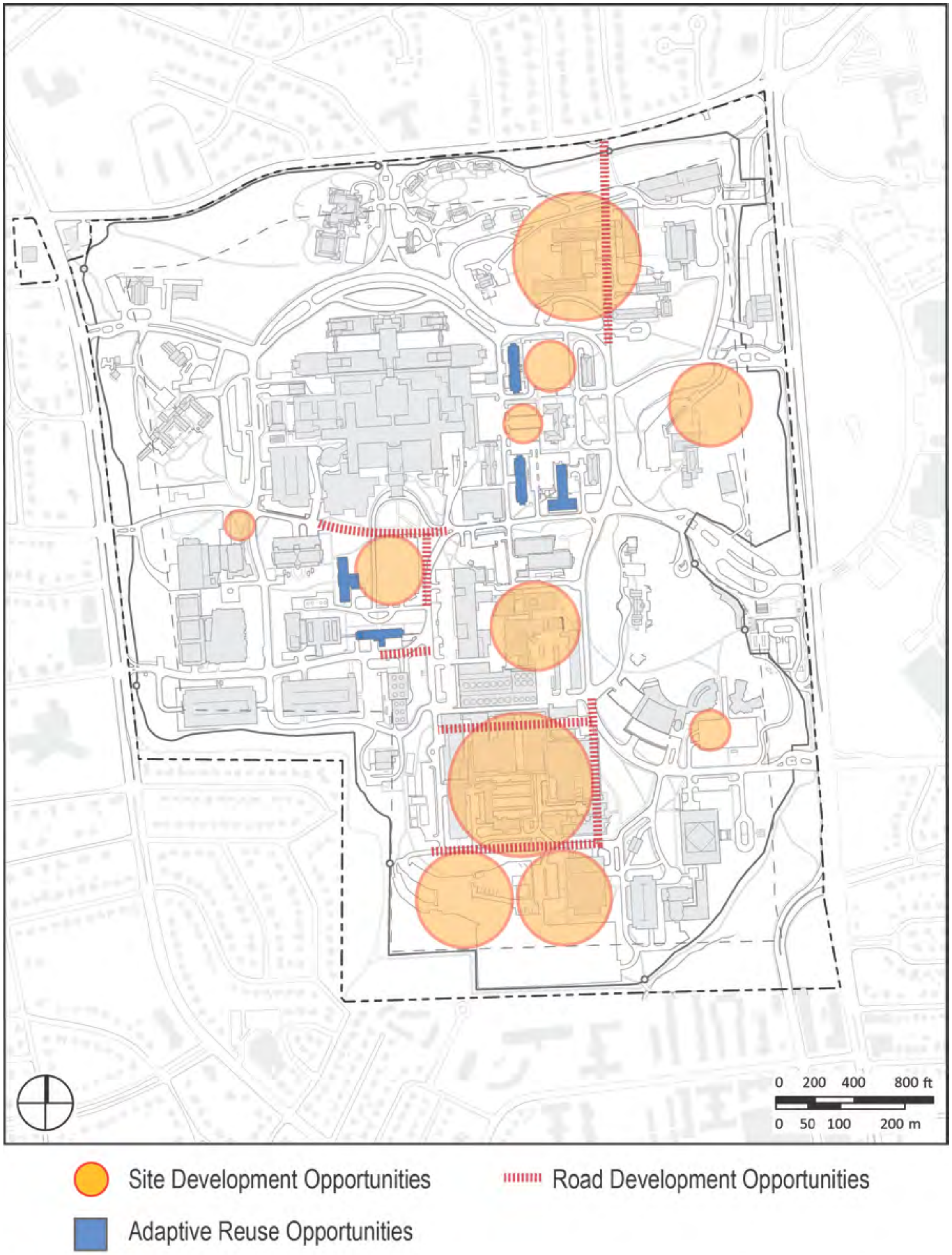

Exhibit 4.12.A. Opportunities

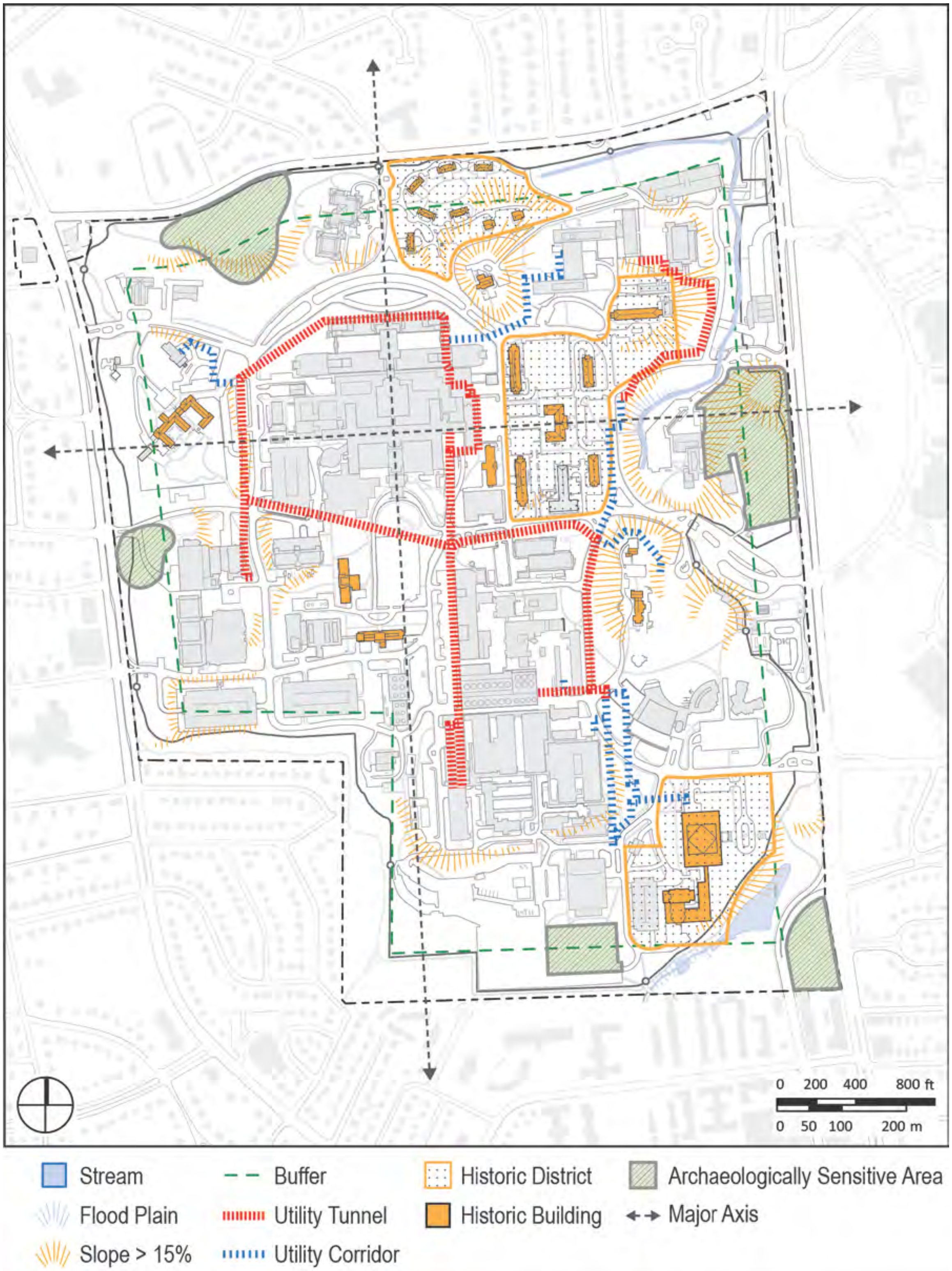

Exhibit 4.12.B.Existing Constraints

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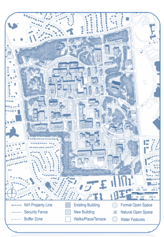
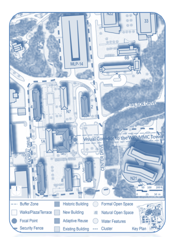
END OF CHAPTER 4.

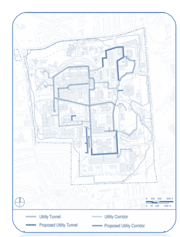
U.S. Department of Health and Human Services

National Institutes of Health

Chapter 5
NIH Bethesda Campus Master Plan





Prepared by the Division of Facilities Planning
Office of Research Facilities

06-14-2013

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5 NIH Bethesda Campus Master Plan

5.1 Planning Process

5.1.1 Approach to the Master Plan

The staff of Division of Facilities Planning (DFP) has determined that there is a need for a new NIH Bethesda Campus Master Plan because it is has become critical in light of key projects and programs that are planned, underway, or soon-to-be-completed. These projects include: renovation of the John Porter Neuroscience Research Center II (PNRC II) the Clinical Center, replacement of the Building 31 Complex, adaptive reuse and renovation of the Building 29 Complex (when the Food and Drug Administration relocates the Center for Biologics Evaluation and Research to White Oak, MD), construction of the Animal Research Center; and expansion of the Central Utilities Plant (Buildings 11 and 34).

DFP's approach to the NIH Bethesda Campus Master Plan is to take into account NIH's impact on the region's economy and transportation systems, as well as the region's impact on NIH. The plan will adhere to Executive Order 13327 "Federal Real Property Asset Management". DFP's approach will also bring NIH's mission critical biomedical research facilities into the 21st century by adaptively reusing older and historic laboratories and replacing them with new state-of-the art biomedical research facilities. In addition, the master plan will:

- Bring back lease laboratory space to the campus.
- Maintain the current NIH Transportation Management Plan.
- Develop an orthogonal grid road system that will enhance internal pedestrian safety.
- Place parking structures at the perimeter of the campus.
- Ensure adequate site infrastructure to meet NIH's future needs.
- Protect NIH historic resources by employing adaptive reuse of historic laboratories into administrative functions.
- Provide the necessary amenities to enhance the working environment for NIH employees.
- Meet or exceed the Federal Real Property Council's Performance Measures with respect to: mission, condition, utilization, operating cost, and disposal of unneeded assets.

Realization of the Master Plan at any given time will depend on HHS and NIH priorities, governmental policy decisions, as well as budgetary considerations. The Master Plan does not represent the pre-approval of any individual facilities project or the pre-approval of the particular needs of specific programs to be accommodated on the campus. The Master Plan is, therefore, designed as a flexible framework and a guide for the orderly future development of the campus, if and as it occurs.

5.1.2 Summary of Master Plan Goals

The Master Plan contains the following goals to support the mission of NIH (discussed in Section 1.7):

- 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, patients, their families, and residents.
- GOAL 4: Respect the stability and integrity of the surrounding residential community.
- GOAL 5: Protect the environment of the NIH campus and its impact on the region.
- GOAL 6: Foster communication about NIH goals and policies.
- GOAL 7: Meet the Federal Real Property Council's Performance Measures.

5.1.3 Planning Principles

The planning principles for the NIH Master Plan are derived from the Goals and the planning and program premises. These principles represent broad physical design objectives which could be applied to any concept that is developed for the site.

5.1.3.1 Regional Objectives

- Reduce leased-portfolio and high operating cost by disposing of leased-research space and construct new biomedical research laboratories and animal research facilities on the Bethesda campus.
- As telework and hoteling increases the need for administrative space will decrease; therefore, new administrative space growth should be held to a minimum.

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5.1.3.2 Campus Organization

- Retain the landscaped character of the site perimeter; respect existing topography.
- Relate existing and future building groupings to an overall campus structure.
- Organize and develop the campus into a series of community clusters.
- Refine the sense of hierarchy among campus buildings and open spaces.
- Re-establish and reinforce the original orthogonal grid system of the campus (made legible from the roadway system) when locating and siting new structures.
- See Exhibit 5.1.A.

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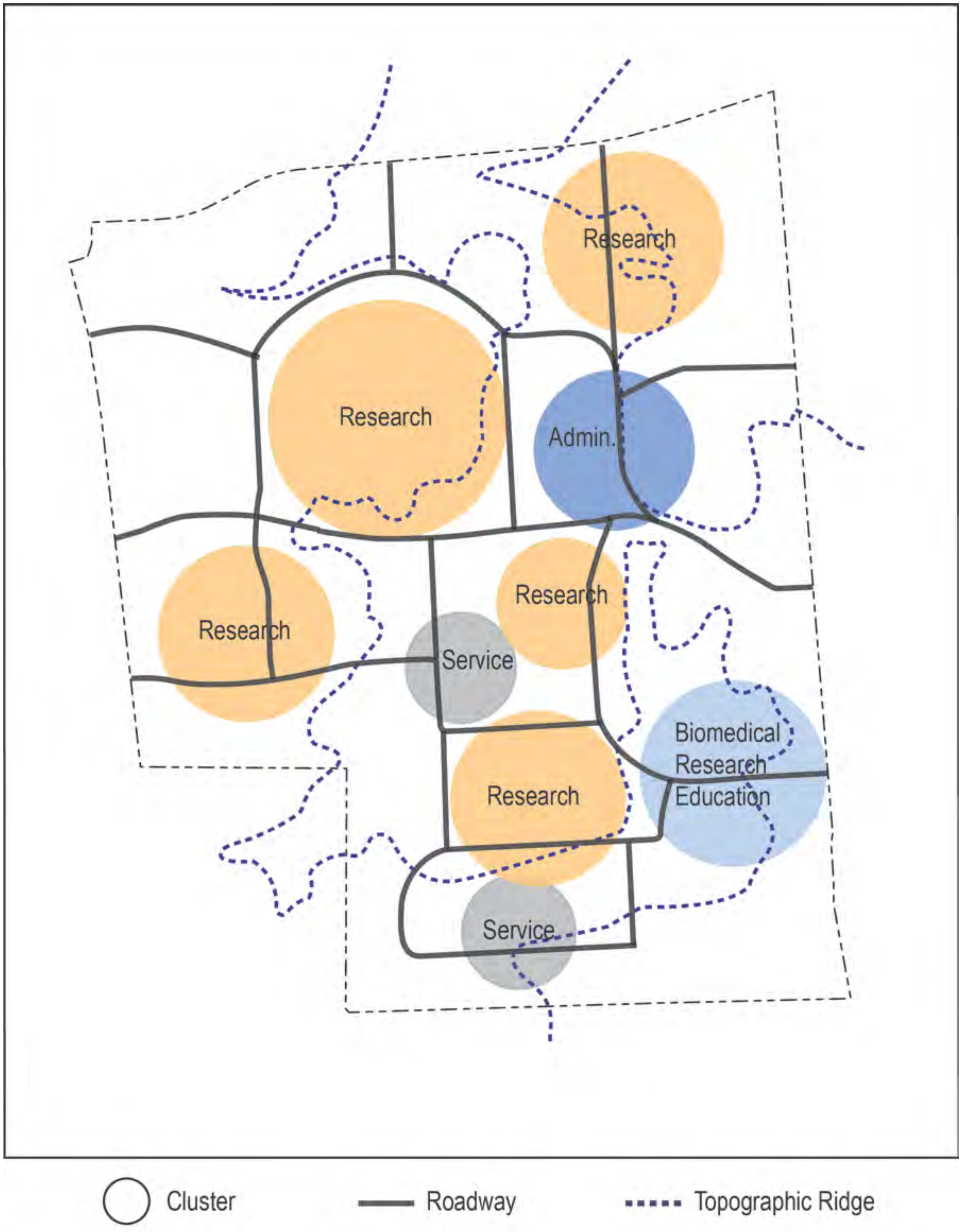

Exhibit 5.1.A. Planning Principles - Campus Organization and Structure

5.1.3.3 Zoning and Functional Relationships

- Construct new laboratories as "Centers of Science" zones, clustering related scientific research in order to create synergies and informal interaction among the intermural scientific community.
- Construct new administrative space via adaptive reuse of existing historic buildings.
- Cluster administrative and biomedical research education functions along the more "public" east side of the campus in close proximity to public transportation.
- Residential facilities are expected to contract and be converted to administrative space.
- Relocate and replace the waste management facilities.
- Relocate and replace the NIH police station.
- Consolidate utility and support/service functions in proximity to Building-11 and on the southern end of the campus.
- Expand steam, chilled water and electrical generation capacity to meet the needs of new research and support facilities
- Reduce the surface parking in favor of structured parking to provide additional space for research laboratory construction and open space.
- See Exhibit 5.1.B.

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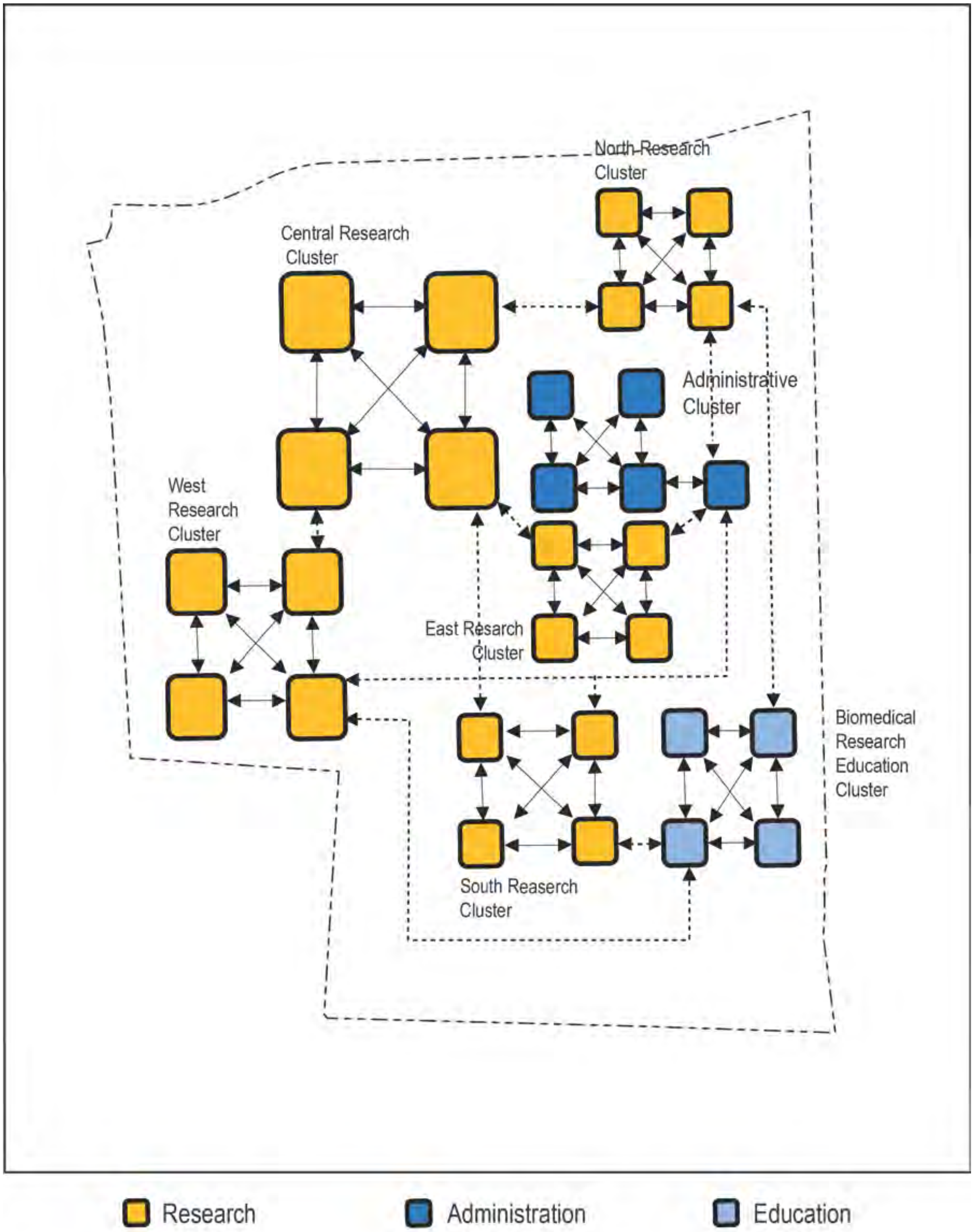

Exhibit 5.1.B. Planning Principles - Zoning and Functional Relationships

5.1.3.4 Open Space

- Preserve the perimeter of the campus as informal open space with an informal landscape character. The buffer zone around the periphery will be retained at a width of 250 feet from the NIH property line.
- Enhance and preserve the unique landscape characteristics of the four corners of the site:
    - the “Woodland” at the northwest corner
    - the “Stream” at the northeast corner
    - the “Lawn” at the southeast corner, and
    - the “Park” at the southwest corner
- Retain less densely planted lawn areas allowing views into the site along Rockville Pike and Old Georgetown Road.
- Create or enhance defined open space within the interior of the campus. The landscape character within this area of the site should be more formal than the naturalized perimeter buffer. Develop an open space system to enhance the sense of unity, order and scale on the campus.
- Locate and utilize interior campus open spaces to link the various areas of the campus, and to create a pedestrian friendly environment.
- Landscaped elements of special value will be preserved and additional landscaping, signage, and street furniture will be added to enhance the campus environment.
- Historic resources and their environmental settings will be respected.
- Where there are opportunities to develop large sites NIH will plan and cluster facilities around entrance plazas or “pocket parks” that are pedestrian oriented and restrict vehicle access.
- See Exhibit 5.1.C.

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Exhibit 5.1.C. Planning Principles - Landscape and Open Space

5.1.3.5 Access and Circulation

- Traffic impacts of future campus development will be mitigated on the surrounding roadways serving the NIH campus to the maximum extent possible.
- Shuttle bus service will be maintained to and from off-campus sites.
- Reinforce the Rockville Pike and Old Georgetown Road corridors as the primary and secondary regional public frontages for the site.
- Maintain the existing visitor entries at Cedar Lane and Rockville Pike.
- Provide a well-defined road system with a primary distributor network carrying the bulk of vehicular traffic and a network of secondary roads providing service accessibility to increase efficiency, orient the visitor and protect open spaces and pedestrian routes.
- Reconnect South Drive to ease the flow of east west campus traffic.
- Construct a new road from Center Drive near Building 6 to Cedar Lane.
- See Exhibit 5.1.D.

5.1.3.5.1 Pedestrian and Cyclist Circulation

- Create safe, well lit, landscaped and furnished pedestrian pathways, and bicycle routes that link campus buildings to the Medical Center Metro Station.
- Provide for orderly, efficient and safe pedestrian pathways between buildings and transportation nodes.

5.1.3.5.2 Parking

- Employee parking will favor multi-occupant vehicles and mobility impaired drivers. It will provide for NIH employees traveling from other NIH sites not served by shuttle bus.
- Reduce surface parking on the campus (to the extent feasible) to create a more pedestrian friendly environment and reduce storm water runoff.
- Concentrate employee parking in existing or new parking “receptors” which are:
    - Conveniently accessed from major campus entries.
    - Located away from the Medical Center Metro Station.
    - Buffered from residential neighborhoods.
    - Distributed in proportion to the campus population throughout the site.

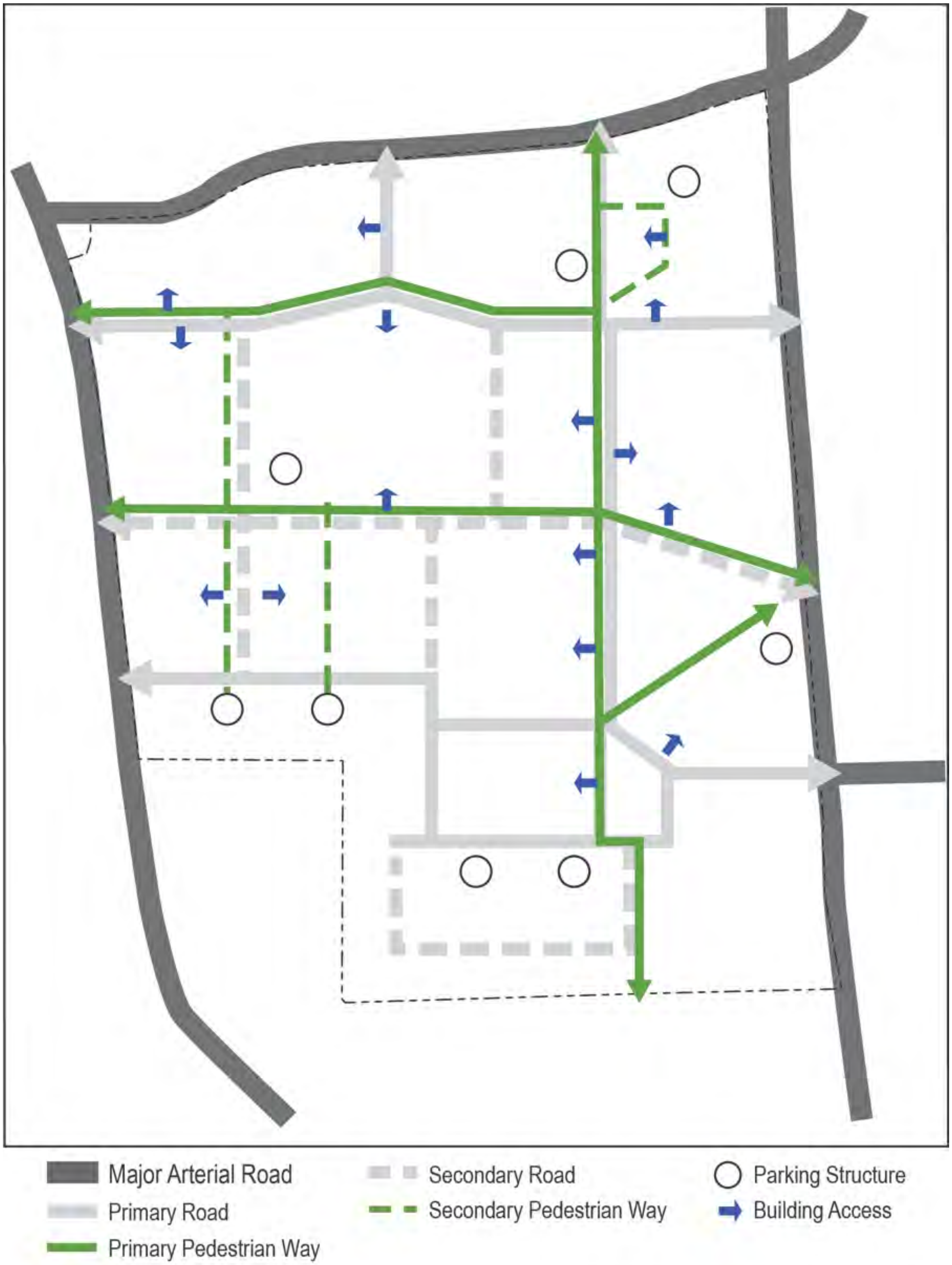

Exhibit 5.1.D. Planning Principles - Access and Circulation

5.1.3.6 Development Proximity to the Medical Center Metro Station

- Encourage public transit use by locating development within walking proximity to the Medical Center Metro Station.
- Visitor-oriented amenities should be located as close to the Medical Center Metro Station transit node as possible.

See Exhibit 5.1.E.

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Exhibit 5.1.E. Planning Principles - Development in Proximity to Metro

5.1.3.7 Architectural Image

- The architecture image of buildings on the NIH Bethesda campus shall be of the highest aesthetic quality to preserve and enhance the beauty and order of the NIH Bethesda campus.
- Establish Center Drive as “Main Street” where the campus’ major and important buildings are placed. Open sites on Center Drive will be reserved for important buildings.
- Establish South Drive between the Medical Center Metro Station and the Clinical Center Complex (the “heart” of campus), and Center Drive between Building 45 and Building 1 (the “front” of campus), as “main pedestrian arteries” along which primary pedestrian circulation flows. Develop the sidewalk and building frontage along these streets into wider pedestrian-friendly boulevards that reinforce safe, efficient, and pleasant pedestrian and bicyclist circulation to the “heart” and along the “front” of campus.
- Improve and enhance the streetscape of Center Drive by providing a unifying signage system, enhance lighting, landscaping, open space and street furniture.
- See Exhibit 5.1.F.

5.1.3.8 Adaptive Reuse and Renovation of Existing Buildings

- Employ adaptive reuse of older and historic structures where practical to extend the useful life of those buildings.
- Adaptive reuse of existing structures is a cornerstone of sustainability and maintains the historic fabric of the campus.

5.1.3.9 Reduce Operating Cost

- Reduce operating cost by replacing leased space with government-owned space.
- Dispose of unneeded assets.
- Adapt and reuse older laboratory facilities with less energy intensive uses such as administrative uses.
- Construct new sustainable research facilities to replace older non-sustainable research facilities.

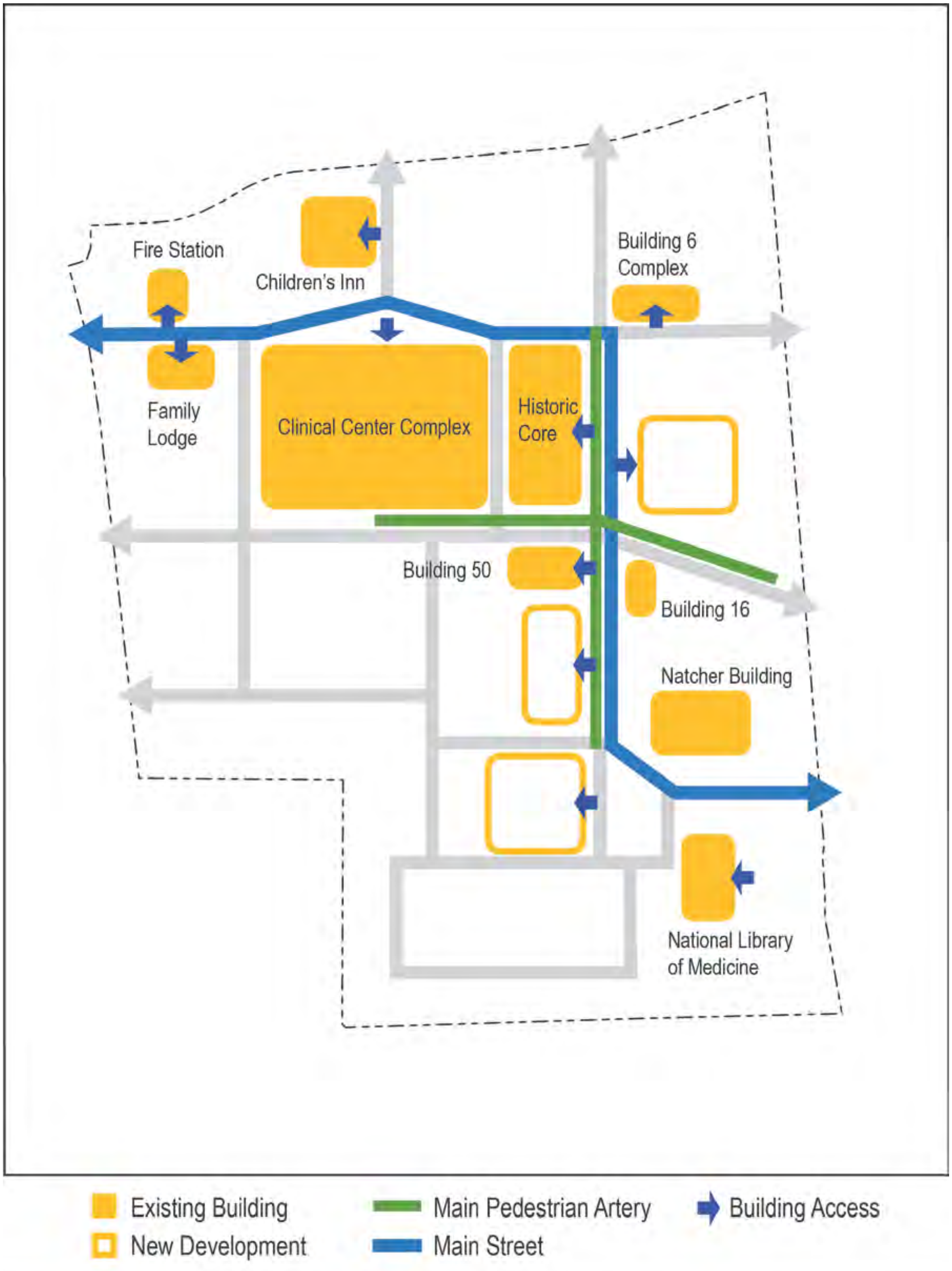

Exhibit 5.1.F. Planning Principles - Architectural Image

5.1.3.10 Population Growth

- Campus population will increase as employees return to campus from leased facilities but the overall employee population is expected to remain flat.
- NIH anticipates a reduction in the number of employees that report to campus on a daily basis as telework and hoteling programs are adopted by the NIH Institutes and Centers.

5.1.3.11 Improve Building Performance

- Improve building performance in accordance with the Federal Real Property Council's and NIH's performance measures.
    - The proposed new construction, adaptive reuse and demolition will improve the Bethesda Campus condition index
    - The proposed new construction and adaptive reuse will improve the Bethesda Campus utilization rate.
    - The proposed new construction and adaptive reuse will eliminate functional obsolescent facilities on the Bethesda Campus.
    - All unneeded real property assets on the campus will be disposed of through demolition.

5.1.3.12 Clinical Center Stabilization and Renovation Program

- The existing core of Building-10 will be retained and should remain the highest building mass within the Clinical Center Complex composition.
- Due to the large bulk of the Clinical Center Complex and the Clinical Research Center, appropriately scaled open spaces should be created around the building and the relative sense of openness of the surrounding landscape should be preserved.
- The "public face" of the complex and the primary public entrance is located on the north side of the complex addressing Center Drive "Main Street".
- The primary campus or research entry is located on the south side of the complex.
- Service access is located away from the primary entries and pedestrian circulation paths.

5.1.4 Alternatives

The three alternatives detailed below were considered when preparing the Master Plan. They are described and evaluated below with respect to the Master Plan Goals that were presented in Section 5.1.2. The findings are summarized at the end of this section in Exhibit 5.1.J and Exhibit 5.1.K.

5.1.4.1 Alternative 1 - Minimum Development

In the minimum development alternative, existing structures will not be demolished and the new construction will be limited, as depicted in Exhibit 5.1.G. New development will consist of buildings that are currently under construction, Porter Building Phase 2 and the Northwest Childcare Center, which total approximately 535,690 gsf. Since existing buildings are not demolished in this alternative, the only site available for new construction is east of Building 45.

Under this alternative there would not be a need to establish a comprehensive and coordinated approach to physical development at NIH that will ensure the orderly growth of NIH facilities since there would not be an opportunity to develop building sites, open spaces, or realign campus circulation systems. This alternative precludes opportunities to identify patterns of existing development in relationship to factors which potentially limit future development and therefore define an achievable development strategy.

If the minimum development alternative is pursued, NIH will not meet or fully support:

Goal 1: to foster innovative research to improve the nation's health or Goal 2: to Support the evolving requirements for biomedical research and education. The NIH needs new, state-of-the-art facilities to remain at the forefront of biomedical research. Limiting the campus growth to renovations of outdated buildings is a costly and inefficient solution which would not fulfill the needs of the NIH intermural community.

Goal 3: to provide a secure and supportive environment for the people involved in NIH activities, including scientists and professional/administrative staff, visitors, patients, their families, and residents. This goal is not met because this alternative does not allow the opportunity to create "scientific Centers" which will further enhance the interaction among scientists and create opportunities for interdisciplinary collaboration through adjacency of scientific resources and the creation of formal and informal meeting and gathering spaces on campus. It would not allow for the construction of adequate campus amenities such as child care, recreational resources, fitness facilities, convenience retail, conference facilities, etc.

This Minimum Development Alternative will technically fulfill:

Goal 5: to protect the environment of the NIH campus and the region by maintaining the current facilities, but it will limit the opportunities to comply with HHS sustainability goals since NIH would maintain inefficient buildings and, therefore, could not expect significant improvement in energy use, water use or air quality. This alternative will provide limited opportunities to enhance campus design to encourage greater NIH employee use of bicycles and walking as commuting modes.

Goal 6: to foster communication about NIH goals and policies, could be accommodated in a minimum development alternative but many of the National Library of Medicine programs and facilities that could effectively be accommodated on the Bethesda Campus would have to be placed in leased facilities. This is not beneficial to the programs or the efficient operation of the institute.

The Minimum Development Alternative will take longer to meet:

Goal 7: the Federal Real Property Council's performance measures. Under this alternative the number of mission critical, mission dependent and non-mission dependent structures will remain the same. The condition index will only modestly improve. The rate of over-utilized facilities may increase due the inability to grow under this alternative. Operating cost could be expected to trend upward due to need to maintain and operate inefficient space and an increase in leases due to unavailability of space on campus. This alternative will not allow NIH to dispose of functionally obsolete space.

The minimum development alternative will only fully meet Goal 4, to respect the stability and integrity of the surrounding residential community. It will conserve the campus perimeter buffer zones bordering the residential areas. This alternative will maintain the scale and height of existing NIH facilities ensuring that they have no adverse impact on adjoining neighborhoods or cultural resources. It will continue to foster effective transportation solutions to minimize both external and internal traffic and parking problems.

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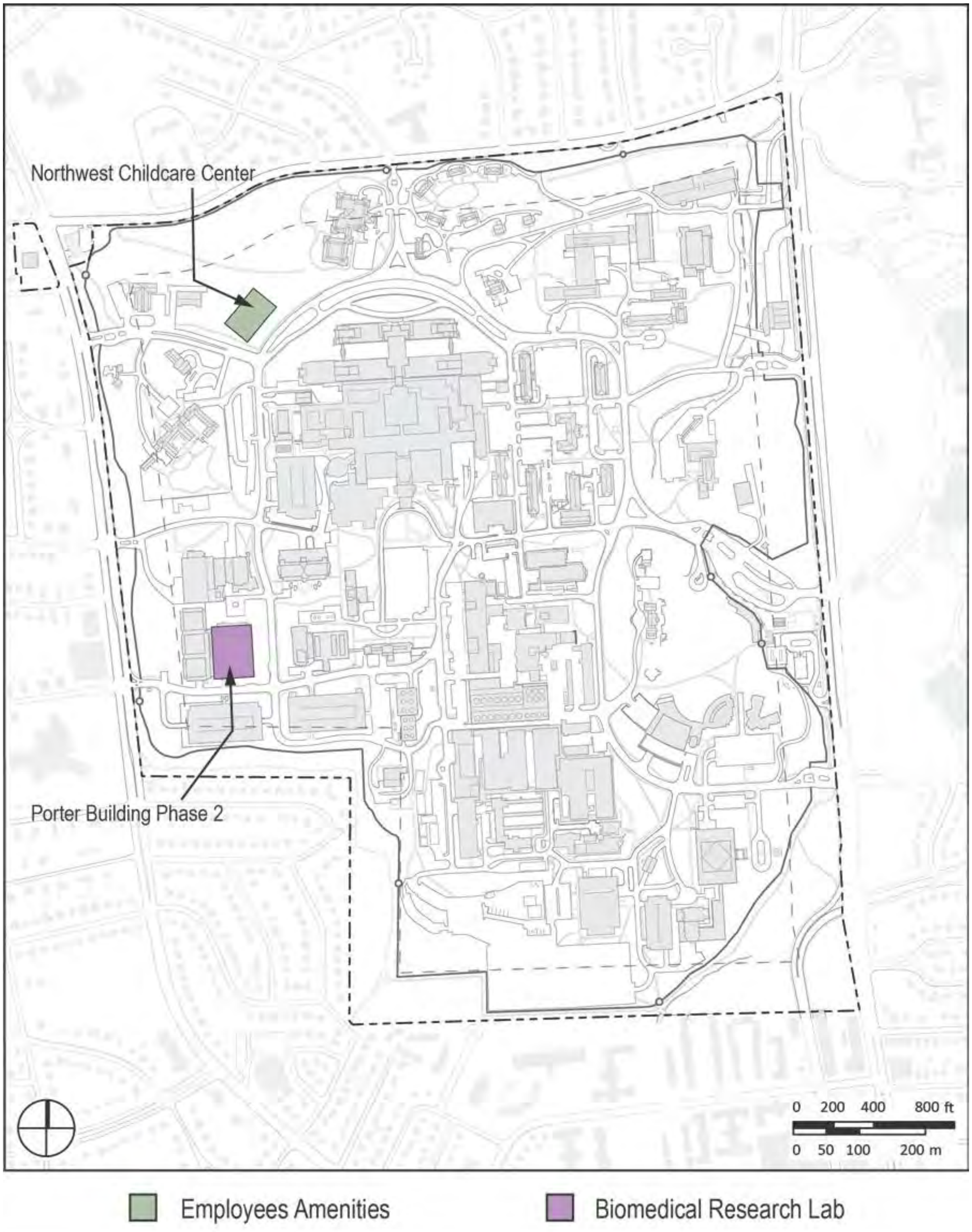

Exhibit 5.1.G. Alternative 1 – Minimum Development

5.1.4.2 Alternative 2 – Redevelopment

The Redevelopment Alternative proposes replacing the laboratories that were constructed during the mid-20th century with new state-of-the-art laboratories. The vacated laboratories would be adapted to new uses. These uses would include office space, physician offices and space for systems biology and other "dry" lab functions. This alternative will bring some of the leased laboratory space to the campus. It will replace and modernize the campus waste transfer and storage facilities. The redevelopment alternative would replace the Building 14/28, Building-31 and Building-12 complexes. New development would consist of 4,430,598 gsf of new construction with a population increase of 3,000. Exhibit 5.1.H depicts these redevelopment activities.

The Redevelopment Alternative gives NIH opportunities to develop building sites, open space, and transportation and circulation systems that will ensure appropriate campus facility utilization, functional land use and efficient accommodation of future program requirements. There will be an opportunity to enhance campus function, efficiency and character through better definition of land use and functional relationships. This alternative enhances opportunities to identify patterns of existing development and factors which potentially limit future development and therefore define an achievable development strategy.

This alternative will enhance the quality of the research and work environment and overall campus quality. It will preserve the integrity, and it will build upon the character of the NIH campus. It will continue to preserve structures with established historic and cultural value, and protect and document important archeological finds. This alternative will improve the system of landscape that enhances the quality and character of the campus. It will increase the ease of orientation and direction-finding around the campus and improve pedestrian and bicycle movement on campus. The Redevelopment Alternative will define and communicate building character and scale to achieve a perceivable and attractive identity. This alternative will provide for the convenience and safety of employees and the neighborhood through site lighting and security.

Within this Alternative, NIH could establish a comprehensive and coordinated approach to physical development of the NIH Bethesda Campus that is based on cost-effective, incremental growth which would ensure orderly development of the campus. This alternative would support Goals 1: foster innovative research to improve the nation's health and; Goal 2: support the evolving requirements for biomedical research and education. Redevelopment of the Bethesda Campus would afford NIH the opportunity to create a flexible development plan that will allow for changing program needs in the future. NIH will be able to address potential impacts of changes in technology and advances in research processes.

The Redevelopment Alternative would satisfy Goal 3: provide a secure and supportive environment for the people involved in NIH activities, including scientists and professional/administrative staff, visitors, patients, their families, and residents. It would enhance the quality of the research facilities and create opportunities for interdisciplinary collaboration through adjacency of uses and the creation of formal and informal meeting and gathering spaces on campus. This alternative will allow for campus amenities such as child care, recreational resources, fitness facilities, convenience retail, etc. It will 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.

The Redevelopment Alternative will support Goal 4: to respect the stability and integrity of the surrounding residential community by conserving the campus perimeter buffer zones. This alternative will maintain the scale and height of existing NIH facilities ensuring that they have no adverse impact on adjoining neighborhoods or cultural resources. It will minimize future construction near the adjoining residential neighborhoods. This alternative will protect adjoining neighborhoods from intrusion of NIH traffic, parking, noise, and intrusive lighting. It will endeavor to ensure that the NIH and its activities do not contribute to security or safety issues in adjoining neighborhoods. It will continue to foster effective transportation solutions to minimize traffic and parking problems both external and internal.

The Redevelopment Alternative will meet Goal 5: to protect the environment of the NIH campus and its impact on the region by providing opportunities to meet the HHS sustainability goals. It will provide opportunities to identify and build upon the unique environmental qualities of the campus and enhance existing landscaping and vegetation. It will continue to maximize the use of public transportation and shared transportation, and reduce the use of the single occupancy vehicle. This alternative will provide opportunities to enhance campus design to encourage greater NIH employee use of bicycles and walking as commuting modes. The Redevelopment Alternative will improve and enhance bikeways and bicycle circulation on the campus. There will be opportunities to promote energy efficiency. It will maintain current management of storm water runoff quality and quantity above minimal State requirements. This alternative will maintain ambient noise levels in adjacent residential areas caused by campus sources. It will improve and enhance facilities for storage and handling of hazardous materials. This alternative will encourage environmentally sound development, sensitive to surrounding neighborhoods and responsive to optimizing the campus' close proximity to the Bethesda Central Business District.

The Redevelopment Alternative will meet the Federal Real Property Council's performance measures, Goal 7 of the master plan. Under this alternative the number of "mission-critical" and "mission-dependent" structures will increase. The condition index will improve. The rate of over-utilized facilities will decrease under this alternative. Operating costs are expected to trend downward due to new and efficient space uses and decrease in research leases. This alternative will allow NIH to dispose of unneeded real property and functionally obsolete space. It will also allow NIH to adaptively reuse existing buildings.

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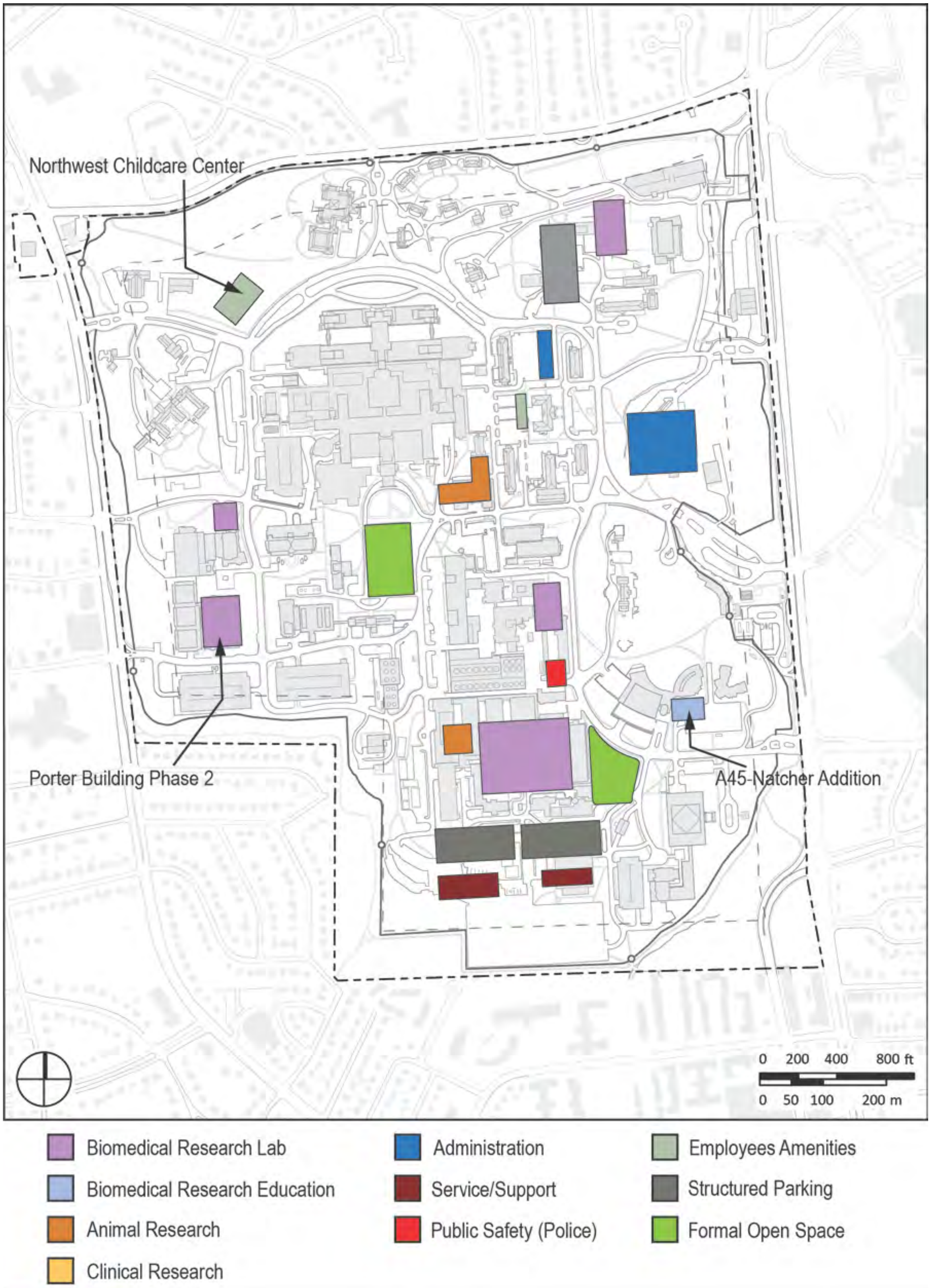

Exhibit 5.1.H. Alternative 2 - Redevelopment

5.1.4.3 Alternative 3 - Maximum Development

The Maximum Development Alternative assumes that the laboratories that were constructed during the mid-20th century on the NIH Bethesda Campus will be replaced with new state-of-the-art laboratories. Some of buildings that are currently older laboratories will be adapted to new uses such as office spaces, physician offices or space for systems biology the others will be replaced with new office buildings. This alternative will bring all leased laboratory and all office space except for the quasi-commercial leases into new facilities on the Bethesda Campus. It will replace and modernize the campus waste transfer and storage facilities. This plan calls for the replacement of the Building-31, Building 14/28 and Building-12 complexes and Buildings 4, 5, 8, 16, and 16A. New development will consist of 7,063,298 gsf of new construction with a population increase of 10,000. Maximum development is depicted in Exhibit 5.1.I.

Similar to Alternative 2; the Maximum Development Alternative would meet Goals 1, 2, 3, 6 and 7. However, the proposed level of population growth would have significant impact on the surrounding community and the environment which would make it difficult to meet Goal 4: respect the stability and integrity of the surrounding residential community, and Goal 5: Protect the environment of the NIH campus and its impact on the region.

In an effort to meet Goal 4 the Maximum Development Alternative would conserve the campus perimeter buffer zones, especially those bordering the residential areas. It would endeavor to ensure that the NIH and its activities do not contribute to security or safety issues in adjoining neighborhoods. It would continue to foster effective transportation solutions to minimize traffic and parking problems both external and internal. However an increase in population of 10,000 full time employees will create significant impacts on currently congested roadways. While the Maximum Development Alternative would provide opportunities to promote national sustainability goals and provide opportunities to build upon the unique environmental qualities of the campus, an increase in population and the number of facilities at this scale could have significantly impact on the environment that would need to be mitigated.

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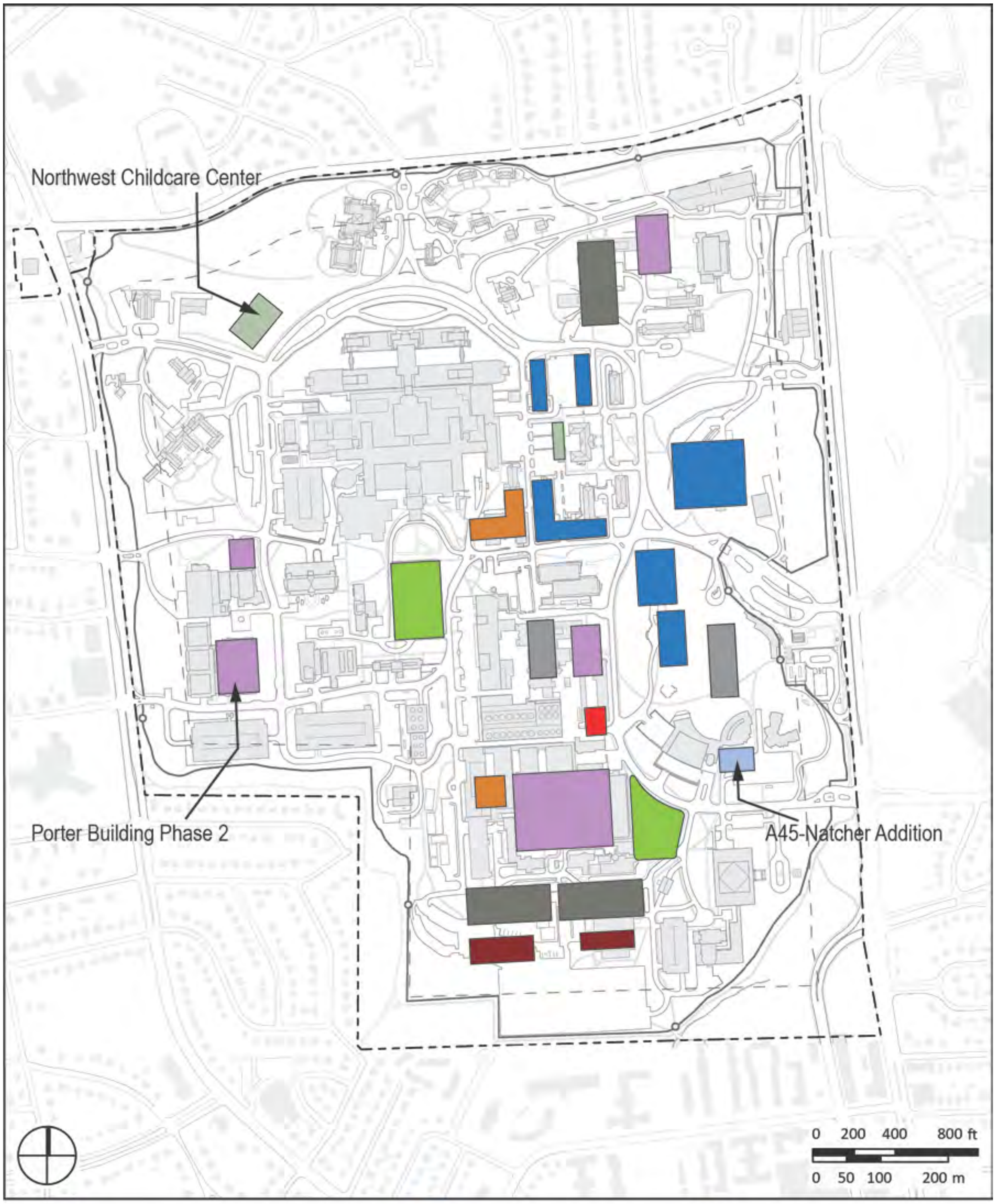

- Biomedical Research Lab
- Biomedical Research Education
- Animal Research
- Clinical Research
- Administration
- Service/Support
- Public Safety (Police)
- Employees Amenities
- Structured Parking
- Formal Open Space

Exhibit 5.1.I. Alternative 3 - Maximum Development

5.1.4.4 Conclusion

The alternatives present evaluations of minimal development, redevelopment (moderate development) and maximum development. The programmatic needs for the Bethesda area remain the same. The decision that has been made is that it is cost effective to bring research and animal facilities onto the government enclave while it is more cost effective to leave administrative space in lease facilities in Montgomery County, MD.

The analysis of Alternative 1 illustrates that, if the minimum development alternative is pursued, NIH will not meet a majority of its goals because there will not be the opportunities to realign programs into scientific centers, renovate facilities and bring facilities up to current sustainability goals. The analysis of Alternative 3 shows that maximizing development by bringing all the administrative space back to the campus could have detrimental impacts on the surrounding community and NIH employees commuting to the campus It was determined that moderate development, as proposed in Alternative 2, was the appropriate program scale that could be accommodated on the Bethesda Campus; therefore Alternative 2 – Redevelopment – is the preferred alternative. Conclusions and development scale are summarized in Exhibit 5.1.J and Exhibit 5.1.K.

Exhibit 5.1.J. Summary Table of Alternative Support of Master Plan Goals

LEGEND	○	◉	●
Degree of Support for Goal	Minimal	Fair	Extensive

Goal / Alternative (Development Extent)	Alt 1: Minimum	Alt 2: Redevelop	Alt 3: Maximum
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	◉	●	●

Exhibit 5.1.K. Proposed Development Table

Building	GSF	Alt. 1: Minimum Development	Alt 2: Re-development	Alt 3: Maximum Development
Porter Neuroscience Center	514,355	✓	✓	✓
Northwest Childcare Center	21,335	✓	✓	✓
Cafeteria Addition	26,000		✓	✓
NIH Data Center	118,664		✓	✓
Central Animal Research Center	299,891		✓	✓
Research Laboratory	256,538		✓	✓
Research Laboratory	774,504		✓	✓
Police Station	45,000		✓	✓
Radiation Safety Offices and Laboratories	36,123		✓	✓
Chemical Waste	6,300		✓	✓
Mixed Waste	2,371		✓	✓
Biomedical Waste and Recycling	11,700		✓	✓
Grounds Maintenance	22,218		✓	✓
Administration Building	601,039		✓	✓
Research Laboratory	287,808		✓	✓
Large Animal Facility	10,391		✓	✓
Research Laboratory Addition	46,200		✓	✓
Administrative Building Addition	87,461		✓	✓
Parking Structure	267,000		✓	✓
Parking Structure	267,000		✓	✓
Parking Structure	327,000		✓	✓
Administrative Building	240,000			✓
Administrative Building	240,000			✓
Administrative Building	480,000			✓
Administrative Building	311,350			✓
Administrative Building	311,350			✓
Parking Structure	525,000			✓
Parking Structure	525,000			✓

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5.2 Master Development Plan

5.2.1 The Master Plan

The NIH Master Plan is a strategic tool for the efficient allocation of campus resources, the orderly development of future growth, and the creation of an environment, which is both functionally and aesthetically conducive to accomplishing the mission of the National Institutes of Health. The plan also creates a rational framework to accommodate projected growth incrementally and in a manner which clearly reinforces the sense of the campus as a larger whole.

The main campus of the National Institutes of Health is located in Bethesda, Maryland on a rolling, landscaped, 310-acre site. The Master Plan proposes an approximate campus employee population growth from 20,000 current employees to a maximum 24,000 employees over the next 20-years. To support the potential growth in campus employees, the campus gross built area would increase during the 20 year Master Plan period from approximately 11.9 million gsf to 14.25 million gsf (not including parking structures).

Building area growth will be possible through the redevelopment of the southern portion of the campus, adjacent to Metro, and the northwest portion of the campus. Redevelopment will occur in a series of clusters to organize the campus in a more efficient manner. The Master Plan will direct density and development closer to the Medical Center Metro Station to encourage greater use of public transit. To the extent possible, surface parking will be consolidated into structured parking to decrease the net area of built or paved surfaces, which will improve storm water management and increase the open space on campus.

The Master Plan building directory with floor areas[1] is summarized in Exhibit 5.2.A. An illustrative site plan and site sections are depicted in Exhibit 5.2.B and Exhibit 5.2.C, respectfully. The remainder of this chapter provides detailed discussion.

The Master Plan defines the Clinical Center Complex as the heart of the campus. Open spaces and building groups extend out from the center, linking all parts of the campus into orthogonal related clusters. The campus has an urban character.

Several specific project programs are included in the Master Plan. The two largest are the, nearly complete, 514,355 gsf "Porter Neuroscience Research Center Phase 2 expansion" and the replacement of the Building-31 complex.

[1] Areas do not include parking structures

Additionally, the plan calls for replacing historic, functionally obsolete laboratories with new laboratories in the southern portion of the campus. Adaptive reuse of the historic laboratory buildings will provide administrative space for the NIH Office of the Director and physicians' offices. The historic laboratory buildings that are proposed for adaptive reuse are: Buildings 4, 5, 8 and 30. Reusing these buildings will help NIH meet suitability goals; reduce its leases and operating costs. Furthermore, it will provide for critically needed physicians' office space.

Currently there are no large sites on the Bethesda campus to construct critically needed new facilities. Demolition will be required to clear underutilized sites for new facilities.

Funding has been requested to demolish Buildings 7 and Building 9 to provide a site for a new central animal research facility to replace the Building-14/28-18/32 complex. Once it has been replaced, the demolition of the Building-14/28-18/32 complex and building 41 will provide a site for a new research cluster. A new state-of-the-art waste handling and transfer facility is proposed in the southern portion of the campus.

The Master Plan calls for the demolition of Building-21 (the Waste Handling and Transfer Facility) to allow the site to be used for the proposed replacement of the Building-31 complex. Also proposed is demolition of Building-12, Building-12A and Building-22.

Realization of the Master Plan at any given time will depend on HHS and NIH priorities, governmental policy decisions, as well as budgetary considerations. The Master Plan does not represent the pre-approval of any individual facilities project or the pre-approval of the particular needs of specific programs to be accommodated on the campus. The Master Plan is, therefore, designed as a flexible framework and a guide for the orderly future development of the campus, if and as it occurs.

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Exhibit 5.2.A. Master Plan Building Directory and Area Summary Table

Building #	Gross Area	Primary Use	Remarks
Note	*N/A*	*Building number prefixes*	*(N)ew, (A)ddition, and (R)enovated.*
1	95,948	Administration	NIH Headquarters
A1	26,000	Amenity	Cafeteria and Conference Center
2	47,979	Administration	Adaptive Reuse from laboratory to office
3	48,979	Administration	Adaptive Reuse from laboratory to office
R4	98,103	Administration	Adaptive Reuse from laboratory to office
R5	99,849	Administration	Adaptive Reuse from laboratory to office
6	84,347	Research	
6A	24,641	Research	
6B	58,817	Research	
N7	118,664	Administration	NIH Data Center
R8	99,471	Administration	Adaptive Reuse from laboratory to office
N9	299,891	Animal Research	AKA Building "D"
10	2,658,165	Clinical Research	
10-CRC	1,779,728	Clinical Research	
11 & 11A	290,488	Utility	NIH Central Utility Plant (CUP)
N11B	16,700	Utility	Addition to Building 11
N12	256,538	Research	
13	284,994	Support Services	
N14	774,504	Research	
15B1	4,033	Administration	Adaptive Reuse from residential to office
15B2	4,033	Administration	Adaptive Reuse from residential to office
15C1	4,033	Administration	Adaptive Reuse from residential to office
15C2	4,033	Administration	Adaptive Reuse from residential to office
15D1	4,033	Administration	Adaptive Reuse from residential to office
15D2	4,033	Administration	Adaptive Reuse from residential to office
15E1	4,033	Administration	Adaptive Reuse from residential to office
15E2	4,033	Administration	Adaptive Reuse from residential to office
15F1	4,033	Residential	Adaptive Reuse from residential to office
15F2	4,033	Residential	Adaptive Reuse from residential to office
15G1	4,033	Residential	Adaptive Reuse from residential to office
15G2	4,033	Residential	Adaptive Reuse from residential to office
15H	6,010	Residential	
15I	6,010	Residential	
15K	14,839	Residential	Proposed NIH Director's House
16	24,843	Biomedical Education	
16A	4,822	Biomedical Education	
17	7,651	Utility	Electrical Substation
N18	45,000	Public Safety	Police Station
N19	36,123	Support Services	Radiation Safety Offices and Laboratories
N19 A	6,300	Support Services	Chemical Waste Storage
N19 B	2,371	Support Services	Mixed Waste

Building #	Gross Area	Primary Use	Remarks
N19 C	11,700	Support Service	Biomedical Waste and Recycling
N20	22,218	Support Services	Grounds Maintenance
N21	601,039	Administration	New IC Headquarters
N22	287,808	Research	
N23	21,335	Amenity	Northwest Child Care Center
N24	10,391	Large Animal Facility	
N27		Utility	West Satellite Switching Station
R29	89,028	Research	Lab Administration and Computational Biology
R29A	106,694	Research	
29B	117,380	Research	
R30	110,240	Clinical Research	Physicians' Offices; Adaptive Reuse from laboratory to office
33	164,224	Research	
R34	46,680	Utility	Chilled Water Plant
R34A	25,867	Utility	Chilled Water Plant
35	514,355	Research	Porter Neuroscience Center
37	322,677	Research	
38	236,530	Biomedical Research Education	The National Library of Medicine
38A	226,545	Biomedical Research Education	Lister Hill
40	141,398	Research	
A40	46,200	Research	
45	537,014	Biomedical Research Education	Natcher
A45	87,461	Biomedical Research Education	Natcher II
46	11,526	Utility	Electrical Substation
48		Utility	West substation
49	274,509	Research	Silvio Conte
50	565,458	Research	Louis Stokes Laboratories
51	21,724	Public Safety	NIH Fire Station
52	689	Utility	Electrical Vault
53	3,968	Utility	Electrical Vault
54	168	Utility	Electrical Vault
59	2,891	Utility	Electrical Vault
60	67,500	Lodging	Mary Woodward Lasker Center
61	2,396	Administration	
61A		Administration	
62	70,448	Lodging	Children's Inn
63	8,000	Utility	Electrical Sub Station
64	15,448	Amenity	East Child Care Center
65	26,118	Lodging	Family Lodge

Building #	Gross Area	Primary Use	Remarks
66	12,325	Public Safety	Gateway Center
67	18,110	Public Safety	Commercial Vehicle Inspection Facility
68	782	Public Safety	Patient Screening Facility
MLP-6	280,206	Multi-Level Parking Structure	
MLP-7	137,578	Multi-Level Parking Structure	
MLP-8	465,276	Multi-Level Parking Structure	
MLP-9	351,034	Multi-Level Parking Structure	
MLP-10	375,000	Multi-Level Parking Structure	
MLP-11	118,334	Multi-Level Parking Structure	
NMLP-12	267,000	Multi-Level Parking Structure	
NMLP-13	267,000	Multi-Level Parking Structure	
NMLP-14	327,000	Multi-Level Parking Structure	

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Exhibit 5.2.B. Illustrative Master Plan

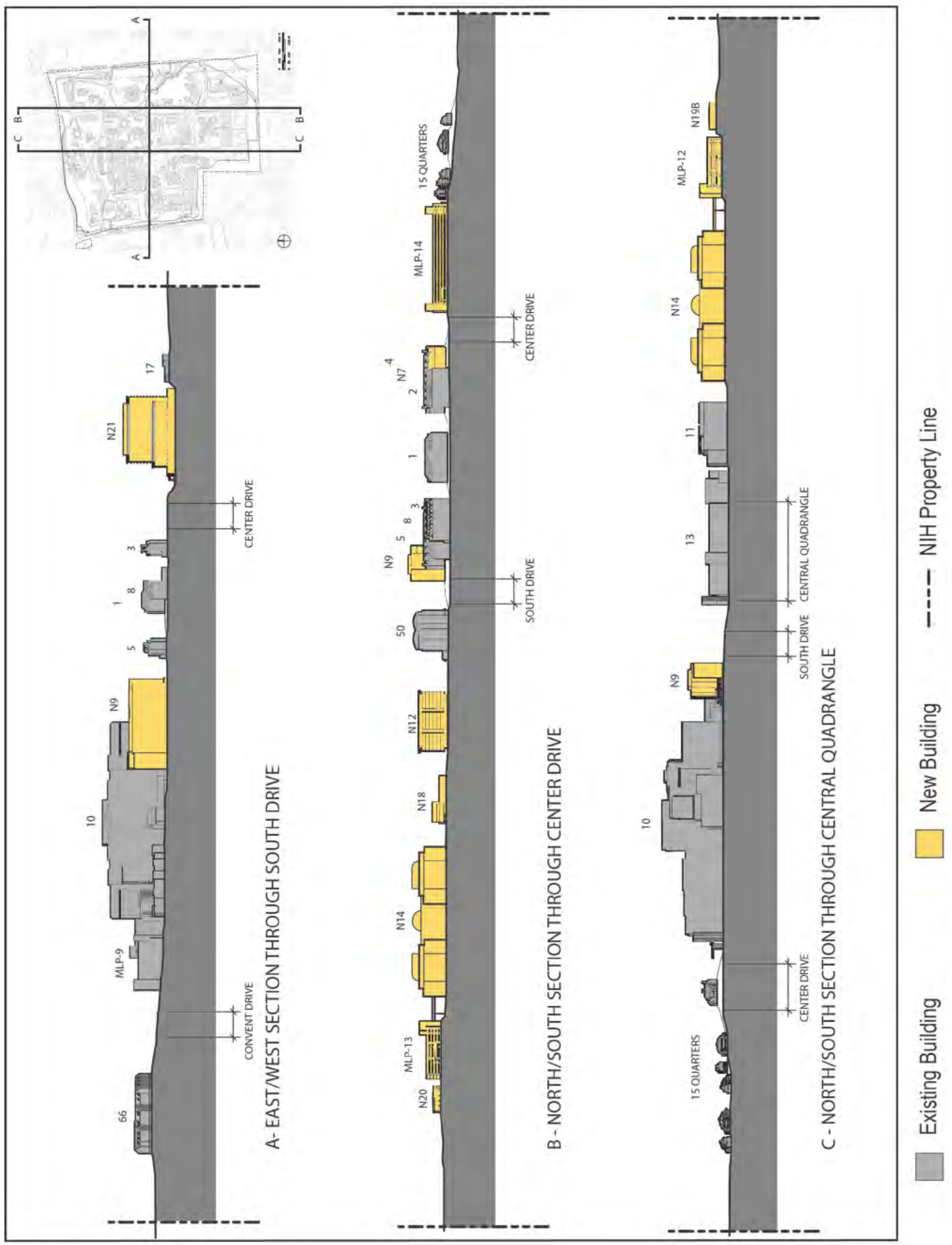


Exhibit 5.2.C. Site Sections

5.2.2 Master Plan Concept

The overall concept for the Master Plan is summarized graphically in Exhibit 5.2.D and based on the Planning Principles discussed in Section 5.1.3.

5.2.2.1 Building Patterns

The existing pattern of building clusters as defined by the functional relationships described in Section 5.1.3.3 will be continued and enhanced by the Master Plan. Buildings are placed to relate to each other through open spaces which clearly identify the research cluster. The open space defining the proposed “South Research Cluster” will be a single building with an enclosed atrium. .

There are six existing program clusters or building groups that will remain and anchor the site. The North, East, Center, West, Administrative, and Biomedical Research Education Clusters will remain as will the supporting Central Service Cluster. All existing clusters will have infill construction. In addition, two new clusters will be developed at the south of the campus. They are the "South Research Cluster" and the “South Service Support Cluster”. There will be three new multi-level parking structures, two in the southern cluster and one near the existing Building-31 site. Existing residential buildings and public safety facilities will anchor a significant section of the north perimeter.

All new development will follow the orthogonal grid initially generated by the Historic Core (Buildings 1 through 5). Within this grid, important focal points and axes are identified which should be respected in the location and design of individual buildings. These key focal points include the central administration Building-1, Building-16 (“Stone House”), the termination of the restructured entry of Center Drive at Rockville Pike, and the north and south ends of the Central Quadrangle. Advantages of developing the campus on a grid system include ease of integration with existing orthogonal oriented structures, efficiency of land use, and the acknowledgment and further establishment of a clearly defined pattern to guide future growth.

5.2.2.2 Massing and Heights

The primary concept for building massing on the NIH Bethesda Campus is the concentration of the tallest structures at the center and east of the campus along Rockville Pike, with a transition in height to lower buildings toward the perimeter. It is also important to establish a transition in height between new development and existing historic structures such as the buildings in the Historic Core, the Stone House, and the Wilson Estate.

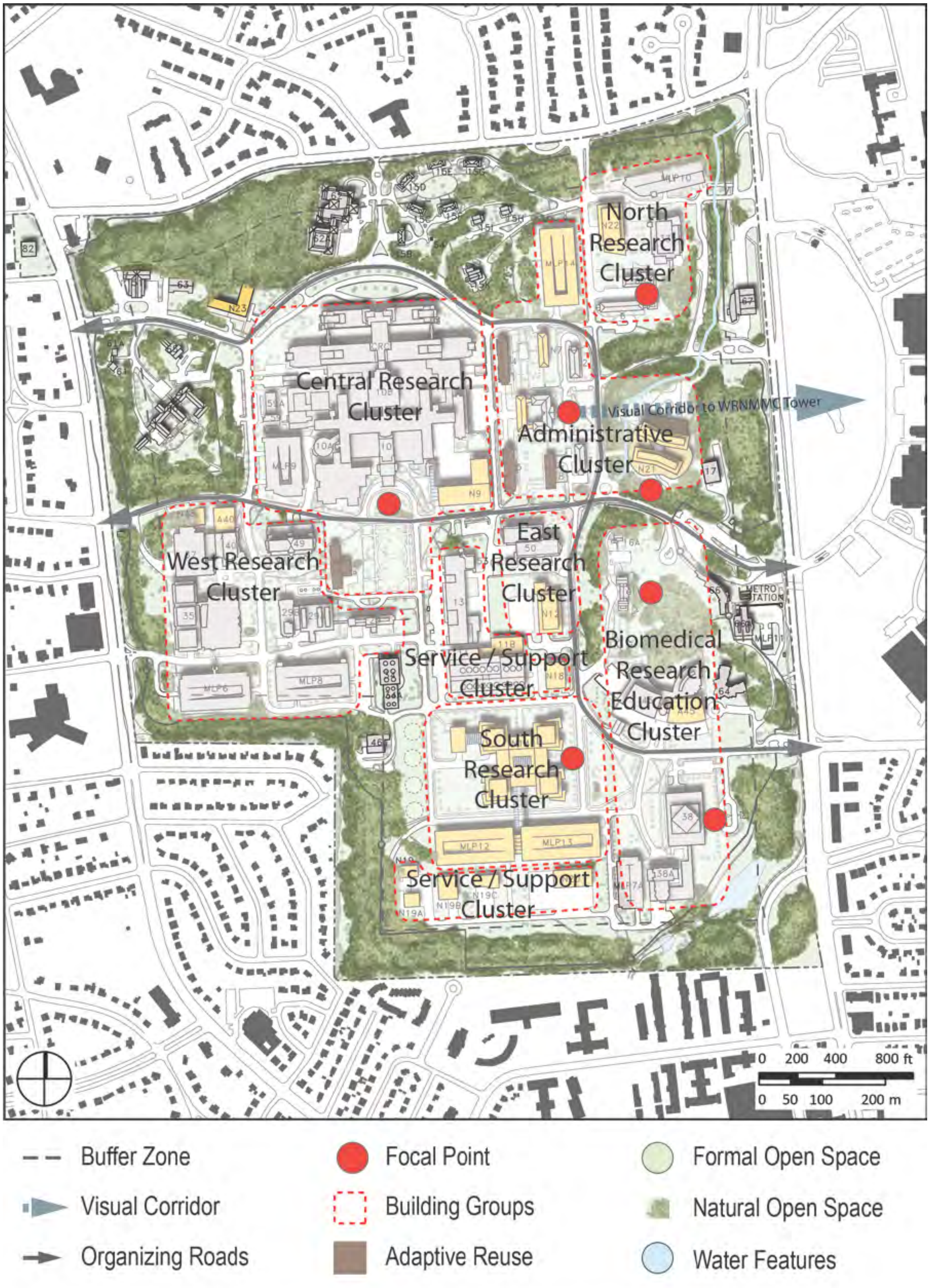


Exhibit 5.2.D. Concept Diagram

5.2.3 Campus Population and Growth

During the Buildings and Space Plan Interviews in 2010 and 2011, the Institutes and Centers stated that they did not anticipate any growth in their intramural programs within the next 5 to 10 years. The population for the Bethesda Campus is expected to grow by 3,265 in the next twenty years over the current population of 20,594. The proposed population growth will be due to consolidating existing programs by bringing leased laboratories and some leased administrative space to the Bethesda Campus, as well as new personnel growth. The Master Plan will also accommodate personnel for new programs. See Exhibit 5.2.E and Appendix A.

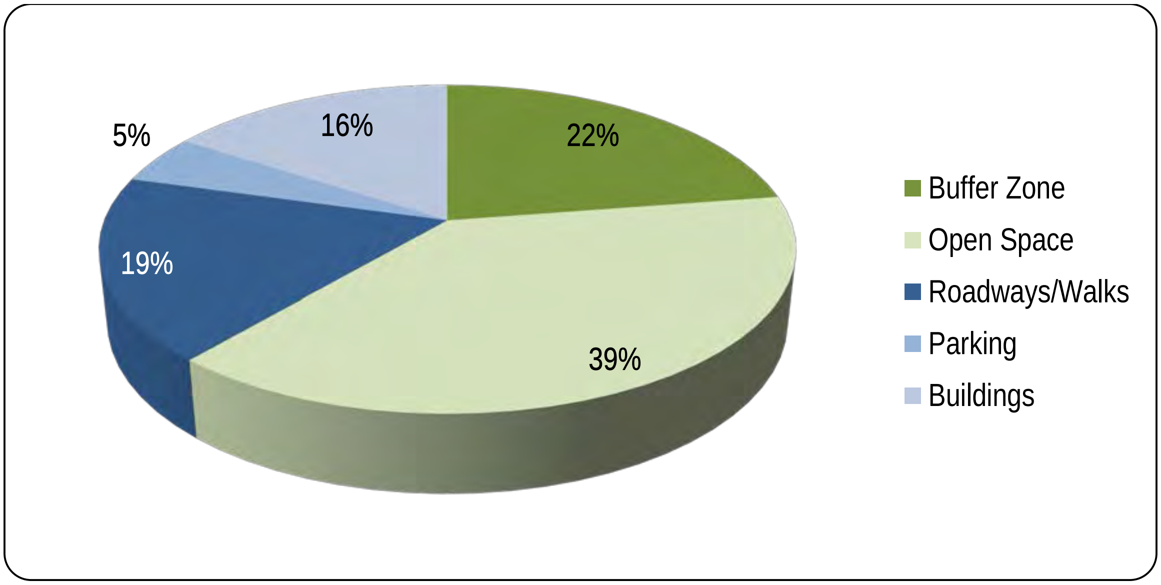
Exhibit 5.2.E. Population Growth Table

Personnel Category	Number of Personnel
FTE Federal Employees	1,406
Contractors	701
Fellows	507
New Personnel Growth	651
Total Bethesda Campus Population Growth	3,265

5.2.4 Land Use

The proposed Master Plan will increase open space on campus by 3% adding 9 acres. Surface parking will be reduced by 5% or 17 acres. Campus roads, walkways, and service areas will increased by 1% or 2 acres. Building foot prints will increase by 2% or 5 acres. Proposed land use is shown in Exhibit 5.2.F.

Exhibit 5.2.F. Land Use Chart and Table



Land Use	Acres	Percentage of Site
Buffer Zone	70	22
Open Space	120	39
Sub Total Open Space	190	61
Parking	15	5
Roads/Walks/Service	56	19
Sub Total Parking & Circulation	71	24
Buildings	49	16
Total Land Area	310	100

5.2.4.1 Site Development Capacities

New development planned for each major building site or area, as identified in the Master Plan, is summarized in Exhibit 5.2.G and graphically in Exhibit 5.2.H. For each site, a target area is indicated. The cumulative target areas meet the overall campus development. Development of a site below its target number will decrease the possibility of meeting the overall campus development program. Target area estimates are based on the building footprints shown in the Illustrative Master Plan (see Exhibit 5.2.B), and a target building height determined according to the context of each structure and its massing relationship to other buildings. The target heights are illustrated in the campus section drawings in Exhibit 5.2.C.

An important principle of the Master Plan is to increase development density near the Medical Center Metro Station to encourage increased public transit use. Several of the primary visitor destinations are located in the immediate vicinity: Building-45 (the Natcher Building), Building-38 and 38A (the National Library of Medicine) and the East Child Care Facility. The Gateway Center, channeling visitor traffic to the campus is located at to the Medical Center Metro Station and within a five to eight minute walk (1,500 feet) from most NIH administration offices.

The Master Plan proposes several new buildings with increased population concentrations. The proposed new IC Headquarters (N21) is in the immediate vicinity of Metro. In addition, the Master Plan proposes adaptive reuse of the laboratories in the Historic Core as administrative space also within walking distance of Metro. With the exception of the Clinical Center Complex, most buildings likely to be visited by the public are in close proximity to the Medical Center Metro Station.

Exhibit 5.2.G. Site Development Land Capacities Table

Building #	Gross Area	Primary Use	Acres
Table Notes	*N/A*	*Building Number Prefixes: (N)ew, (A)ddition, and (R)enovated; Areas do not include parking*	*N/A*
A1	26,000	Amenities	1.1
R4	98,103	Administration	
R 5	99,849	Administration	
N7	118,664	Administration	0.9
R8	99,471	Administration	
N9	299,891	Animal Research	1.7
11B	16,700	Addition to the NIH Central Utility Plant (Building 11)	
N12	256,538	Research	1.8
N14	774,504	Research	6.0
N18	45,000	Public Safety	0.9
N19, N19A/B/C	44,794	Support Services	2.8
N20	22,218	Support Services	1.6
N21	601,039	Administration	7.7
N22	287,808	Research	1.7
N23	21,385	Amenity	1.6
N24	10,391	Animal Research	1.4
A40	46,200	Research	0.4
A45	87,461	Biomedical Research Education	0.7
NMLP-12	267,000	Multi-Level Parking Structure	1.8
NMLP-13	267,000	Multi-Level Parking Structure	1.8
NMLP-14	327,000	Multi-Level Parking Structure	1.8

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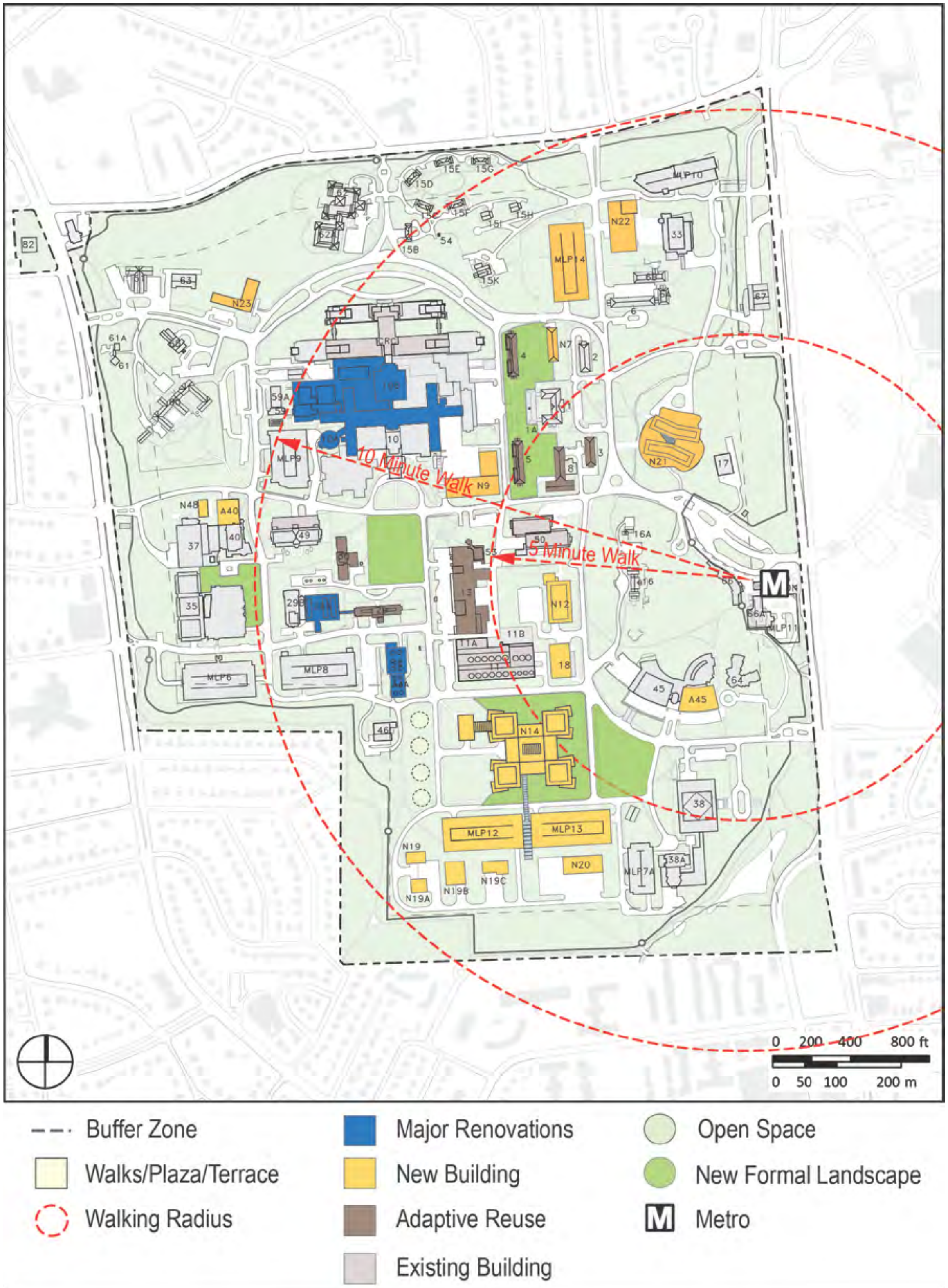

Exhibit 5.2.H. Development Sites

5.2.5 Building Use

Building uses are classified by the categories listed in Exhibit 5.2.I and depicted in Exhibit 5.2.J.

Exhibit 5.2.I. Building Use Categories Table

Category	Notes
Biomedical Research Laboratories	Houses basic research
Clinical Research Laboratories	Comprise the dominant land use; consists primarily of the Building-10 complex
Animal Research Laboratories	Houses animals and animal research
Biomedical Research Education	Houses NIH research education mission programs administered by the National Library of Medicine and the Fogarty International Center
Administration	Houses the programs of the Office of the NIH Director and IC's headquarters
Service and Support	Houses the programs of the Office of Research Services and Office of Research Facilities Development and Operations
Public Safety	Houses the proposed new police station, fire station, Gateway centers and inspection stations
Family Housing	Consists of the Officer's Quarters and homes for the Director of NIH and U.S. Surgeon General
Lodging	Consists of the Children's Inn and the Family Lodge
Employee Amenities	Consists of two stand-alone childcare centers and other amenities that are co-located in other buildings.
Utilities	Consist of the NIH power plant; the central chiller plant; and electrical substations and vaults
Structured Parking	Consists of multi-level parking structures
Formal Open Space	Are landscaped quadrangles, the Central Quadrangle and pocket parks
Recreation	Consists of playgrounds and the tennis court

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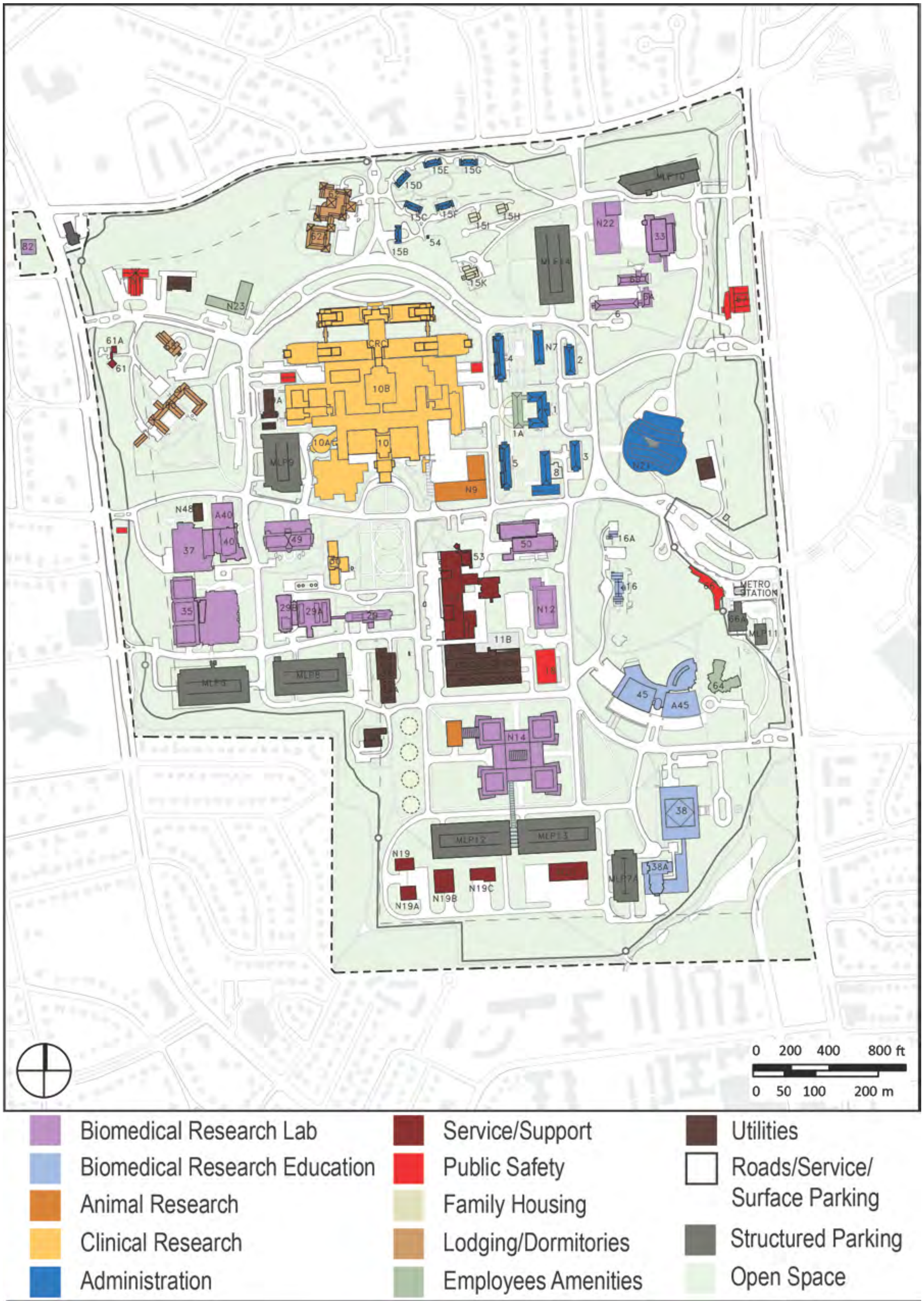

Exhibit 5.2.J. Land and Building Use

5.2.6 Campus Clusters

To illustrate detailed elements of the Master Plan, the campus has been divided into ten clusters. Although each cluster is primarily defined by a building group or an open space, there may be some overlap and interface between the clusters.

5.2.6.1 North Research Cluster

(See Exhibit 5.2.K and Exhibit 5.2.L) The North Research Cluster consists of approximately 14 acres of land. It includes the Building-6 complex, the “C. W. Bill Young Laboratory” (Building-33), and a proposed new five-story (with interstitial space) 287,808 gsf biomedical research laboratory (Building-N22). The cluster is served by Multi-Level Parking Garage (MLP-10). The new research building will form a quadrangle shared by Building-33 and Building-6B. The parking structure is located north of Building-33 and south of the north buffer zone allowing for a mature tree buffer to screen the structure. Care should be taken in landscape screening to avoid negative effects to the prominent view into campus from the corner of Rockville Pike and West Cedar Lane. The remaining historic setting of Building-6 should be protected.

To connect the cluster to the rest of the campus, pedestrian paths are proposed to the north and south of the Building-6 complex, with views into service areas shielded where possible. North Drive connects Building-N22, Building-33, and MLP-10 to Wilson Drive/Center Drive as well as the new road from Center Drive to West Cedar Lane. There will be a NIH shuttle bus stop at the quadrangle to accommodate pedestrians that are going to the research Buildings N22 and 33 as well as those coming into campus from MLP-10.

As part of the NIH Stream restoration project, the North Branch of the NIH Stream has been un-channelized. A storm water management system has been created between West Cedar Lane and MLP-10. Additionally, the NIH Stream restoration project has restored 3.54 acres or 2,100 linear feet of the NIH Stream channel. Restoration plans consist of extensive stream bank restoration and erosion control measures to reduce stream flow velocities.

Wilson Drive as well as the new road that connects Center Drive with West Cedar Lane has been designated as a major entry and also as a commercial vehicle entry. After passing through inspection at the Commercial Vehicle Inspection Station (CVI, Building-67), the new vehicular bridge from the CVI to East Drive carries trucks to Wilson Drive. All roadway changes in this cluster should be designed to affect existing bridges and mature trees as little as possible.

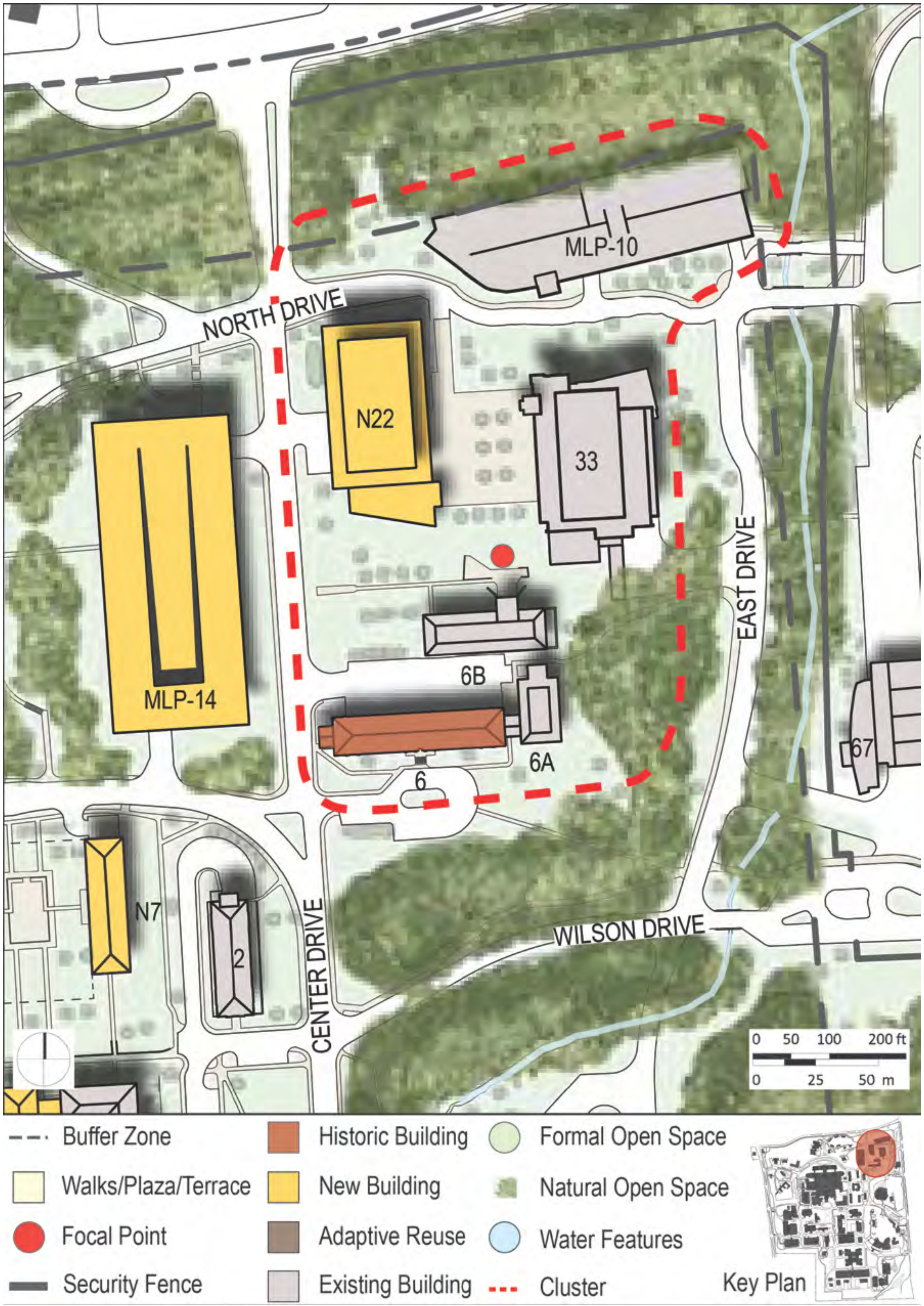

Exhibit 5.2.K. North Research Cluster

Exhibit 5.2.L. North Research Cluster Conceptual Rendering

5.2.6.2 Administrative Cluster

(See Exhibit 5.2.M and Exhibit 5.2.N.) The Administrative Cluster consists of approximately 22-acres and is located on the east side of the campus very close to the Medical Center Metro station. Most all OD and IC headquarter functions are to be located in this cluster. This cluster houses the administrative and proposed administrative function in Buildings 1, 2, 3, 4, 5, 8A, the proposed new 601,039 gsf IC headquarters building (Building-N21), proposed addition 26,000 gsf addition to Building 1 consisting of a cafeteria and conference center, and a new multi-level parking structure (MLP-14).

The Historic Core District is defined as the area of the early campus structures (Buildings 1 through 6). One of goals for this area is to enhance the historic setting of Buildings 1, 2, 3, 4 and 5. As part of the enhancement of the Historic Core District, the Master Plan proposes that most of the surface parking in this area be removed. This will allow landscaped open spaces to surround and highlight Building-1, the actual and symbolic origin of the NIH Bethesda campus. One of the most important "ceremonial" open spaces on the campus is the quadrangle in front of Building-1, which is often used as a defining image for the NIH campus environment. These landscaped areas will also allow clear pedestrian movement from the campus core to periphery.

The Master Plan recommends that Buildings 4, 5 and 8 of the Historic Core be converted from research use to administrative use, complementing Building-1. Any modifications to buildings within the Historic Core should conform to the Secretary of the Interior's "Standards for Rehabilitation" as discussed in Section 6.4.8.4. "Existing Buildings".

Building N-21's location is proposed for the replacement site for Building-31. The new Building 31 will feature a 2 story base with two towers one being 5 stories and other 17 stories. The current Building-21 (waste management facility) will be demolished and the new proposed Building-N21 will be constructed and will be clearly connect to the Historic Core District.

The Master Plan proposes to build a new NIH Data Center located in the historic district. The form of the building will be consistent with the surrounding historic buildings and the architecture will also be in context with surrounding historic structures. Direct pedestrian connection to the Medical Center Metro Station is highly desirable for this site.

The NIH Stream area should be upgraded for pedestrian access and use. A tree shaded pool area could be created at the outfall of the piped section of the NIH stream to positively affect water temperature cooling.

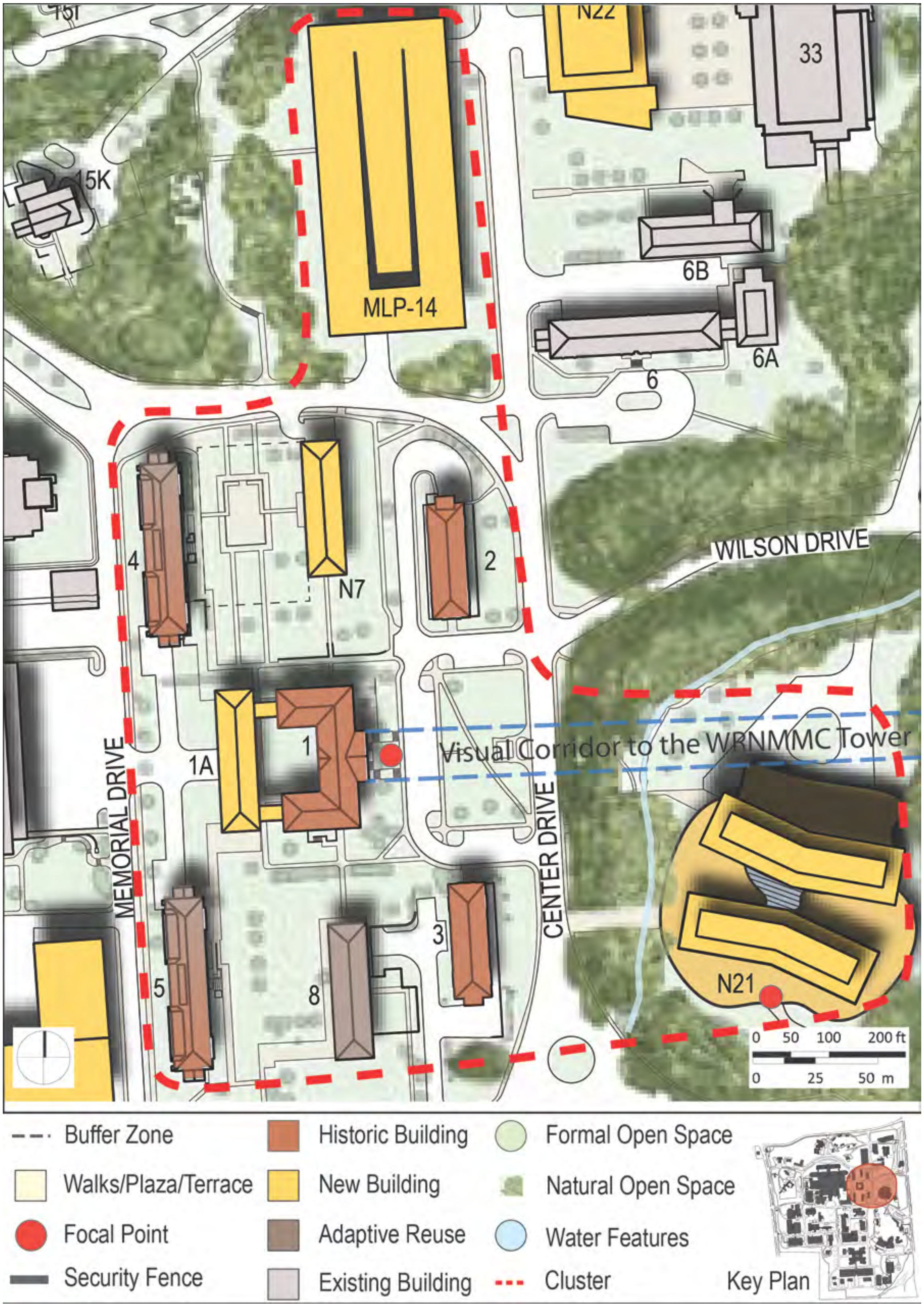

Exhibit 5.2.M. Administrative Cluster

Exhibit 5.2.N. Administrative Cluster Conceptual Rendering

5.2.6.3 East Research Cluster

(See Exhibit 5.2.O and Exhibit 5.2.P.) The East Research Cluster consists of approximately five acres and includes the Louis Stokes Building (Building-50) and a proposed new five-story 256,538 gsf laboratory (Building-N12). To make more efficient use of a central site near the Clinical Center Complex in close proximity to the Medical Center Metro Station, the Master Plan proposes the redevelopment of the existing computer services Building-12 site for more intense and higher scaled laboratory uses. The existing pocket park, located between Building-50 and N12, will be expanded.

The East Research Cluster has pedestrian access to most of the campus because of its central location. It offers direct pedestrian access to the Medical Center Metro Station and the Central Quadrangle via South Drive. There is also direct access to Administrative Cluster. Building-50 features a landscaped entry plaza. Likewise, Building-N12 should also employ a landscaped entry plaza in its design.

A parking lot for government vehicles is located in this cluster in addition the parking lot a fueling station for government vehicles is also located in this area.

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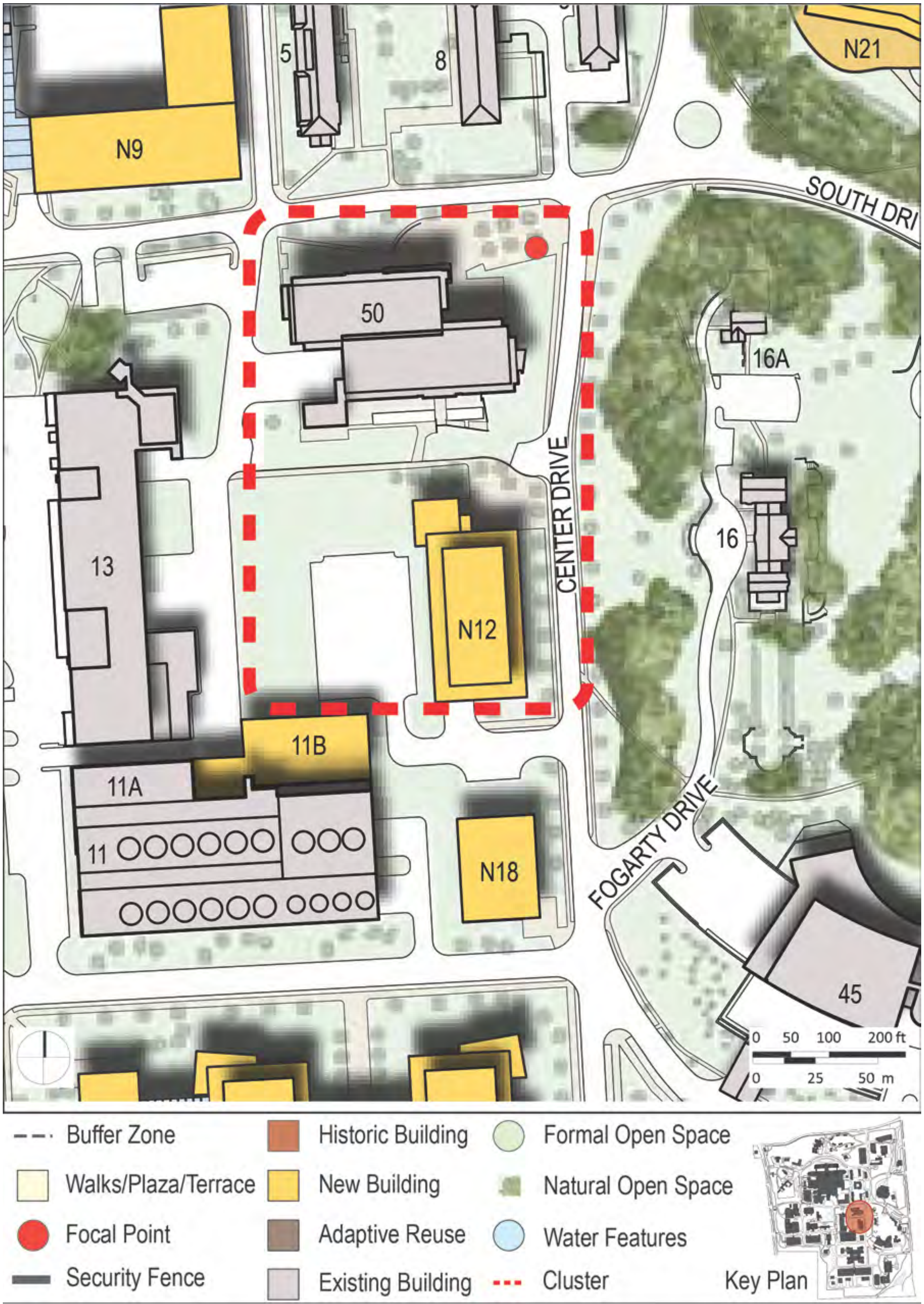

Exhibit 5.2.O. East Research Cluster

Exhibit 5.2.P. East Research Cluster Conceptual Rendering

5.2.6.4 Biomedical Research Education Cluster

(See Exhibit 5.2.Q and Exhibit 5.2.R.) The Biomedical Research Education Cluster is located to the southeast of the campus on approximately 19-acres. It houses the National Library of Medicine in Building-38, Building-38A, and Building-45. It houses the Fogarty International Center in Building-16, Building 16A and a proposed 87,461 gsf addition to the Natcher Building (Building-45). The addition would be a compatible functional use for the existing facility.

The Master Plan proposes that an allèe be planted along the sides of Center Drive, creating a vista, which opens to a landscaped focal space at the front of the proposed South Research Cluster building complex. The prominent lawn at the southeast corner of the site will include a retention pond (currently under construction), and will provide views to the National Library of Medicine and the Lister Hill Building.

This cluster includes buildings at the southeast portion of the campus which defines the major employee entry to the campus from Rockville Pike. This area is planned to efficiently accommodate the large volumes of traffic which use the Center Drive entry and to creating a positive entry image for the campus. The Center Drive entry at Rockville Pike currently has the highest volume of entering and exiting traffic of any entry on campus. In the future, traffic projections indicate that the use of this intersection will increase. Employees will use this entry to travel north into the campus and south to the proposed MLP-12 and MLP-13. It is proposed that the roadway be upgraded to four lanes with a landscaped median. Additional turn lanes will be added at the intersection with Rockville Pike (as later discussed in Section 5.3.1.2).

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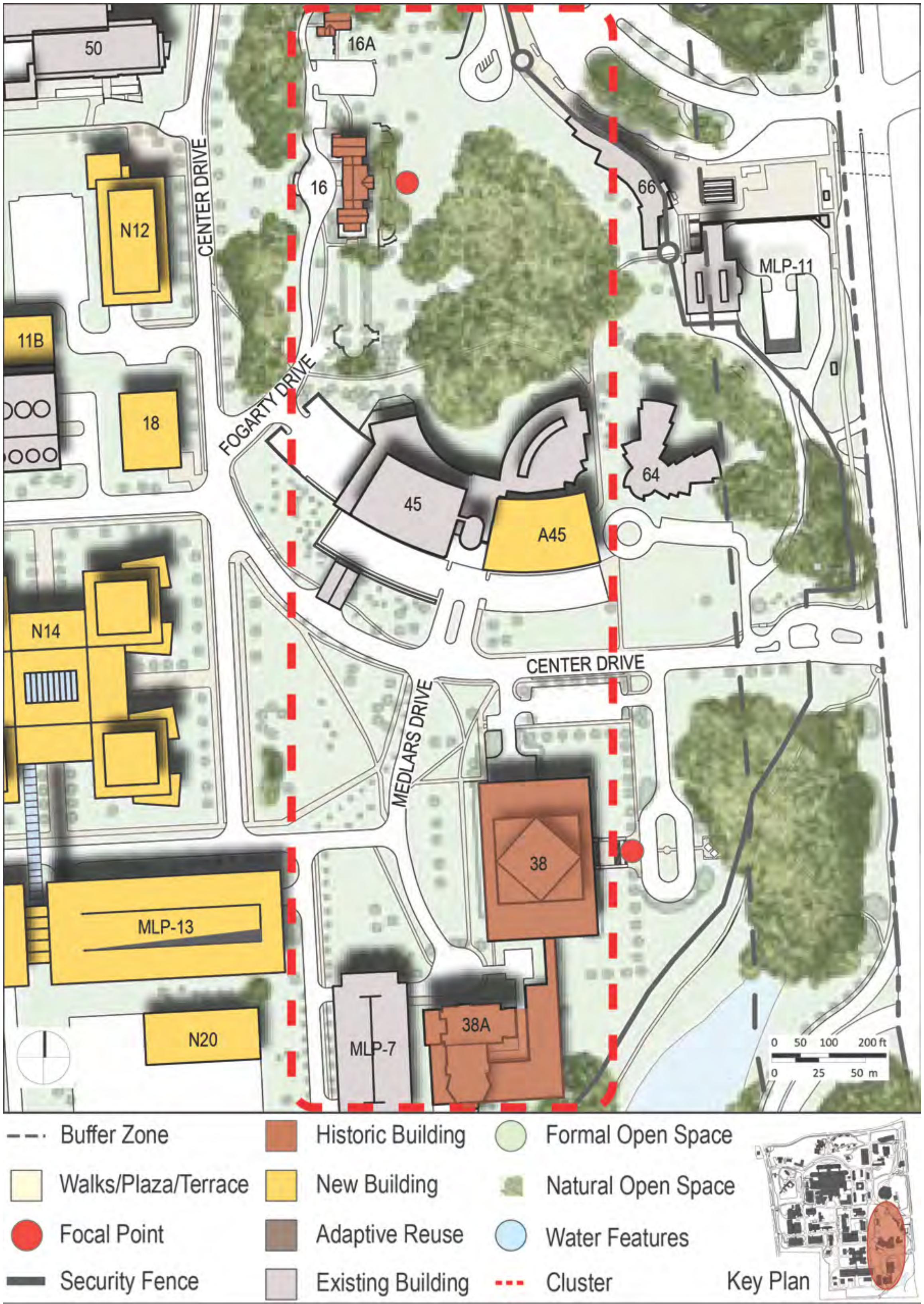

Exhibit 5.2.Q. Biomedical Research Education Cluster

Exhibit 5.2.R. Biomedical Research Education Cluster Conceptual Rendering

5.2.6.5 Central Research Cluster

(See Exhibit 5.2.S and Exhibit 5.2.T.) The Central Research Cluster consists of approximately 33 acres and it features the Clinical Center Complex (Building-10), Building-30 and a proposed new six-story, 299,891 gsf, central "Animal Research Center" (ARC, Building-N9). It also includes the proposed "Central Quadrangle".

The Master Plan is premised on the retention and renovation of Building-10 as the Clinical Center. To the west of Building-10 is a multi-level parking structure (MLP-9). The site of Building 7 and Building 9, to the east of Building-10, is planned to be developed as the ARC. Building-30 will be retained and adapted to be used as physicians' offices.

The open space strategy for the Center Cluster is to create the Central Quadrangle with a landscaped edge. A compatible use for this location is the site of two large underground water tanks beneath the Central Quadrangle. One water tank would ensure potable water supply reliability and the other will supplement chilled water capacity. A conceptual rendering of this central green space is shown in Exhibit 5.2.U.

The Central Quadrangle is intended as the primary outdoor "room" and symbolic heart of the campus. It will be the primary space on campus for interaction and collegiality (a goal of the Master Plan) because of its central location and proximity to the Clinical Center Complex. The Master Plan envisions the Central Quadrangle as an active space with a central open area for ceremonial gatherings or informal recreation, and edges strongly defined by allèes with pathways accommodating pedestrian and bicycle circulation, seating, and garden spaces. There should be as much "people activity" as possible at the building edges that define the space. At the north end of the Quadrangle, the space is terminated by a south-facing plaza which can be used for recreation, seminars, and other NIH programs and events. The scale of the space is an appropriate foreground to the height and bulk of the Clinical Center Complex. The Central Quadrangle accommodates and responds to and reinforces the strong axial and symmetrical character of the existing Building-10 configuration.

Parking to accommodate approximately 1,550 spaces will continue to be provided in the ACRF garage. Service access to the Clinical Center should be limited to the east and west sides of the facility as opposed to the more publicly oriented north and south sides.

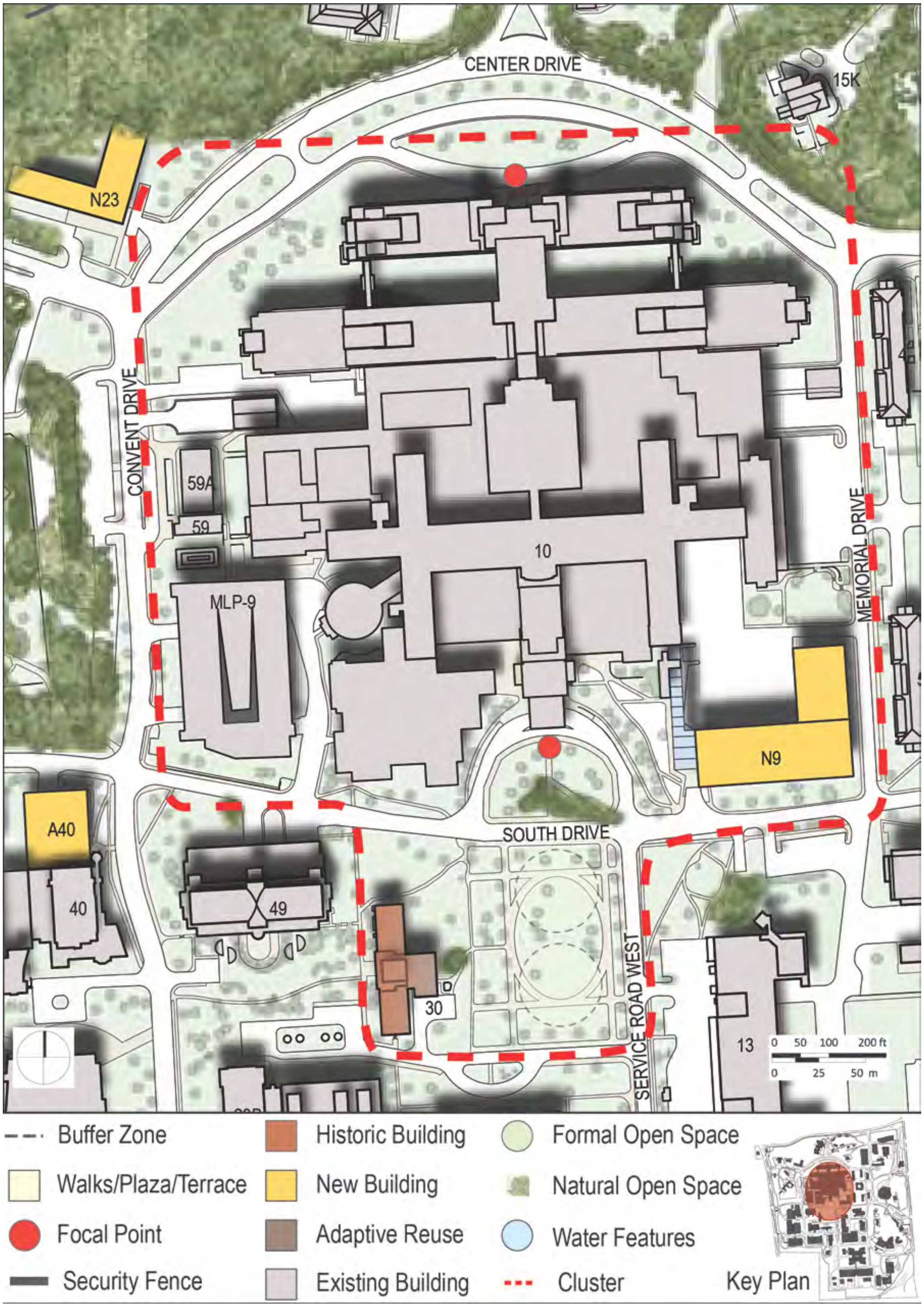

Exhibit 5.2.S. Central Research Cluster

Exhibit 5.2.T. Central Research Cluster Conceptual Rendering

Functionally, the Central Quadrangle helps organize pedestrian movement through the center of campus, creating clearly defined north-south and east-west paths across campus. However, space must be shared with vehicle traffic. The challenge is to be able to accommodate vehicle traffic and maintain the desired pedestrian character. The Master Plan proposes to reopen South Drive at the Clinical Center as an east-west vehicle thoroughfare. Building-13, which generates substantial truck traffic, will remain on the east edge of the Quadrangle. The Master Plan proposes to extend Lincoln Drive as a major thoroughfare to Center Drive south of the Power Plant. Trucks will be required to enter and exit Building-13's service area south of the Central Quadrangle. Building-29 will remain as the southern spatial terminus for the Central Quadrangle. Buildings 29 and 30 will continue to require service road access.

Exhibit 5.2.U. Central Quadrangle Conceptual Rendering

5.2.6.6 West Research Cluster

(See Exhibit 5.2.W and Exhibit 5.2.X.) The West Research Cluster consists of approximately 12 acres and includes the Building-29 complex, the Porter Neuroscience Research Center (PNRC, Building-35), Building-37,the Dale and Betty Bumpers Vaccine Research Center (Building-40), the Silvio Conte Laboratory (Building-49), and a proposed new 46,200 gsf addition to Building-40 (A40).

Phase-II of the PNRC (shown in Exhibit 5.2.U) is currently under construction and replaces former Building-36, which has been demolished. Multi-level parking structures MLP-6 and MLP-8 are also retained in this sector.

The open space goal of this cluster is to better define and connect the open space between the PNRC and Building-40 with the open space between Building-49 and the Building-29 complex. Due to the significant elevation change from west to east, care must be taken to create a coherent open space while maintaining building entry relationships.

Exhibit 5.2.V. Porter Neuroscience Research Center Phase II

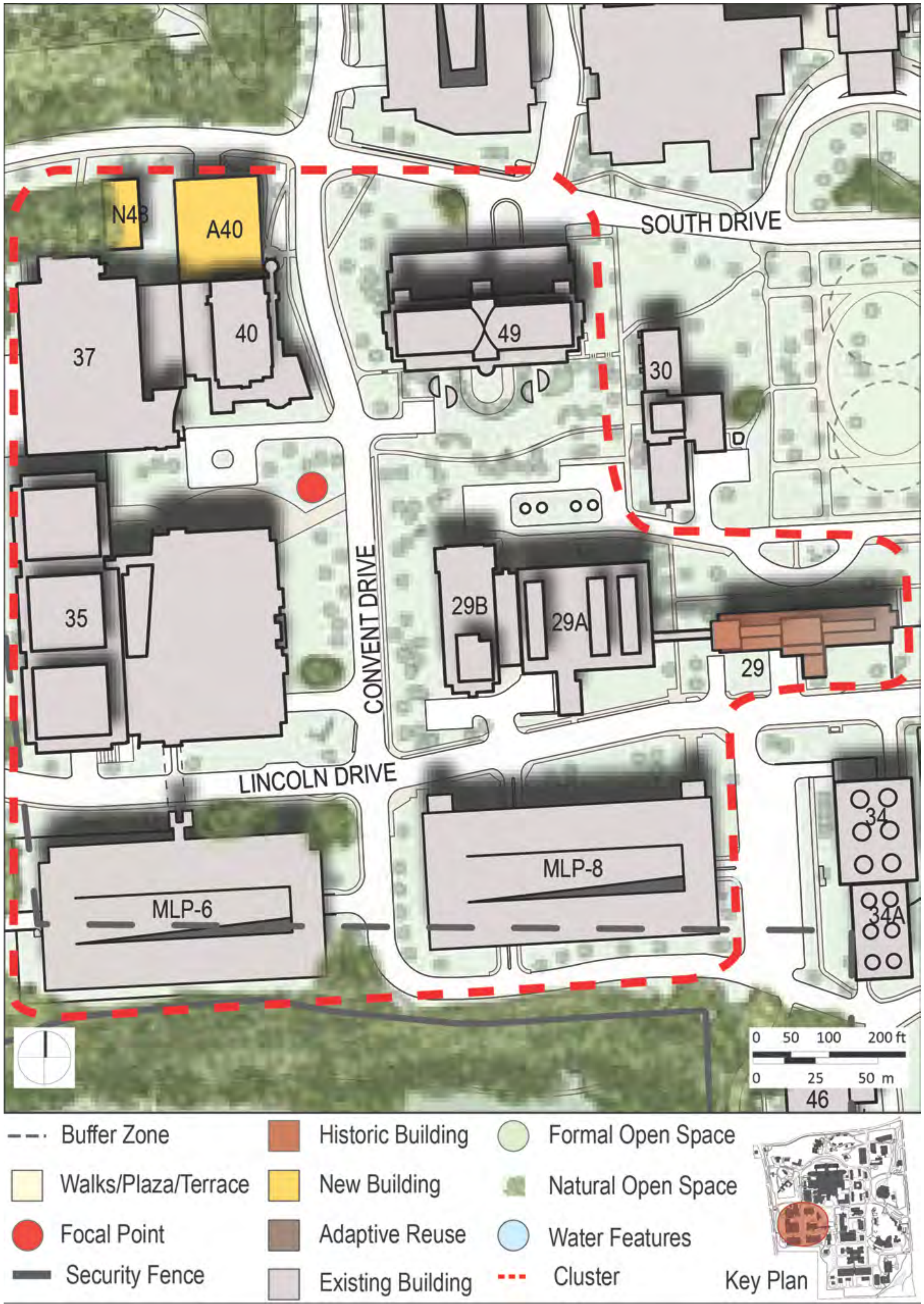

Exhibit 5.2.W. West Research Cluster

Exhibit 5.2.X. West Research Cluster Conceptual Rendering

5.2.6.7 South Research Cluster

(See Exhibit 5.2.Y and Exhibit 5.2.Z.) The South Research Cluster consists of approximately 13 acres. It will house multi-IC research programs in a proposed new four-story (with interstitial space) 774,504 gsf, biomedical laboratory complex (N14) and an animal research facility for large animals (canine and swine). The South Research Cluster proposed building height is limited to four-story with interstitial space because of its close proximity to the Power Plant. Vehicle access is via Lincoln Drive and Center Drive. Multi-level parking structures (MLP-12 and MLP-13) connect the complex by a covered pedestrian bridge.

The South Research Cluster would occupy the site of existing animal and laboratory facilities (Building-14/18/28/32 complex). The existing complex has a large footprint but the one to two story structures are an inefficient use of the site. The functions of these buildings will be moved to the new central ARC (N9) and the addition to Building 35 (PNRC). Then the Building-14/18/28/32 complex will be demolished. Likewise, the area south of the Building-14/28 complex is underutilized as a surface parking area so it will be included in this Cluster design.

5.2.6.8 Service and Support Clusters

(See Exhibit 5.2.Y and Exhibit 5.2.Z.) Service and support functions are clustered in the center and the southern edge of the campus. The Central Service Support Cluster houses the NIH Central Power Plant (Building-11), Central Chiller Plant (Building-34), Building-13, and a proposed new 45,000 gsf police station (Building-N18). The South Service Support Cluster consists of a proposed new 22,218 gsf grounds maintenance facility (N20) and a proposed new 56,494 gsf Waste Management Complex. The Waste Management Complex will have 4 buildings: Mixed Waste Facility (N19), Chemical Waste Facility (N19A), Radiation Safety Facility (N19B) and the Biomedical Waste and Recycling Facility (N19C).

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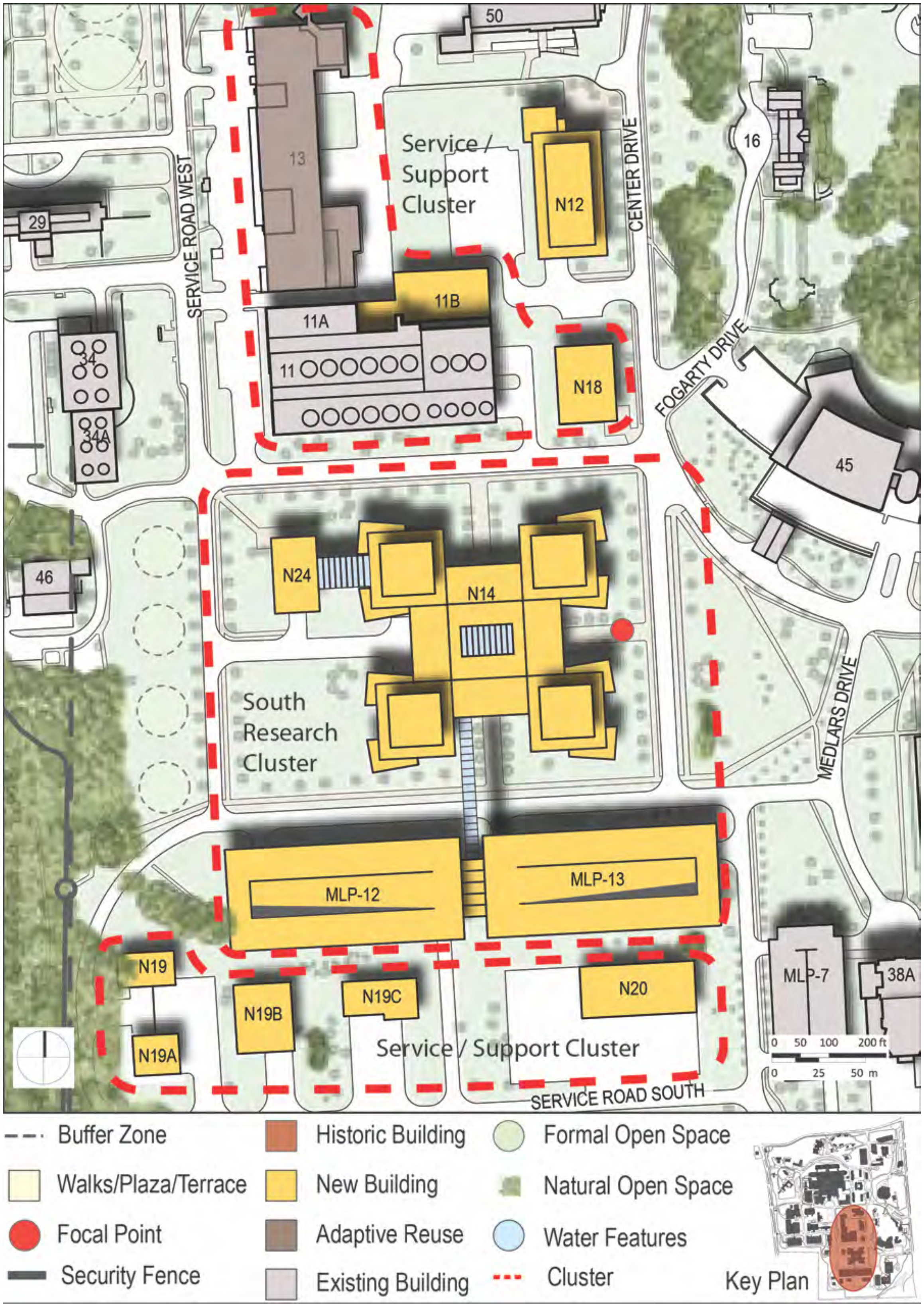

Exhibit 5.2.Y. South Research Cluster and Service & Support Clusters

Exhibit 5.2.Z. South Research and Service & Support Clusters Conceptual Rendering

5.2.6.9 Officers' Quarters District

(See Exhibit 5.2.AA.) The Officer's Quarters District is located on the north side of the campus and consists of duplex housing with three single family homes. All of the homes are eligible for listing in the National Register for Historic Places. The Officer's Quarters form a historic district. Building 15K is the historic Wilson Estate. The Master Plan proposes converting all the duplexes into office space. The two single family homes are reserved for the U.S. Surgeon General and the NIH Director. When the Surgeon General or NIH Director chooses not to use the residences they are used for student housing. Building 15K (Wilson Estate) is proposed to be converted from administrative use to the NIH Director's House.

5.2.6.10 Convent District

(See Exhibit 5.2.BB.) The Convent District consist of the Convent (Buildings 60, 61, and 61A), the Family Lodge (Building 65), the NIH Fire Station (Building 51), North Electrical Substation (Building 63) and the Children's Inn (Building 62). The Northwest Child Care Center (NWCCC) (N23) is currently funded for construction.

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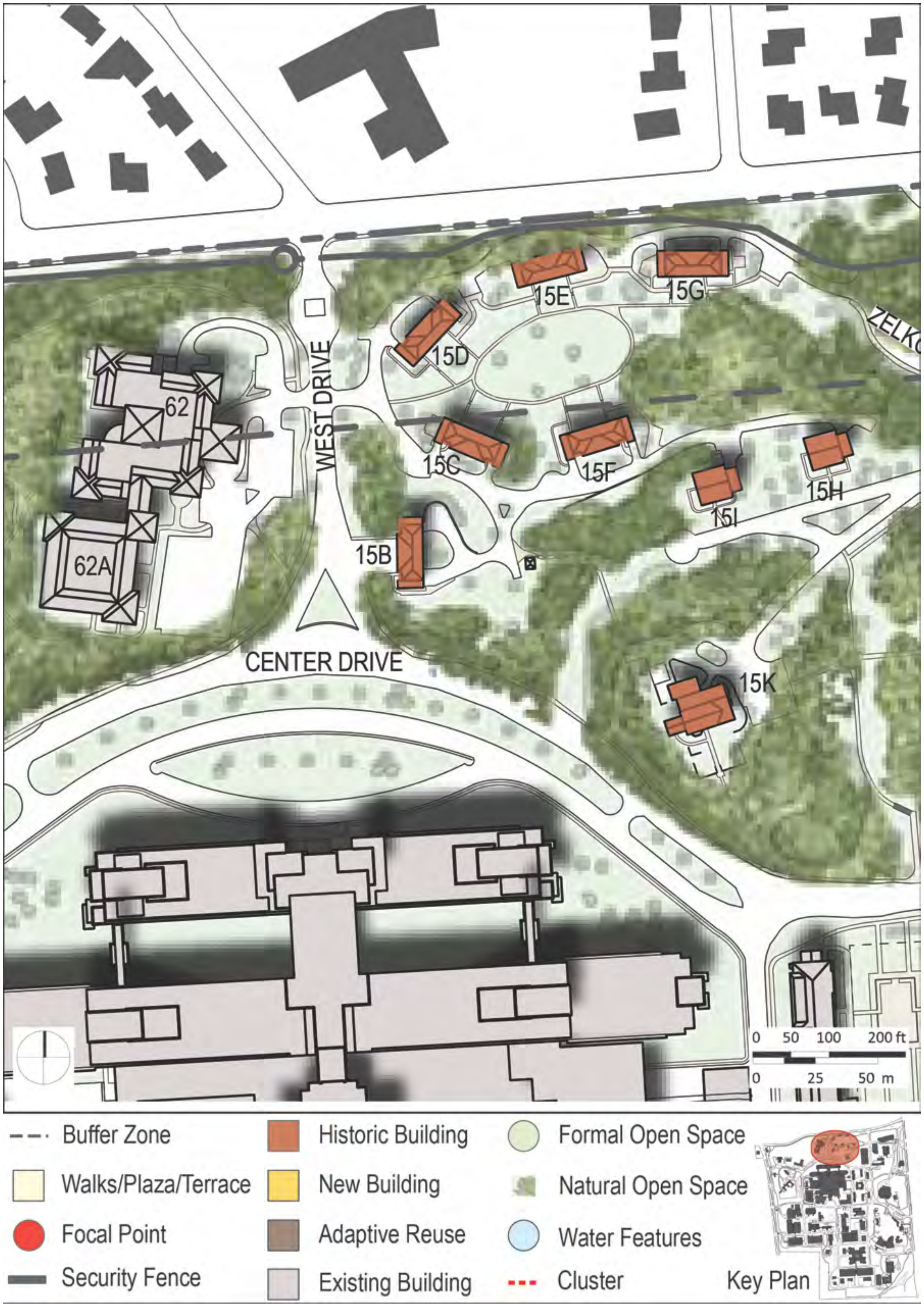

Exhibit 5.2.AA. Officers' Quarters District

Exhibit 5.2.BB. Convent District

5.2.7 Campus Amenities

Campus amenities can generally be divided into two groups: employee/visitor services and positive site features which enhance the use or image of the campus. The Master Plan addresses the issue of campus amenities in an effort to provide for the practical needs of employees as well as to create a campus setting which is conducive to attracting and retaining the highly qualified employees who are needed to carry out the mission of NIH. There is also a need to provide amenities and therapeutic environments for patients who are participating in studies at the Clinical Center.

Proposed locations for future campus amenities are shown in Exhibit 5.2.CC. In the Master Plan, employee and visitor services continue to be dispersed throughout the site at the locations of greatest employee concentrations. Most of the existing services will remain, however some will need to be relocated as demolition and replacement occurs over time (e.g. Building-31 services). A large number of campus services will continue to be located in the Clinical Center Complex, which has the highest density of employee and visitor populations. Campus amenities and activity areas should be placed at the ground level of buildings and along paths that are convenient to pedestrians and bicyclists. Amenities or services, which are supportive of public transit use, should be located along paths in proximity to the Medical Center Metro Station.

Child-care facilities are an important campus amenity. The two child-care facilities on campus are currently located in the 21,000 gsf East Child Care Facility (Building-64) the 3,000 gsf facility in Temporary Building-T46 located on the southwest side of the campus. The child-care facility in Building-T46 is planned to be replaced with a new facility, the Northwest Child Care Center (NWCCC), is currently under design on the north side of the campus.

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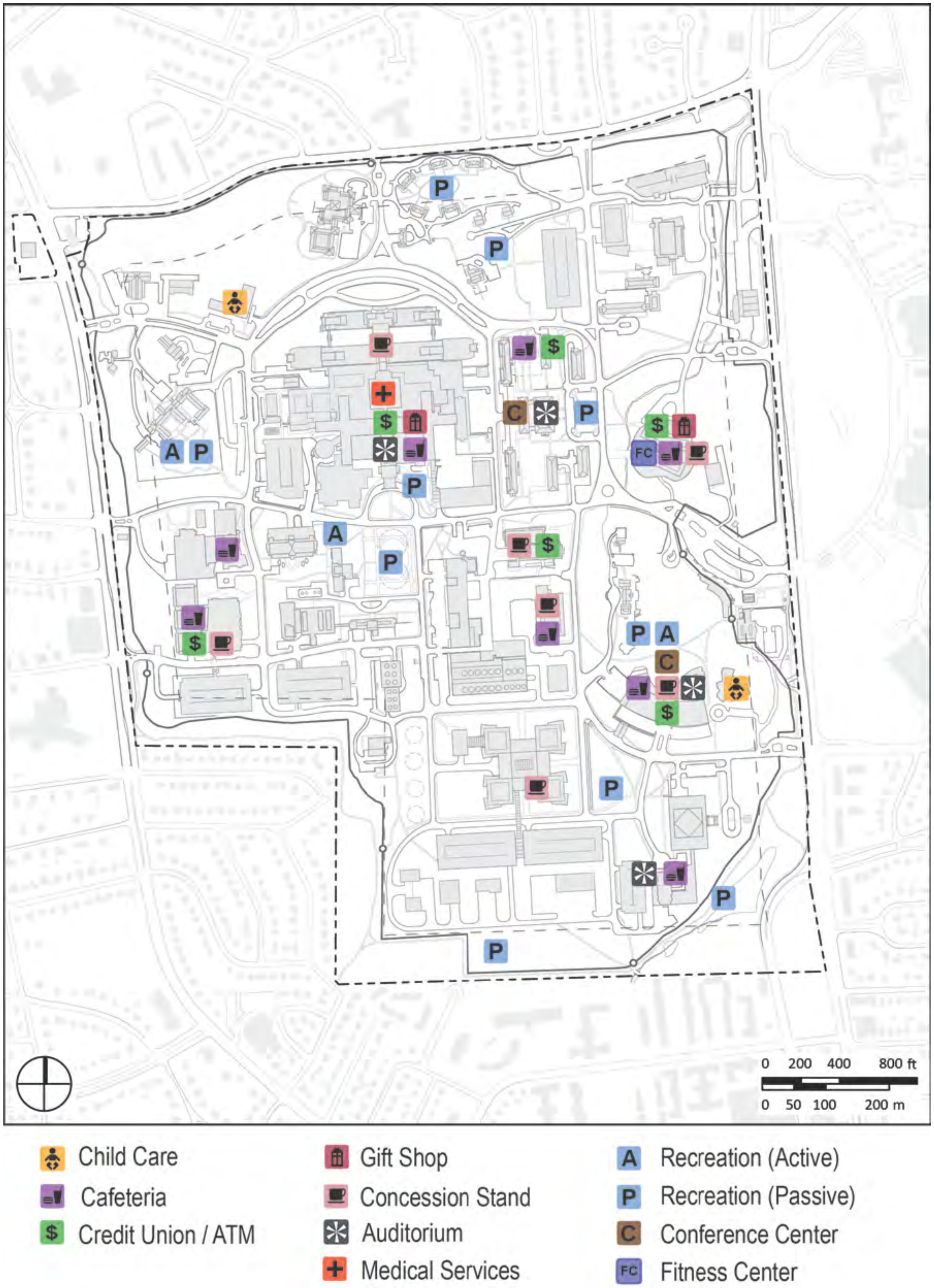

Exhibit 5.2.CC. Campus Amenities

5.2.7.1 Outdoor Recreation

The National Institute of Health is committed to the long term health of its employees. One way to encourage fitness on the Bethesda Campus is to develop fitness facilities to assist employees in developing an on-campus fitness routine. In addition to indoor fitness facilities proposed in the new administration building, other potential indoor and outdoor fitness facility/station locations, and walking paths are identified below.

5.2.7.1.1 Fitness Station Area

The proposed fitness stations would be similar to the example depicted in Exhibit 5.2.DD. One could be placed between Building-10 and Building-30 in the shade of the mature red oak trees. This area would be comprised of eight to 12 fitness stations on a cushioned playground surface.

5.2.7.1.2 Walking Paths

Painted markings on existing sidewalks will identify a ½-mile, one-mile and one-kilometer loop as shown in Exhibit 5.2.EE. The markings will be spaced every 1/10th of a mile. This project is currently funded and will be in place by 2013.

Exhibit 5.2.DD. Outdoor Fitness Station Area Example

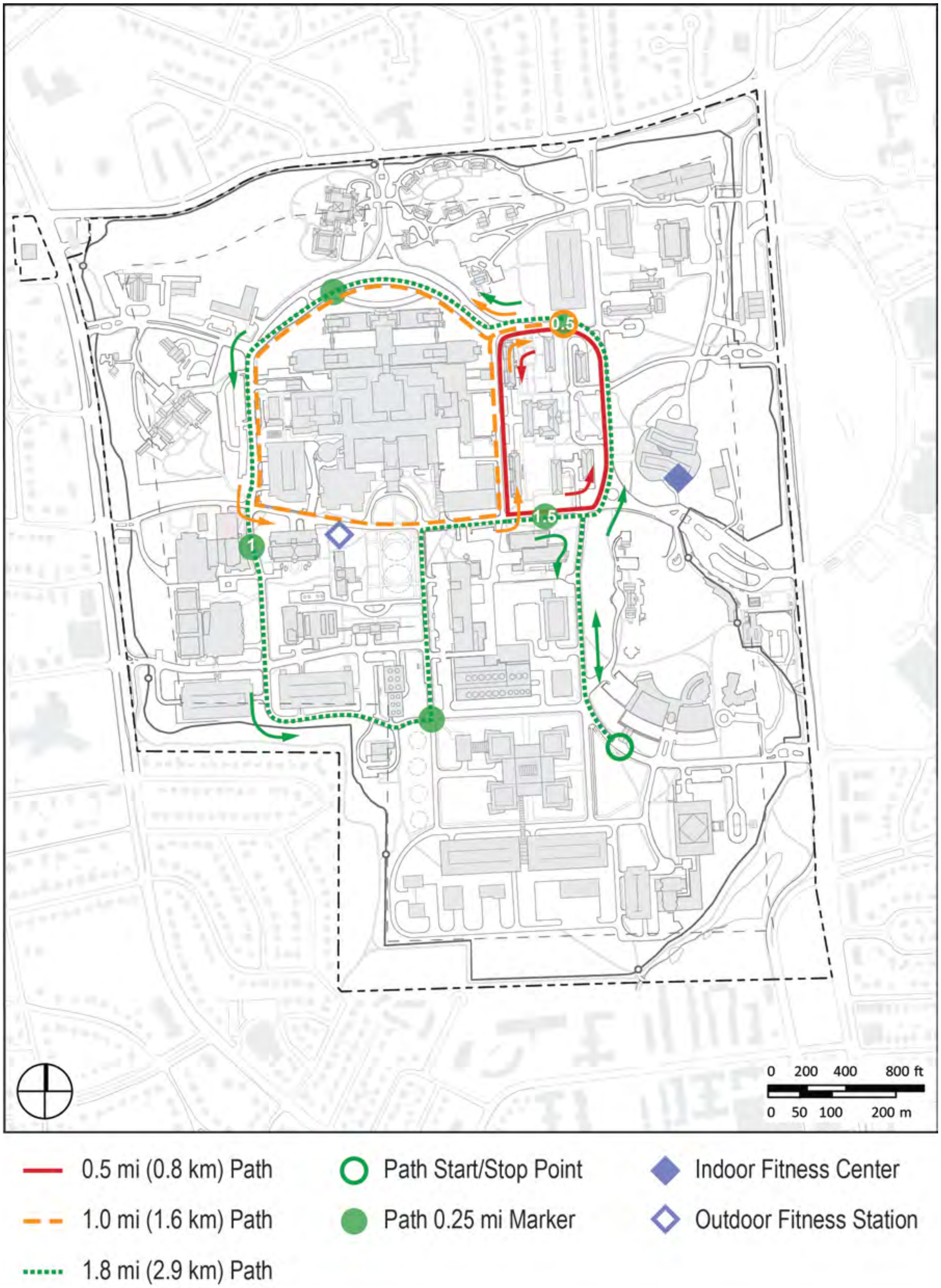

Exhibit 5.2.EE. Campus Recreation

5.2.8 Open Space and Landscape

5.2.8.1 Landscape Development Principles

The guiding principles of the landscape plan serve to complement and reinforce the overall Master Plan by:

- Improving and strengthening the buffers to adjacent land uses
- Giving the plan identity and structure
- Articulating the circulation system
- Creating a hierarchy of open spaces which will encourage interaction among NIH staff and visitors

Plants integrate the man-made architectural elements into the natural landscape and reinforce the site's indigenous character. Various combinations of plants and water are encouraged. Landscape Concepts are shown in Exhibit 5.2.FF and discussed below.

5.2.8.2 Perimeter and Buffer Landscape

The perimeter and buffer landscape includes a distinctive natural landscape character at each of the campus' four corners among the design goals for the landscape plan are to repair the site following the removal of surface parking in order to preserve and extend the landscape character of each corner in strengthening the perimeter. In addition, the landscape concepts include additional plant materials to screen and enhance the NIH facility from adjacent land uses, particularly the neighboring residential areas along the southwest corner of the facility. Specific landscape recommendations for each distinctive corner are as follows:

5.2.8.2.1 Southeast Corner

The southeast corner, with its open pastoral views to the National Library of Medicine and the William H. Natcher Building (Building-45), will remain open but will somewhat change in character with the addition of the southeast storm water pond and water related landscaping along Stoney Creek.

5.2.8.2.2 Northeast Corner

As one proceeds northward along Rockville Pike, the landscape character will remain open and informal with views to the Stone House and Clinical Research Center beyond. North of South Drive, the character of the perimeter landscape will begin to close, presenting selective views into the NIH campus. The NIH stream area will be enhanced from the northeast corner south to South and Center Drives. The landscape concepts for the Northeast corner should include additional plant material to screen and enhance the NIH facilities in this area from adjacent neighboring residential areas.

5.2.8.2.3 Northwest Corner

The landscape character of the northwest corner poplar groves should be extended toward the campus core. To the north, along West Cedar Lane, the predominantly residential quality of the NIH campus is compatible with the adjacent neighboring community. It should be augmented with evergreen screening and ornamental plantings. To the west, the woodland character should be extended to the existing poplar groves. It is recommended that the woodland floor be allowed to develop into its indigenous native understory. Where additional screening is necessary to buffer NIH development from residential neighborhoods, the landscape should be supplemented with evergreen and ornamental plants. Additional understory screening is proposed adjacent to new parking structures and in areas where the perimeter setbacks narrow.

5.2.8.2.4 Southwest Corner

From its hilltop topography, the southwest corner provides commanding views of the campus. The hilltop acts as a park-like resource for the neighborhood and campus. All existing plantings should be retained. Additional plants should be used to screen the adjacent neighborhoods, to direct prominent vistas of the campus, and to form spaces in the park.

5.2.8.3 Central Campus

The Central Campus forms the innermost zone of the campus and is dominated by buildings organized in an orthogonal pattern. Spaces between the buildings and the landscapes within this zone should be designed to relate to the axial and orthogonal arrangement of the buildings, through the formation of bosques, pedestrian ways, allées, pocket parks, and courtyards.

5.2.8.4 Hierarchy of Open Space

The NIH campus open space is formed by two contrasting systems. The first is the group of formally designed spaces, originating within the program clusters (where practical) and continuing into the smaller outdoor rooms, such as pocket parks, courtyards, and pedestrian promenades. The second is the enhancement of the natural stream and the informal extension of the woodland into the central core. The dovetailing of the two systems will knit the campus together while the subtle contrast between the systems will serve to generate a variety of public spaces. To further encourage the use of the outdoors, building arcades and trellised walkways in the central core are recommended to tie buildings and the pedestrian circulation system together.

In the interior of the campus, the Master Plan proposes a series of clusters with internal pocket parks, quadrangles and informal open spaces. Unlike the previous master plan and its updates, several buildings that were proposed to be demolished will not be demolished. As a result, it will be more difficult to create a series of interconnected and well-defined quadrangle spaces as the basic structure of the campus than had previously been proposed. Instead the Master Plan is proposing open spaces associated with each building cluster. These spaces will be connected with walkways and paths.

A primary focal space of the campus will be the "Central Quadrangle" which was also in the prior master plan. There are challenges because the prior master plans envision demolition of Buildings 13 and 30 to create east and west quadrangles and the demolition of Buildings 29 and 34 to lengthen the Quadrangle in a north-south direction. This Master Plan proposes to retain these structures to support the NIH mission for the next 20 years. Unfortunately, the NIH power-plant faces the Central Quadrangle, as does the "back "of Building-30 and many of the Building-13 loading docks. These service areas will not contribute to the envisioned liveliness of the Central Quadrangle. Additionally, the proposed Quadrangle is surrounded on all sides by vehicular access roads. South Drive to the north of the Quadrangle is proposed to be reconnected and become a vehicle thoroughfare. The service road to the east will remain a major truck route to service Building-13. The service roads south and west are required to provide access to Buildings 29 and 30. The development of the Quadrangle should incorporate speed tables and pedestrian paving patterns on the adjacent roads. The roads should also be restricted to only allow service vehicle traffic to promote a safe walking environment.

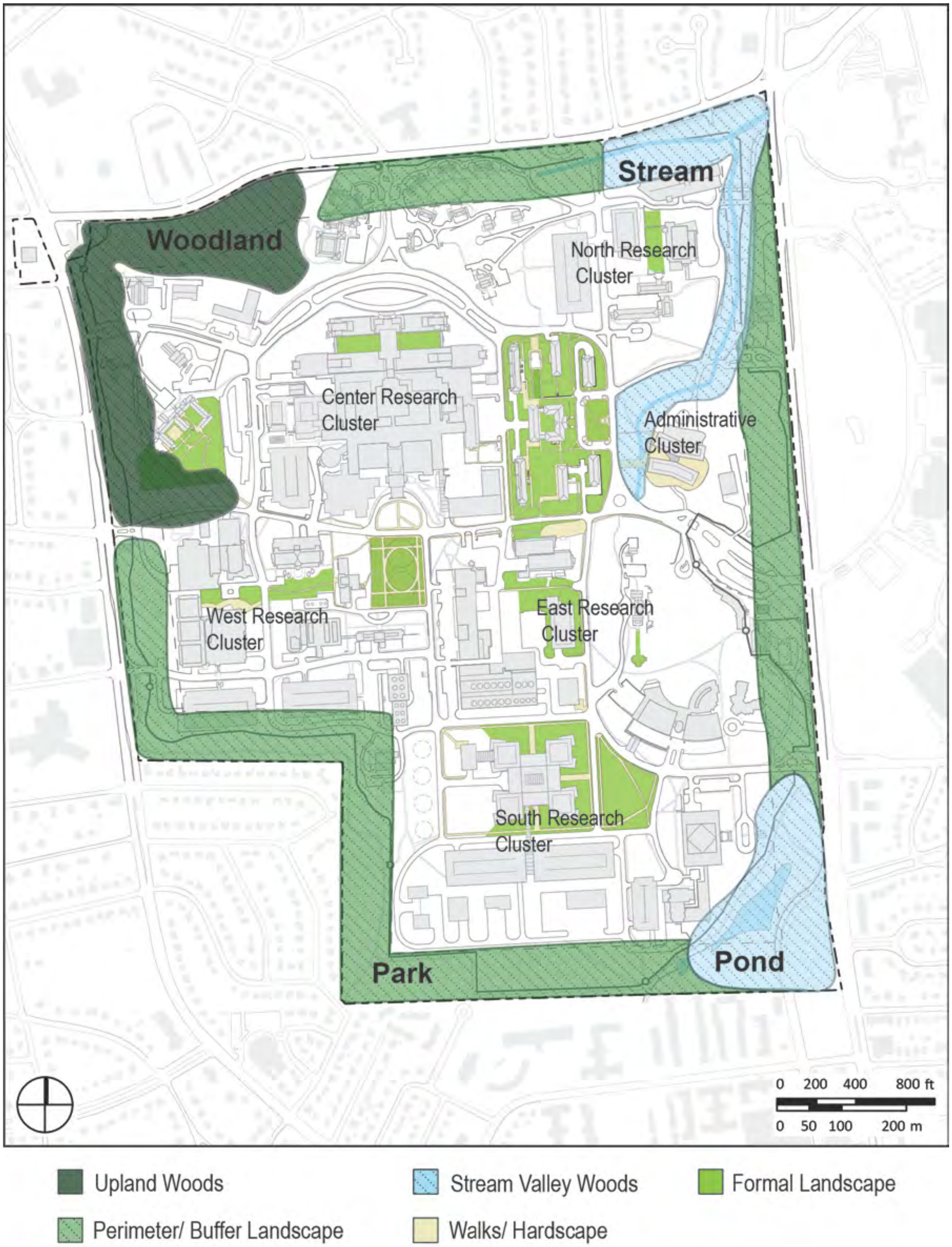

Exhibit 5.2.FF. Landscape Concept

5.2.8.5 Tree Conservation

NIH has had tree preservation and replacement policy since 1996 which specifies that each tree removed should be replaced with a tree. New projects in the Master Plan have been located to minimize tree loss, especially in the significant tree canopy areas at the northwest and southwest corners of the site, as well as along the NIH Stream. The existing Urban Forest Conservation Plan is in the process of being updated to accommodate the new Master Plan.

5.2.8.6 Plant Material Selection Criteria

The initial selection and arrangement of plants is a crucial step in the ultimate success of any landscape plan. Two general criteria have guided initial plant selections:

- Preference for indigenous material
- Reinforcement of the organizational strategy of the campus

Consideration should be given to the arrangement of plants which best integrates the man-made landscape within the natural landscape. The use of balance or symmetry in repetitive arrangements is one method of integrating formal buildings and circulation designs, giving order to outdoor space.

5.2.9 Perimeter Buffer Zone

The Master Plan proposes to retain and enhance the natural character of the perimeter of the campus. The campus perimeter provides much of the public image for NIH. At the boundaries of the site, there is a 250-foot wide buffer zone. The Master Plan does not show any new structures within this buffer zone. Surface parking will be removed from the buffer zone along the southern boundary.

As special features of the perimeter open space system, the four significant corners of the site will retain their existing characters. These are:

- the “woodland” setting of the northwest corner
- the “stream” character of the northeast corner
- the “lawn and pond” image of the southeast corner
- the “park” setting of the southwest corner

In order to achieve the Master Plan goal of ensuring that development on the NIH campus respects and enhances the environment of the surrounding communities, open space buffers are essential. The guidelines below seek to define the character, activities, and traits which should apply to all buffer areas. Due to specific local conditions, the buffer zones will vary around the site. Light recreation envisioned for buffer areas includes activities, which are non-invasive to adjacent areas, such as jogging, bicycling, dog walking, picnicking, etc.

5.2.9.1 General Guidelines:

5.2.9.1.1 All Buffer Zones

- Buffers will primarily be landscaped open space
- Existing buildings in the buffer zones are to remain
- No new buildings or parking lots to be allowed
- Surface parking to be removed (as possible)
- Utility easements and necessary infrastructure to remain
- Security fence, gates, signage, and lighting are allowed for entry identification and direction

5.2.9.1.2 North Campus Buffer

- Existing screen landscaping to remain
- Small-scale buildings with related vehicular access to remain
- Light recreational activity to be allowed
- Stream and storm water management areas to be allowed
- Landscape and lawns to remain allowing views to campus
- Service access drives to remain
- Dense landscape and elements to provide visual buffers
- No new activities to be programmed or encouraged
- Service access to be removed where possible
- Pedestrian path and employee entrance on the south side of the perimeter fence will remain

5.2.9.1.3 South Campus Buffer

- Enhanced landscaping to provide additional screening
- Light recreational activity to be allowed
- Service access to remain
- Community event staging to be allowed

- Bicycle and pedestrian connections (east-west path to Medical Center Metro Station) allowed to cross the buffer outside of the campus perimeter fence

5.2.9.1.4 Rockville Pike Buffer

- Landscape and lawns to remain allowing views to campus
- Light recreational activity to be allowed
- Bikeways and walkways to be allowed along the length of buffer outside of the campus perimeter fence
- Stream and storm water management areas to be allowed

5.2.10 Fire/Life Safety

5.2.10.1 Emergency Vehicle Access

All buildings on the NIH campus should have a minimum clearance of 30 feet to other structures to provide for fire separation and emergency vehicle access. Major campus pedestrian pathways that are intended to serve as fire department access should be designed in accordance with the DRM fire lane requirements for minimum widths and fire vehicle loading.

5.2.10.2 Utility System Capabilities

The existing WSSC water supply has sufficient capacity to meet existing and projected campus fire flow requirements. Additional booster pumps will be installed at individual buildings where needed.

5.2.11 Security Considerations

The Director, NIH has delegated authority for the protection of NIH facilities and grounds to the Associate Director for Research Services (ADRS) and the Associate Director, Security and Emergency Response, ORS. The Security and Emergency Response (SER) services support the NIH's biomedical research goal, by providing a safe work environment for the NIH employees, contractors, affiliates, visitors, research and facilities. All facility projects shall be coordinated with SER. The services within SER are:

- Division of Police (DP)
- Division of Emergency Preparedness and Coordination (DEPC)
- Division of the Fire Marshal (DFM)

- Division of Fire and Rescue Services (DFRS)
- Division of Physical Security Management (DPSM)
- Division of Personnel Security and Access Control (DPSAC).

5.3 Circulation

For more detailed discussion of topics in this section, refer to the "NIH Transportation Management Plan and the final "Environmental Impact Statement" for the Master Plan.

5.3.1 Transportation Management

The National Institutes of Health will continue with its ongoing Transportation Management Plan (TMP) with the objective of reducing peak hour vehicular traffic by encouraging NIH employees who drive alone to ride-share, use public transportation, or use other alternative modes of transportation. The TMP is an important element of the transportation component of the Master Plan because it defines policies and programs that influence the design of the transportation and parking systems at NIH.

The goals of the current TMP are:

1. Improve the availability of parking spaces on campus for NIH personnel and visitors

2. Mitigate the traffic impacts of further campus development on the roadways serving the NIH Campus (such that the level of congestion along the roadways serving NIH is made no worse than such development did not occur).

3. Maintain a good neighbor" relationship with the surrounding community.

A primary goal of the NIH TMP is to reduce the rate of vehicular trip generation per employee such that growth in employment does not generate additional peak hour vehicular traffic. Through the TMP, NIH employees are encouraged to increase the use of multiple-occupant vehicles (carpools, vanpools, shuttles, and HOVs) and public transportation when traveling to and from NIH. Maintaining the TMP as part of the NIH administrative responsibilities is mandated in a Memorandum of Understanding (MOU) signed by NIH, the Montgomery County Planning Board, and the National Capital Planning Commission in May 1992. NIH will continue to explore a variety of approaches to reducing its vehicular trip generation and parking demands

5.3.2 Trip Generation Projection

The NIH will continue to conduct semiannual traffic generation and employee parking supply ratio assessment.

The trip generation portion of this assessment uses the Turning Movement Counts that were conducted from 6 AM to 7 PM at each of the entry and exit points to the campus. Results are summarized in Exhibit 5.3.A below[2].

Exhibit 5.3.A. Projected Peak Hour Trip Generation Table

Time	In	Out	Total
Morning Peak Hour	2,917	376	3,293
Projected Additional Trips	376	56	432
Total Morning Peak Hour Trips	3,293	432	3,725
Evening Peak Hour	364	2,682	3,045
Projected Additional Trips	48	391	439
Total Evening Peak Hour Trips	412	3,073	3,485

5.3.3 Roadway Improvements and Traffic Operations

Proposed Vehicular circulation is shown in Exhibit 5.3.B. Campus roadway improvements are shown in Exhibit 5.3.C and include the following:

- Reconnect South Drive
- Construct a new road from Center Drive to West Cedar Lane with a new employee entrance
- Relocate the service road south of the power plant to provide a setback from the power plant
- Reconfigure the intersection at Service Road West and South Drive
- Reconfigure the intersection at Service Road West and Lincoln Drive
- Construct new roads to service N-14 and the support facilities at the south end of the campus

[2] Information provided by Wells Associates

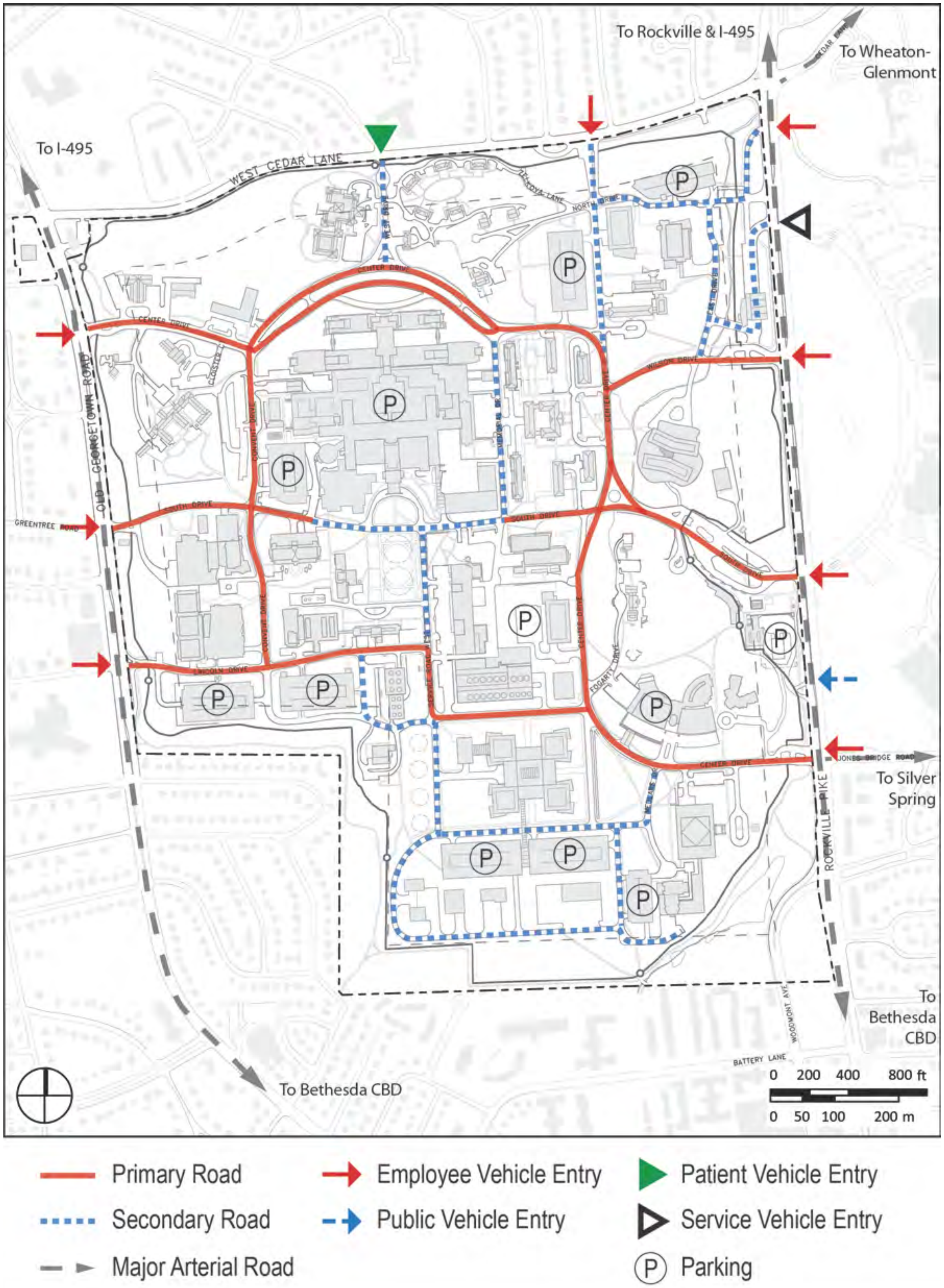

Exhibit 5.3.B. Vehicular Circulation

Exhibit 5.3.C. Roadway Improvements

In addition to these NIH improvements, if funding is acquired by the MD State Highway Administration, there will be improvements to the arterial roads surrounding the campus. The MD State Highway Administration was granted easements at the edge of the Bethesda Campus property to widen the intersections and shared use paths at the MD-355 and West Cedar Lane, MD-355 and Jones Bridge Road, and MD-187 at West Cedar Lane. The SHA project will reconfigure and widen the shared use paths at all these intersections and will reconfigure the entrance at MD-355 and North Drive.

5.3.4 Parking

Proposed parking distribution at NIH Bethesda Campus is shown in Exhibit 5.3.D.

The NIH Master Plan strives to provide adequate parking for employees. It is critical that NIH maintain adequate parking on site to meet legitimate employee and visitor needs and avoid parking shortages. Provision of parking at the NIH Bethesda campus is a complex issue affected by:

- campus population fluctuations
- on-campus security measures
- provision of visitor and motor-pool parking
- the need to offset future parking losses due to ongoing construction
- storm water management requirements

Parking will be set at its current level of 9,045 spaces for employees.

Removal of parking from buffer areas is also planned on a gradual basis throughout the Master Plan period. The specific timing of removal will be tied to the following four factors:

- the ability of NIH to obtain funding for construction of replacement parking outside of the buffers (primarily in structured parking)
- the phasing of the construction of this replacement parking prior to the removal buffer parking
- the need to maintain some amount of "surge" parking to offset future parking losses due to construction and on-campus security measures
- the need to maintain an appropriate ratio of parking to employees within each sector of the campus as well as for the entire site.

Parking construction will be phased. It will be dispersed throughout the campus and mostly accommodated by new and existing multilevel parking structures (MLPs). The majority of parking spaces will be located near the periphery of the site (but not within the buffer zones) and should be easily accessible from campus entries or the thoroughfares. Recaptured surface parking areas will be landscaped to improve the image of the campus.

Exhibit 5.3.D.Proposed Parking Distribution

5.3.5 Service Access

All commercial delivery truck traffic access the NIH campus using the exclusive commercial vehicle access point at the Commercial Vehicle Inspection Facility (CVIF). This truck entrance is located just south of the North Drive employee-only entrance. Commercial vehicles that pass inspection are allowed to continue into the campus. Commercial vehicles that do not pass inspection are either detained or turned away. The release of inspected vehicles from the CVI is coordinated with loading dock managers at destination buildings to avoid overloading the building facilities and adjacent access roads.

The Master Plan consolidates and simplifies service access on the Bethesda Campus to avoid conflicts with passenger vehicles and minimize the negative visual impacts of multiple service areas. Most existing buildings will continue to have individual service areas. However, most of these will be better screened to limit visibility from surrounding areas. See Exhibit 5.3.E.

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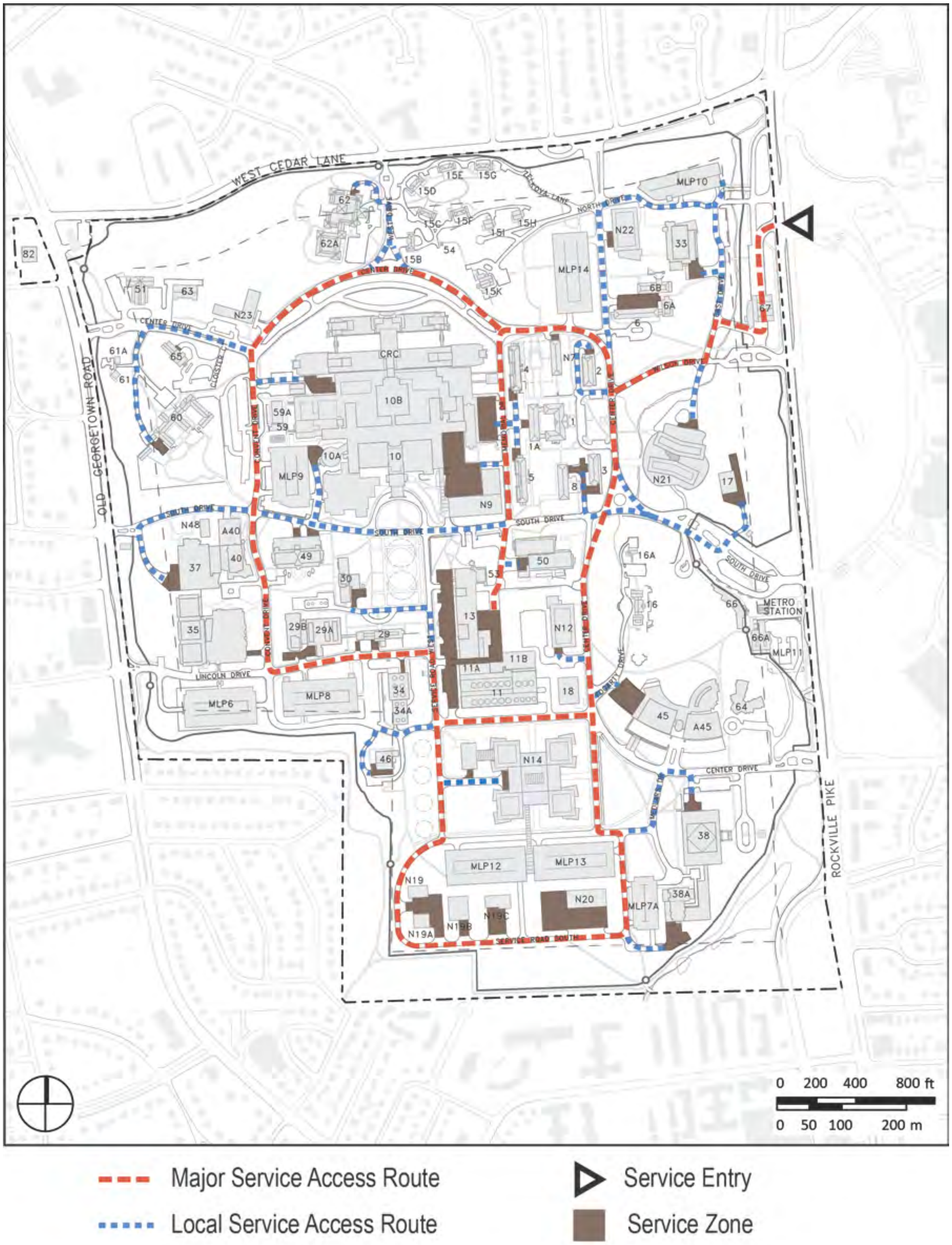

Exhibit 5.3.E. Service Areas and Access

5.3.6 Public Transit

The area of the Medical Center Metro station/Gateway Center for Visitors will continue to operate as the main transit node for the campus, providing intermodal connections among the metro, public buses, NIH on-campus shuttles, NIH off-campus shuttles, passenger vehicles, bicycles, and pedestrian traffic.

The principal point of campus entry for public transit riders will be at the Gateway Center, where they can transfer to the internal campus shuttle or walk to their destination. All visitors using transit will enter the campus at this point. Most of the NIH employees arriving by transit will use this entrance as well, but they can also enter the campus from other bus stops around the campus perimeter via employee pedestrian gates.

Public transit and NIH shuttle routes will continue to be coordinated with the Washington Metropolitan Area Transit Authority (WMATA) and the Montgomery County Department of Transportation (MCDOT) in the future to ensure that passenger transfers between the NIH on-campus routes, NIH off-campus, and off-campus Metro/Ride-On bus routes are as seamless as possible.

To maximize the use of the shuttle system, the NIH will continue to explore route options such as two-way circulation or adding express routes to key destinations as the need arises. See Exhibit 5.3.F for suggested adjustments to campus shuttle routes per the Master Plan. In addition to shuttle services that already exist, cooperative shuttle operations to the WRNMMC and with Montgomery County for service to the Bethesda Central Business District may be explored.

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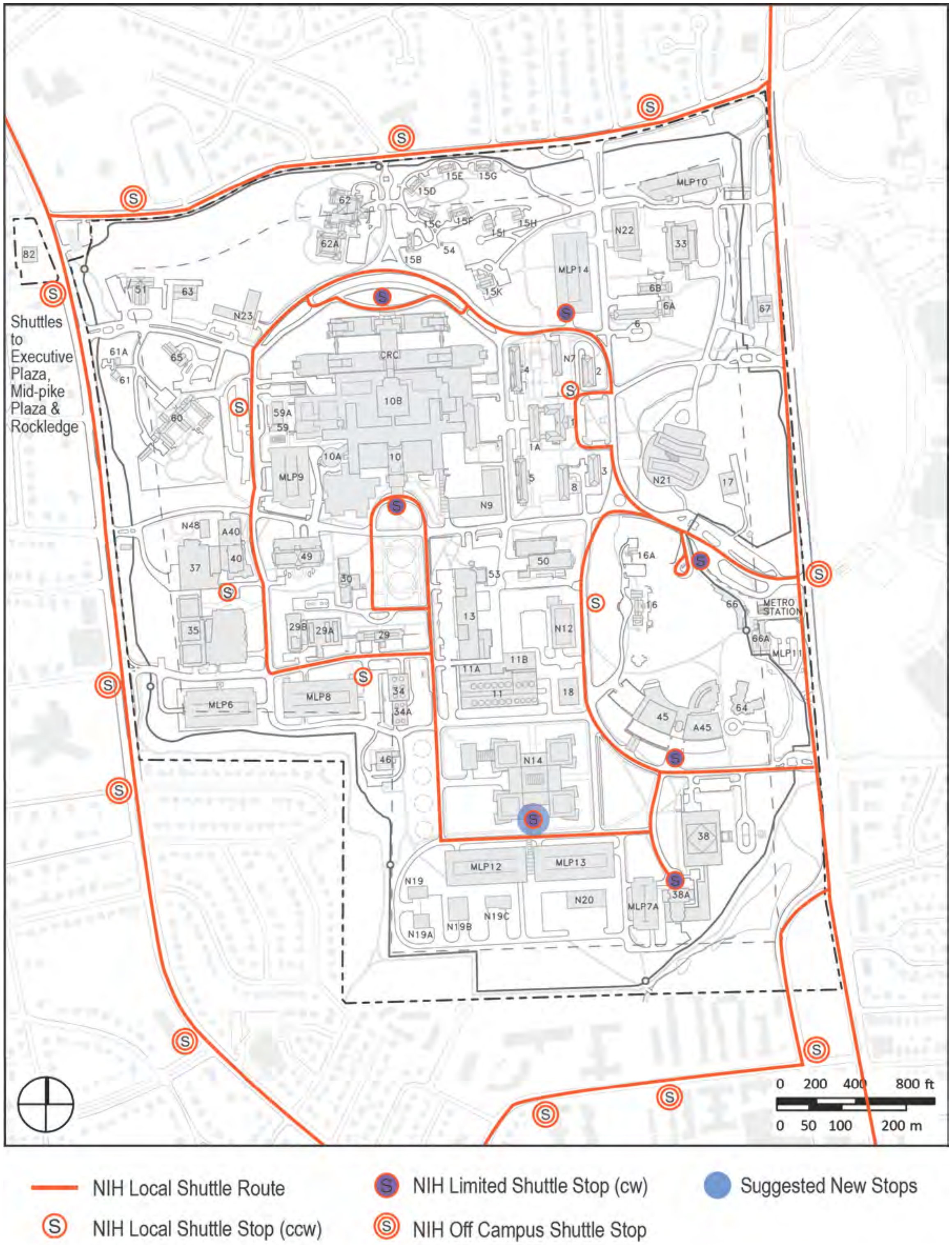

Exhibit 5.3.F. Shuttle Bus Routes and Stops

5.3.7 Pedestrians and Bicycles

Recommendations in the Master Plan regarding pedestrian and bicycle accommodation are intended to make the campus more pedestrian friendly and to make campus bicycle path connections to the off-campus Montgomery County bikeway network. Accessibility for persons with disabilities is considered as an integral part of the campus pedestrian network. It is envisioned that improving pedestrian and bicycle circulation and orientation on campus will encourage campus employees to consider alternatives to commuting by private vehicles and will improve the character of the campus. Exhibit 5.3.G and Exhibit 5.3.H illustrate the Master Plan recommendations for pedestrian and bicycle systems. For more detailed pedestrian and bicycle path design criteria, see Chapter 6.

5.3.7.1 Pedestrian Traffic

Pedestrian access to the campus has been limited, with the completion of the security fence around the campus perimeter. Pedestrian/bicyclist visitors are allowed to enter onto the campus through the NIH Gateway Center located at the Rockville Pike/South Drive entrance and at the West Cedar Lane entrance. Pedestrian/bicyclist employees may enter campus through any of the vehicular entrances and through five employee-only pedestrian/bicycle gates in the security fence (strategically located around the campus perimeter). Two gates are located along the northern campus perimeter, two gates are located along the southern campus perimeter, and one gate is located along the western campus perimeter. All of the vehicular and pedestrian/bicyclist entrances are ADA accessible.

Heavy pedestrian traffic is generated from the Medical Center Metro Station and the parking garages. The master Plan and future site planning of individual projects with emphasis on the safe, direct pedestrian paths between major destination buildings, the metro station and parking facilities. Grade separations such as elevated walkways and tunnels will also be employed to improve pedestrian safety.

5.3.7.2 Bikeways

Bicycle paths proposed for the NIH campus are divided into several categories consistent with the 1978 Montgomery County Master Plan of Bikeways. The current county bikeway plan shows proposed future Class-I bikeways (off-road bike-paths) along the perimeter of the campus, which connect to existing and proposed local or regional bikeways around the site. Bike-paths on the east and west perimeter of the campus are located on NIH property, and will remain there as long as the paths are not deemed to diminish campus security. The bike-path on the north side of the campus is located adjacent to the roadway on the south side of West Cedar Lane. On the south side of campus, the bike-path has three connections to the Battery Lane neighborhood that are shown in accordance with the County Master Plan of Bikeways. One connection is at Woodmont Avenue, another at North Brook Lane and the third one is located adjacent to the Spring House building.

Bicycle access from the east edge of the campus is proposed via a Class-II bikeway (designated bicycle lanes within the roadway) along Center Drive, South Drive, and North Drive. Bicycle access from the west edge of the campus is proposed via a Class-II bikeway along West Center Drive. The west portions of South Drive, as well as West Drive, are proposed as Class-III bikeways where bicycles operate in mixed traffic with motor vehicles. Shared use of campus roadways by bicycles and vehicles is generally safe at speeds less than 30 miles per hour in conjunction with wider (13 to 14-foot), mixed-use outside lanes.

Adequate bicycle storage and provision of facilities for showering and changing should be addressed in the implementation of future development of the campus (see Chapter-6). The Master Plan recommends that covered and secure bicycle parking be located at nodes serving each major building group on campus. This bicycle parking may be freestanding shelters or incorporated into new buildings or parking structures. Other bicycle parking may be provided on a building-by building basis. Likewise, shower and changing facilities should be provided for each major building group.

5.3.8 Access for Persons with Disabilities

The NIH has an approved Management Plan that addresses access for persons with disabilities and has conducted an overall site accessibility study. In general, due to the size of the site and topographic conditions, persons with disabilities are accommodated through enhanced shuttle service and provisions of close-in parking spaces but, as projects are constructed that impact the site, special consideration is required to bring the site into compliance with the Architectural Barriers Act.

Federal facilities must comply with standards issued under the Architectural Barriers Act Accessibility Standards (ABAAS). The Architectural Barriers Act applies to any facility constructed, altered, leased, or financed with federal funds that is intended for use by the public or may result in employment of persons with disabilities.

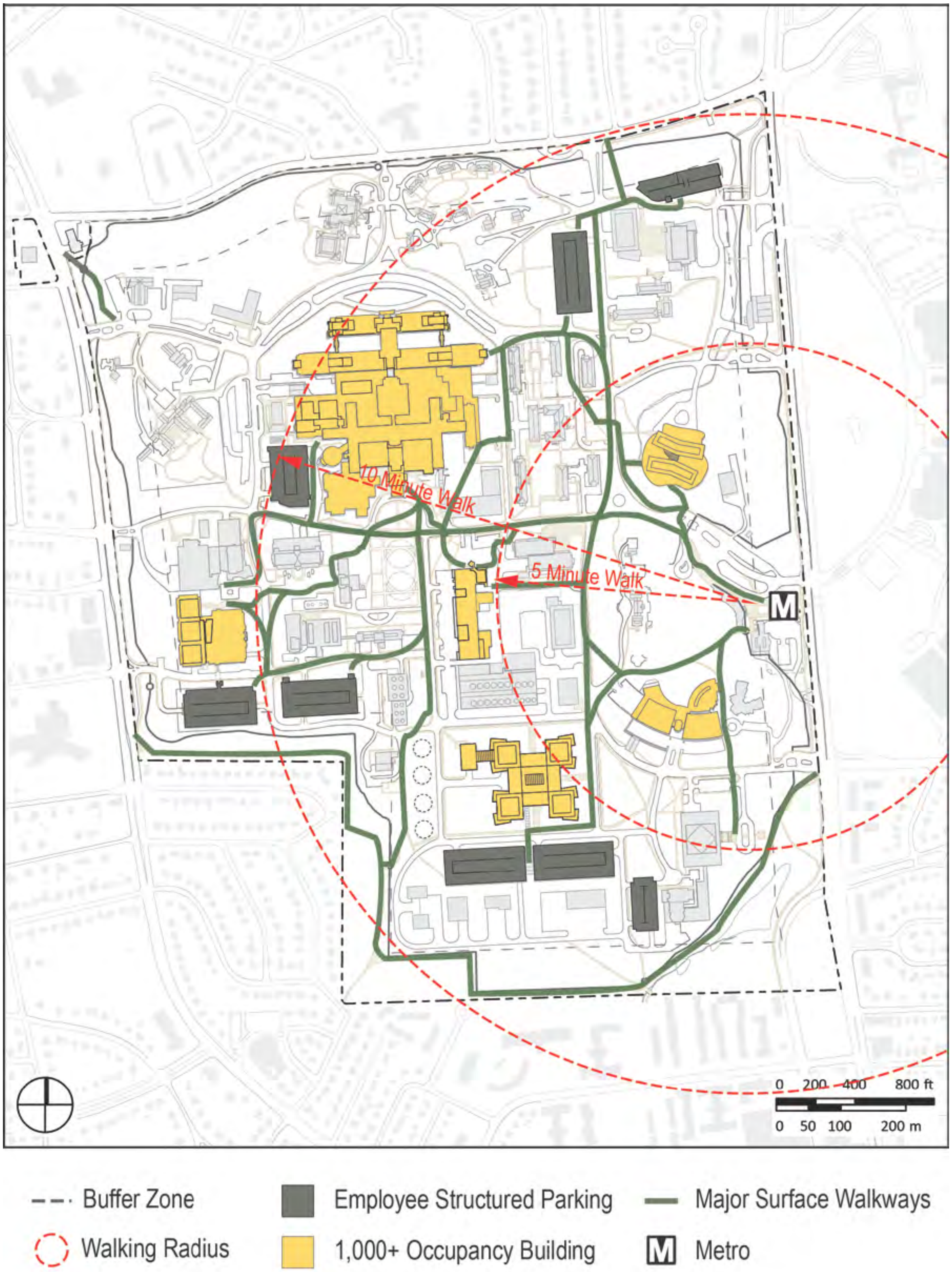

Exhibit 5.3.G. Pedestrian Circulation

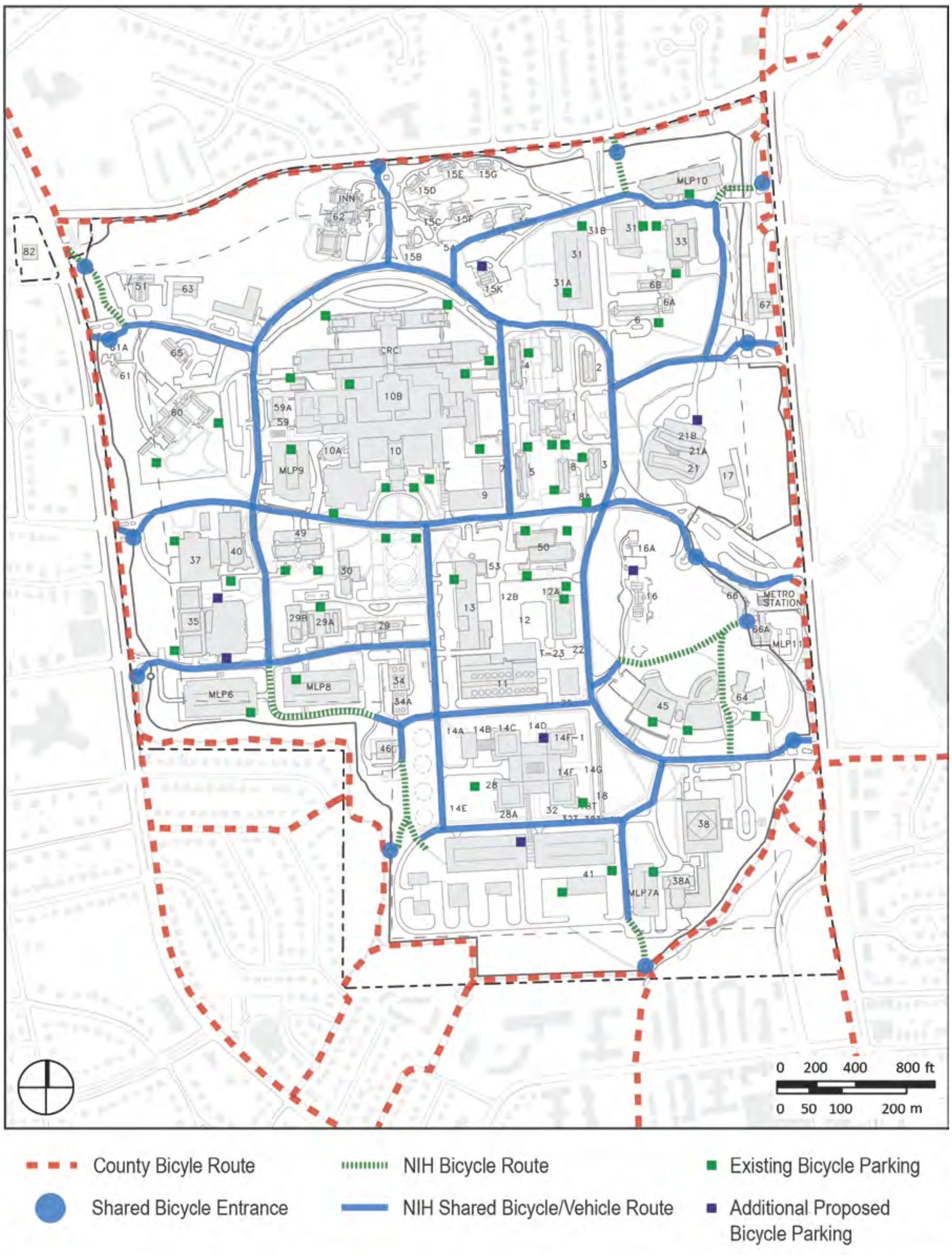

Exhibit 5.3.H. Bicycle Circulation

5.4 Utilities

5.4.1 Utility Distribution System

As noted in the Master Plan Component Concepts (Section 5.2.2), the utility distribution scheme proposed by the Master Plan is a grid system for steam, chilled water, water, and electric power that provides a high level of service reliability. Service can be maintained even if there is a major disruption in one area of the distribution system.

The core of the distribution grid is a utility tunnel system containing the larger steam and chilled water distribution mains, and other pressurized or electrical systems to serve the more densely developed center of campus. This tunnel system is composed of the existing (or reconstructed) north-south tunnel connecting the Power Plant to both the Clinical Center and the South Research Cluster, the existing east-west tunnel connector following the axis of South Drive between Center and Convent Drives, and a future east side tunnel under Center Drive between the east-west tunnel and Building-11. This last section would complete a central tunnel loop providing redundant service from the east and west side of the Power Plant. Where cost effective, comparatively short tunnel stubs would extend from the loops. In general, these tunnels would be about 15-feet wide and 12-feet deep. Branching off from this central core, the remainder of the utility corridor distribution grid roughly follows the proposed development. Utility trench sections are proposed for connections to the northeast, northwest, and south portions of the campus. Major utility corridors would be extended to the north, west, and around the Building-6 cluster to Research Building-33 to complete and connect this network on the campus.

In addition to these proposed systems, there is an extensive network of existing direct-burial secondary utility distribution lines on the campus. Many of these relatively small lines serve individual buildings and can reasonably be relocated for future construction.

The proposed extensions of NIH major utility tunnels and corridors are shown in Exhibit 5.4.A. The Master Plan recommends that future development of buildings avoid these major existing and proposed utility corridors where practical. To avoid disruptions to NIH functions, it is important to closely coordinate all roadway and building construction programs with proposed utility tunnel and distribution line construction. It is also recommended that utility dedications be as narrow as possible and lie within roadway limits where practical. Where this is not possible, a minimum 12-foot wide area adjacent to roadway curbs should be reserved as a landscape “easement”, with utilities placed beyond that zone. The long term Master Plan goal is to relocate all utility distribution lines to the utility corridors (with the exception of individual building services).

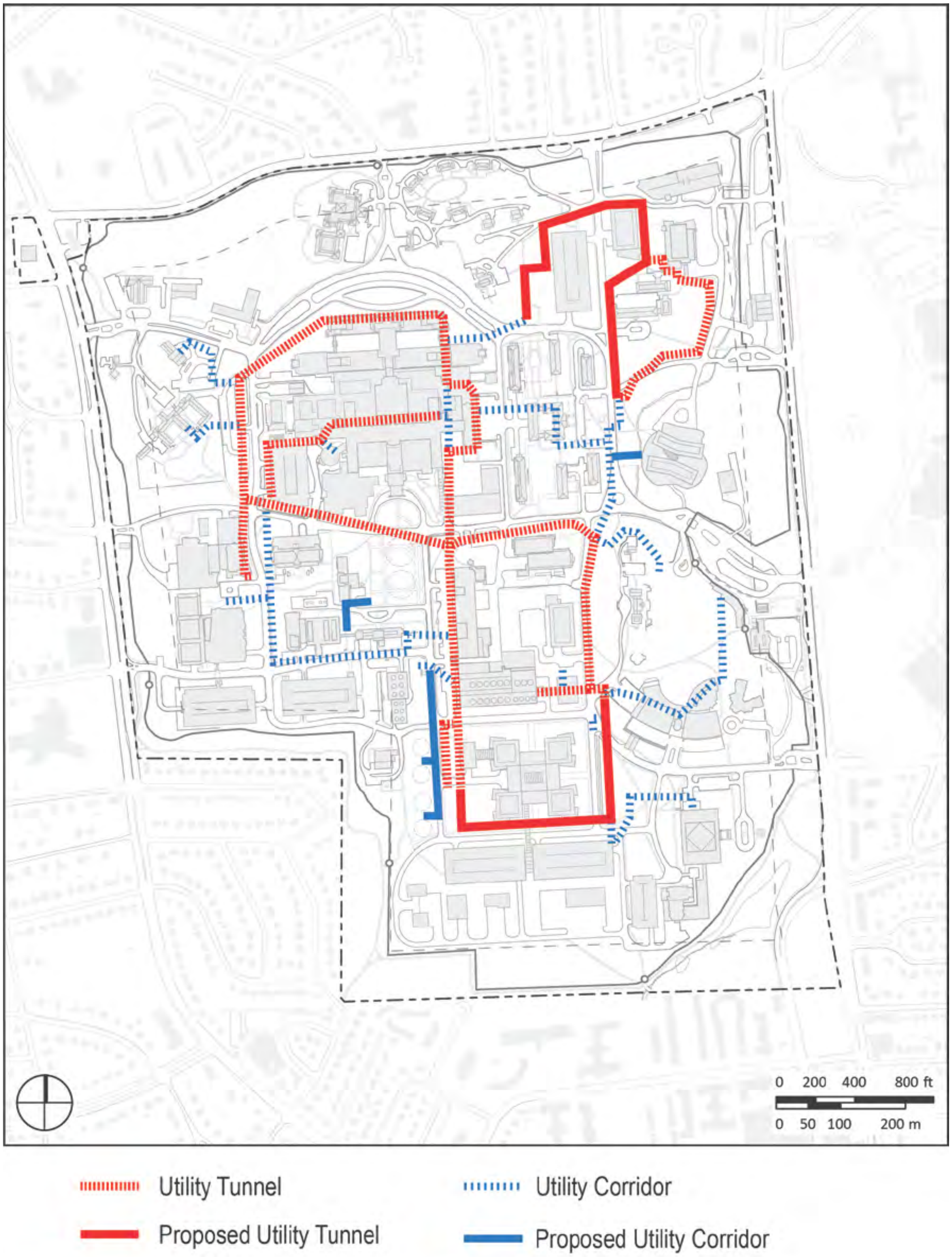

Exhibit 5.4.A. Major Utility Tunnels and Corridors

To meet projected demands, the Master Plan requires the addition of two steam boilers and three chillers.

5.4.2 Assure/Expand Chilled Water Capacity

At present, there are nine 5,000 ton chillers operating on R-22 refrigerant and three 5,000-ton chillers operating on R-134a refrigerant. The average age of these chillers is twelve years with half over 16 years old. In 2006 a HHS study was conducted regarding the "Energy Related Risk Vulnerabilities" on NIH campuses focusing on site and plant infrastructure. This report states that "chilled water is considered a critical utility". Reliability of this system is essential to the NIH Mission. An essential part of assuring reliability of this critical system is maintaining an adequate supply of chilled water at all times 24/7. This reliability will be compromised in the next 5 years as demand for chilled water cooling increases, challenging the central plant to keep up with such demand. Also, refrigerant R-22 has been phased out. NIH is therefore required to convert or replace nine (9) chillers to refrigerant R-134a, which will result in a reduction of their capacities. These current and future demands mandate another expansion to the central plant to increase corresponding Chilled Water capacity and to assure the reliability of this mission critical utility.

5.4.3 Emergency Power Generation to Assure Chilled Water

In order to assure a reliable backup electrical system for chilled water during a power outage, alternative power generation is required. Chilled water is an essential utility to the Bethesda campus as it provides all of the cooling water for air conditioning systems and equipment that keep campus facilities and specialized equipment operational. A 2006 study for HHS entitled "Energy Related Risk Vulnerabilities for the Bethesda Campus," recommended emergency power generation to support chilled water production in the event of a Pepco power outage. During power failure conditions, the existing campus Chilled Water system will be inoperable because backup power currently does not exist.

5.4.4 Fuel Oil Tanks

The Master Plan proposes the location of two new 500,000 gallon fuel oil tanks, needed to assure reliability for NIH steam system, on a site south of Building 46. The intersection improvements at Lincoln and Service Road West may require relocation of the existing two 500,000 gallon fuel oil tanks. If that is the case, the new tanks, to replace the existing fuel oil tanks, can also be located on a site south of Building 46.

Any above ground or underground petroleum storage tanks, which may be utilized, must be installed and maintained in accordance with applicable State and federal laws and regulations. Underground storage tanks must be registered and the installation must be conducted and performed by a contractor certified to install underground storage tanks by the Land Management Administration in accordance with CO MAR 26.1 0. Contact the Oil Control Program at (41 0) 537-3442 for additional information.

5.4.5 Storm Drainage

With minor exceptions, campus storm water drainage can be divided into three general areas (depicted in Exhibit 5.4.B).

- The North Branch channel which drains the northern tier of the campus as well as a comparable area within the Maplewood residential neighborhood to the north. Flows to the channel are either overland or through short pipe connections to impervious areas.
- Three short, independent systems that run parallel to one another in the area between Building-10 and the NIH Stream.
- A short pipe system that drains impervious areas around Buildings-38 and N14, and flows to Stoney Creek.
- A three-branch network that drains the campus area within the NIH Stream watershed south of South Drive.

The three branches flow from the west, southwest, and south. Until recently, they converged at a manhole near the northeast corner of Building-50. The main stem of the west branch is 48-inches in diameter. The line was realigned as part of the South Drive tunnel project. The southwest branch, which ranges up to 96-inches in diameter, and the south branch cross the future East Quadrangle area.

5.4.5.1 Storm Water Management

Future storm water management will be conducted through the NIH Bethesda Institutional Storm water Management Plan (ISMP), which is being updated to reflect the 2013 Bethesda Campus Master Plan. Components of the ISMP include both management procedures and physical facilities. Management will be completed on a campus-wide or "regional" basis. Quantity and quality control of runoff are included in the plan. More detail is in the Master Plan Environmental Impact Statement (EIS).

For the purpose of storm water management (SWM), existing or baseline conditions are defined as those present, just prior to the start of Hatfield Clinical Research Center construction. The computed campus impervious area at that time was 129.6 acres. Although the Master Plan would add over three million gross square feet of floor space, there would be minimal change in site impervious area, because many existing one to three story structures will be replaced by five to seven story buildings, and more than 4,000 surface parking spaces will be consolidated in parking structures. These consolidations will increase the pervious area.

The required minimum campus-wide SWM quantity control or channel protection volume for the campus is 3.14 acre-feet. This requirement is met by the recently constructed North SWM Facility located on the North Branch in the northeast corner of campus. The facility is composed of three underground fields of large diameter perforated pipe connected in series. Release of stored runoff from the facility is controlled through a single small diameter pipe. Detained runoff percolates through pipe perforations to the subsoil below. Under one-year, 24-hour storm runoff conditions, detained facility volume is 3.30 acre-feet.

Campus wide storm water runoff quality control requirements were determined in consultation with the Maryland Department of the Environment (MDE). All development in impervious areas, as defined by pre-Hatfield CRC conditions, is considered to be "redevelopment" in determining project level SWM quality control requirements.

NIH and Montgomery County have signed a MOU for the construction of a county SWM facility, the "South Pond" (to be completed in 2013). It will capture runoff from the Woodmont Triangle area to the south of NIH, and areas within NIH that are in the Stoney Creek watershed. For County purposes, the South Pond will provide SWM quantity control. For NIH purposes, the facility will provide 4.61 acre of SWM quality control storage.

The Bethesda Campus is dynamic with construction and demolition continually underway. The situation will be covered by an ISMP SWM tracking or "banking" system. The overall campus quantity and quality control volumes at the North SWM Facility and South Pond, respectively, supplemented by smaller individual campus facilities, represent "account" levels for the campus as a whole. The quality and quantity control volumes for individual projects would be computed as they are implemented. These individual project control volumes would be charged or credited to the campus "account" values listed in the tracking system at the time of project implementation to determine the management status at any given time.

U.S. EPA design goals should be considered within the framework of the campus ISMP.

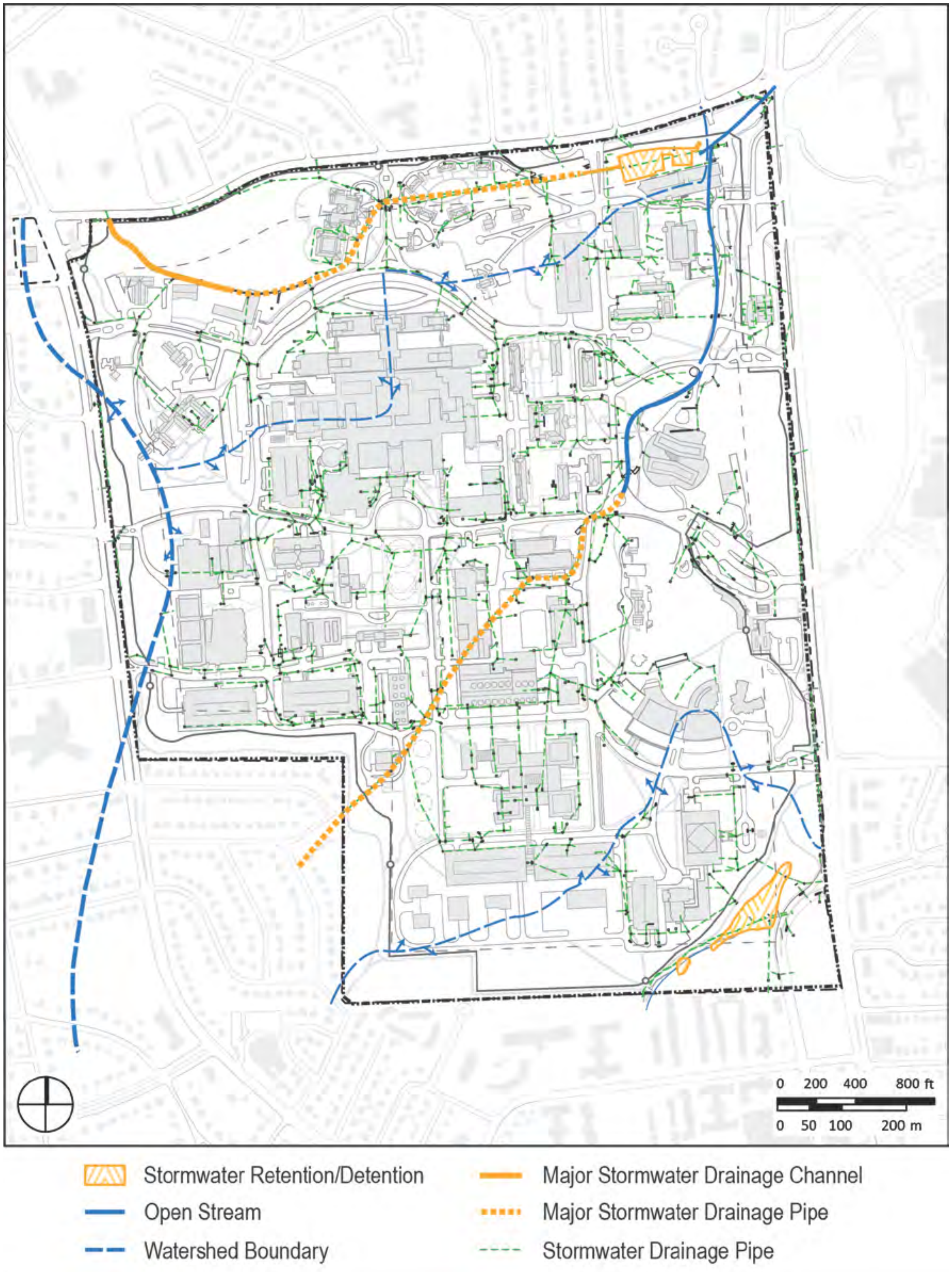

Exhibit 5.4.B. Storm Water System

5.4.6 Catastrophic Risk Mitigation

Consistent with potable water storage tank recommendation of HHS' Utilities Vulnerability Study for NIH (2006), The Master Plan proposes to mitigate risk to domestic water used by: people, animals, fire suppression, cooling tower water make up, boiler water make up by constructing a 5 million gallon potable water tank integrated within a proposed parking structure. The Master also proposes to install a 5 million gallon water tank to mitigate risk to chilled water supply. The benefits of these proposals are:

- Reduced energy consumption; increased renewable energy use,
- Improved absorption of water/reduced runoff
- Transformation of highly visible campus core into a multi-functional, aesthetically pleasing green space emblematic of NIH's commitment to the well-being of its patients, employees, and the environment.
- More efficient use of land via conversion of sprawling parking lots to multi-level parking.
- Consistent with Master Plan goals
- Consistent with HHS Strategic Sustainability Performance Plan

5.5 Performance Improvements

5.5.1 Condition Index

Currently 64% of the Bethesda Campus's facilities have a condition index CI of 90 or above and 36% have CI of less than 90. The master plan proposes to improve the overall CI by:

- Adaptive reuse of Building-4 to bring the building's CI to 100.
- Adaptive reuse Building-8 to bring the CI of the buildings up to 100.
- Rehabilitating Building-10 (Warren G. Magnusson Clinical Center complex) to bring the building's CI to 100.
- Demolishing Buildings 12 and 12A and replacing it with new construction. Buildings 12 and 12A have deteriorated with age and wear and can no longer be economically maintained or rehabilitated. Replacement Building N7 will bring the CI to 100.
- Demolishing Building-21 and replacing it with new construction. The current site of Building 21 is needed for the replacement of Building 31. Building-21 has a CI of 65.74 and the replacement of Building 21 will bring the CI to 100.

- Rehabilitating Building-29 and Building 29A will bring the CI of the buildings to 100.
- Demolishing Building-31 (Claude Pepper Building) and replacing it with new construction. Building-31 has deteriorated with age and can no longer be economically maintained. Rehabilitation would be costly and disruptive to the occupants. New construction will bring the building CI to 100
- Rehabilitating Building-34 to bring the building's CI to 100.

5.5.2 Facility Utilization

Currently 87% of the Bethesda Campus's facilities are utilized, 12% are over utilized, less than 1% is underutilized and 1% is not utilized. The NIH facilities on the Bethesda Campus are densely populated and the Master Plan proposes the following to improve the utilization on the Bethesda Campus.

5.5.2.1 Over Utilized Facilities

- Adaptive reuse of Building-4, 5, and 8 for administrative space for the NIH Office of the Director to allow decompression of Building-1 and Building-2.
- The proposed addition to the Natcher Building (Building-45) to decompress the Natcher Building.
- Adaptive reuse Building-30 for physician's offices for the Clinical Center to allow decompression of Building-10.

5.5.3 Building Functional Suitability

The Master Plan proposes to demolish functionally obsolete facilities and replace them with new construction. Examples of this include:

- Replacing the 14/28 complex with the Central ARC;
- Replacing T46 with the Northwest Childcare Center;
- Replacing Building 31 with the new Administrative building (N21).

5.5.4 Operating Cost

Leasing laboratory and animal research facilities is significantly more expensive then maintaining those facilities on NIH property. The Master Plan proposes a reduction in the NIH operating costs by reducing its lease portfolio and returning leased laboratories to the Bethesda Campus.

5.5.5 Disposal and Remediation of Unneeded Assets

The Master Plan proposes to demolish 1,346,785 gsf of unneeded facilities.

- Demolishing Building-7 (Memorial Laboratory) and Building-9, replacing them with the Animal Research Center (ARC) Building N9. Buildings 7 and 9 have deteriorated with age and can no longer be economically maintained or rehabilitated.
- Demolishing Buildings 12 and 12A and replacing it with new construction. Buildings 12 and 12A have deteriorated with age and wear and can no longer be economically maintained or rehabilitated.
- Demolishing Buildings 14A – 14H and replacing them with new construction. These building are functionally obsolete and there are no NIH programs that can fit into these building once the animal programs are relocated to the ARC.
- Demolishing Building-21 and replacing it with new construction. The current site of Building 21 is needed for the replacement of Building 31.
- Demolishing Building-22 and Building-25 after replacing them with new construction will provide viable facilities for their current functions. Both building sites are needed for other purposes. Building 22 site is needed for a new biomedical research laboratory (Building N12) and police station (Building N18). The Building 25 site is needed to realign and upgrade the service road that is adjacent to the Central Utility Plant (CUP) to give it sufficient set back from the CUP
- Demolishing Building-31 (Claude Pepper Building) and replacing it with new construction. Building-31 has deteriorated with age and can no longer be economically maintained. Rehabilitation would be costly and disruptive to the occupants.

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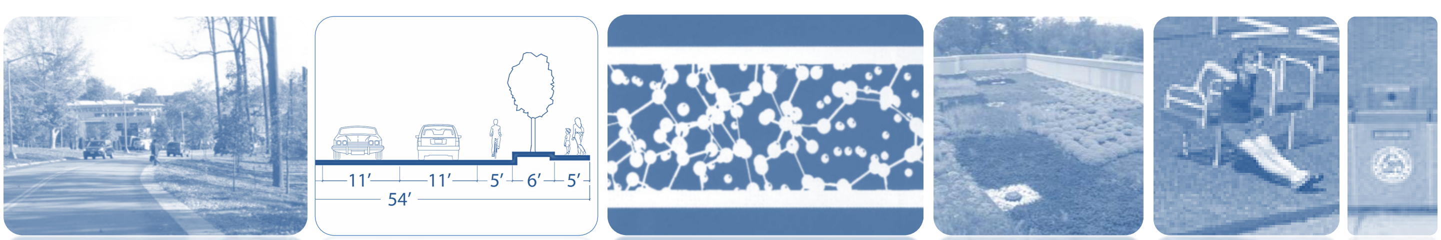
U.S. Department of Health and Human Services

NIH National Institutes of Health

Chapter 6
Development Guidelines



Prepared by the Division of Facilities Planning
Office of Research Facilities

06-14-2013

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6 Development Guidelines

6.1 Development Guidelines

Development guidelines are included in this 2013 Master Plan to quantify or further define the general concepts and planning intentions set forth in Chapter 5. Although there is flexibility within the Master Plan, certain key relationships, patterns, and standards should be adhered to or considered when developing site or building projects to ensure that the desired functional characteristics and campus character are achieved. The Development Guidelines define these key elements and provide recommendations for their implementation.

Subjects addressed in this chapter include issues of building size and scale, definition of open spaces, site character and quality, as well as access and circulation.

6.2 Density and Bulk

Maintaining a “campus” character and image is an important aspect of the Master Plan. To ensure that an appropriate proportion of open space and landscape is maintained, it is important to control the density of buildings on campus. Generally, development should be denser at the core of the campus than at the periphery. Development should also be denser toward the eastern side of the campus to take advantage of the public transportation infrastructure. Filling in of open spaces shown in the Master Plan by additional construction is discouraged as this may diminish the character and quality of the open spaces, as well as impede views and light available to other buildings.

Building bulk in future development should also be limited. The Master Plan concept creates quads or groups of buildings made up of individual building modules, which can be implemented incrementally over time. Where possible, building modules should be limited to footprints of 40,000 gsf or less and not have a dimension greater than 300 feet in any direction. Long buildings without façade articulation, which create the appearance of a long, solid wall, should be avoided.

6.2.1 Setbacks and "Build-to Lines"

6.2.1.1 Major Building Setbacks

On a campus-wide basis, the Master Plan proposes general patterns of setbacks for buildings from major roadways to control density, ameliorate the scale of buildings, and ensure the development of a "campus" character for the site. All new buildings should address the existing context and, where possible, align to create a consistent articulated street wall. Along primary internal roadways, buildings should generally not be any closer than 40 feet from roadway curb lines. Setbacks from secondary service roads should be a minimum of 25 feet. In order to maintain a clear relationship between building entries and roadways, it is recommended that no new structures be set back more than 180 feet from their principal roadway, as shown in Exhibit 6.2.A.

At the perimeter of the site, the buffer zone setbacks should be acknowledged by excluding new buildings and surface parking within this area. The buffer width should be maintained at 250-feet throughout the entire campus perimeter. It is understood that limited paving and roadway access lanes may be needed within the buffers on the East and West sides of the campus. See Section 5.2.9 for more detailed discussion of buffer zone characteristics.

6.2.1.2 Historic District Setbacks

The scale and integrity of buildings within the Historic Districts (Buildings 1 through 6, or the Historic Core; Buildings 15B - 15I, or the Quarters; and buildings 38 and 38A or National Library of Medicine District) should be protected. A minimum setback of 100-feet to the nearest building is recommended.

6.2.2 Building Heights

6.2.2.1 General Campus Height Plan

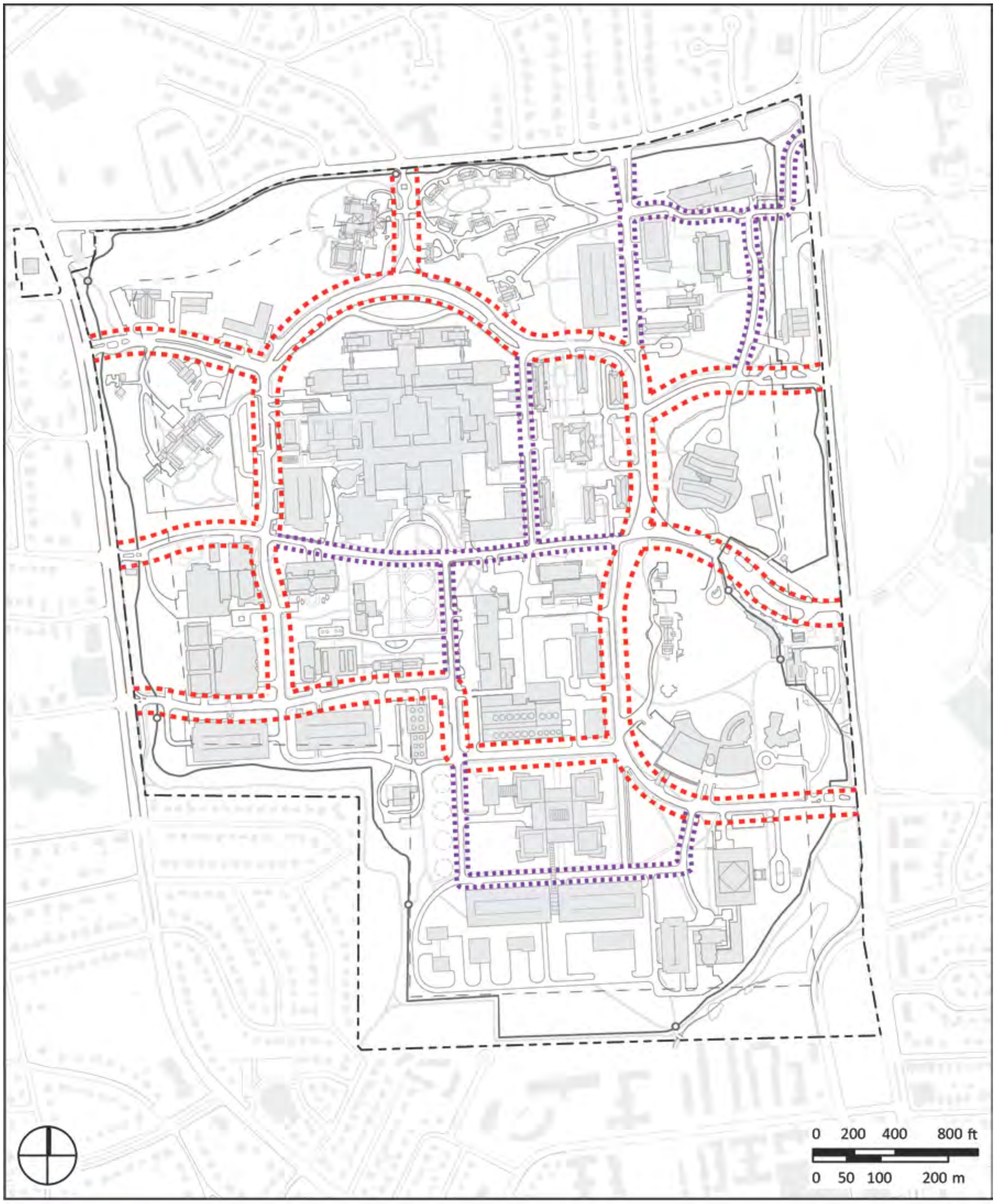
Proposed building heights follow the Master Plan building height concept of placing the highest buildings near the center of campus and transitioning to low buildings at the north, west and south property lines. Transitions in building heights are also made near the structures of the Quarters Historic District and the Historic Core District. Exhibit 6.2.B indicates the recommended maximum heights of new construction on campus. This height limit includes all occupiable floors (excluding interstitial floors and mechanical penthouses) and should be measured from the average grade at the perimeter of the structure. Exhibit 6.2.B is intended as a general campus-wide guideline. Within this overall building height framework there are particular areas which require special consideration upon implementation of nearby construction. These areas are listed later in this section under "Critical Areas".

An important concept in the development of height limitations at the perimeter of the site is the imposition of an allowable height envelope corresponding to a 1:5 height-to-distance ratio, extending into the NIH campus on the north, west and south sides. This ratio limits the height of any proposed new structure to one foot for every five feet of distance measured perpendicularly from the property line of parcels adjacent to the NIH campus, except along Rockville Pike where building height concerns are lessened. The Master Plan proposes to increase the allowable building height to 200 feet along the buffer edge along Rockville Pike between Center Drive and Wilson Drive. The increase in building height will bring the Master Plan into compliance with the Montgomery County goal of higher density development near Metro stations.

There are three primary reasons for using the 1:5 height ratios:

- Generally accepted urban design principles indicate that areas which have a height to distance ratio greater than 1:4 do not feel enclosed. Therefore, a 1:5 ratio will provide an even greater sense of openness at the perimeter of the site.
- A person's primary cone of vision is about 30^{o} above the horizon. Objects which fall within this visual zone block the observer's view of the sky, thus giving a greater or lesser sense of enclosure depending on the amount of the sky-plane which is blocked. The 1:5 height ratio corresponds to approximately 11.5 degrees, so that an object within this height envelope would obstruct less than half of the viewer's sky-plane.
- Almost all of the current buildings on the NIH campus fall within the 1:5 height to distance ratio.

The recommended building heights were determined from three-dimensional massing studies of the relationships between proposed and existing structures on campus, and to fall within the 1:5 height envelopes at the perimeter of the campus. Heights have been arranged to create a coherent pattern among all campus buildings and to give a sense of hierarchy or prominence to the most important ones. The building heights shown also accommodate building construction sufficient for the attainment of the proposed Master Plan development program and concepts described in Sections 5.2.1 and 5.2.2.



40' Minimum Building Setback from Primary Roads

25' Minimum Building Setback from Secondary Roads

Exhibit 6.2.A. Major Building Setbacks

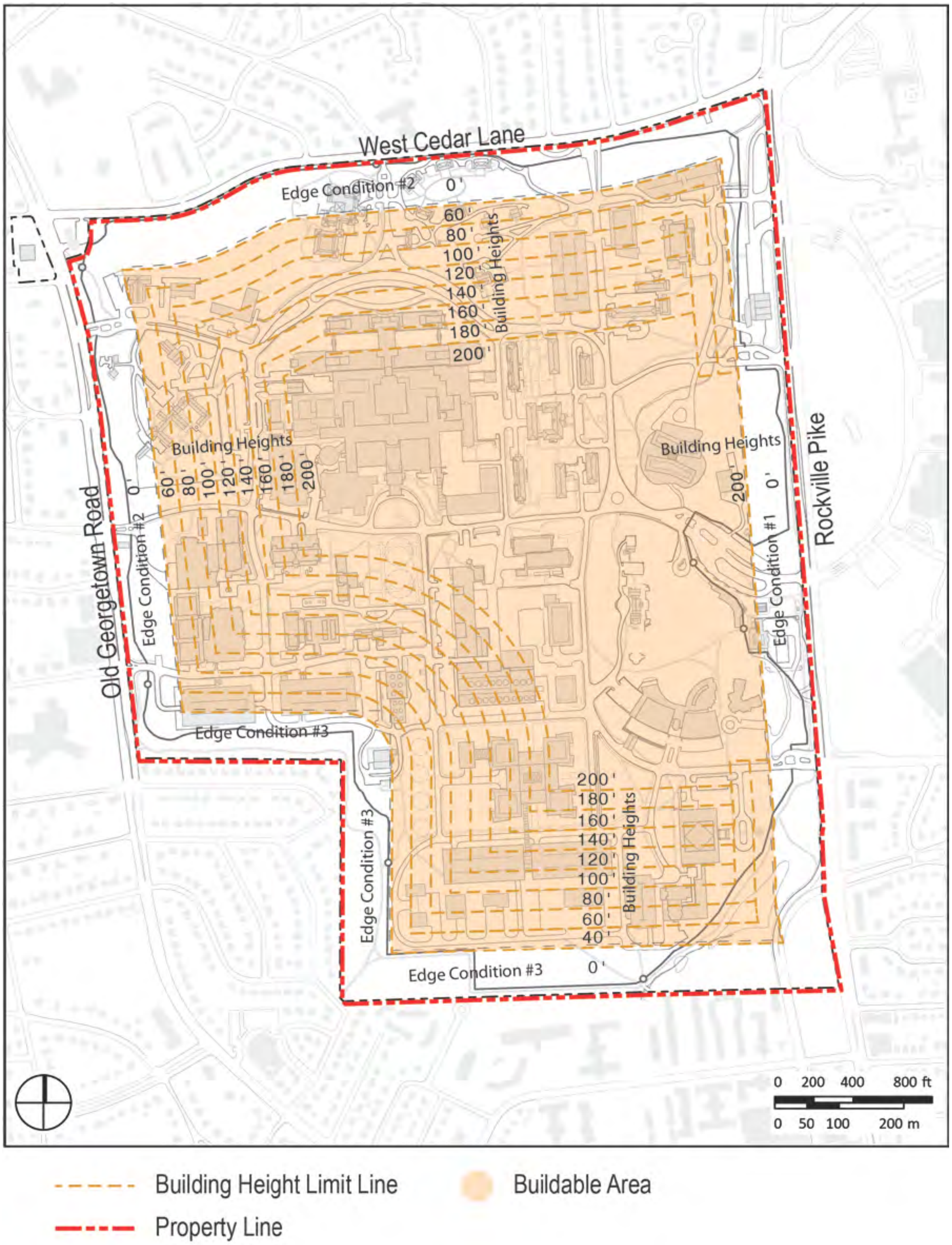


Exhibit 6.2.B.Recommended Maximum Building Heights

6.2.2.2 Critical Areas

The Master Plan minimizes the effects of new construction on neighboring areas off campus. Within the campus, special attention has been given to creating appropriately scaled open spaces and relationships between new and existing buildings. Areas of significant attention to scale issues include:

- Development adjacent to the Convent (Building-60)
- Development near the Historic Core quad
- The Central Quadrangle
- The potential development parcels near the Metro station
- The areas adjacent to the south perimeter of the campus which are directly adjacent to residential neighborhoods

Exhibit 6.2.C illustrates, in section form, the Master Plan intentions for maximum building heights in these sensitive areas. Sectional drawings indicate the desired target heights of buildings as used to calculate the target square footage areas listed in Exhibit 5.2.A. “Master Plan Building Directory and Area Summary Table”.

6.2.3 Ground Level Activity and Use

In all areas of the campus it is desired that buildings present an accessible appearance at ground level. Building entries should be designed to address streets or major spaces. Blank walls without fenestration or articulation should be avoided.

In particular, ground level activities and uses are encouraged around the main pedestrian thoroughfares and the Central Quadrangle. This area should become the central meeting place of the campus. Numerous building entries and ground level activities, which open out into the Central Quadrangle, will aid in creating this sense of vitality and centrality.

Pedestrian movement can also add to the vitality of public spaces on campus. Spaces should be designed to accommodate and encourage pedestrians. Walkways within the major open spaces should be of high quality materials, shaded, and equipped with seating and furnishings where appropriate. Buildings around the major open spaces may also include arcades to ease pedestrian movement in inclement weather.

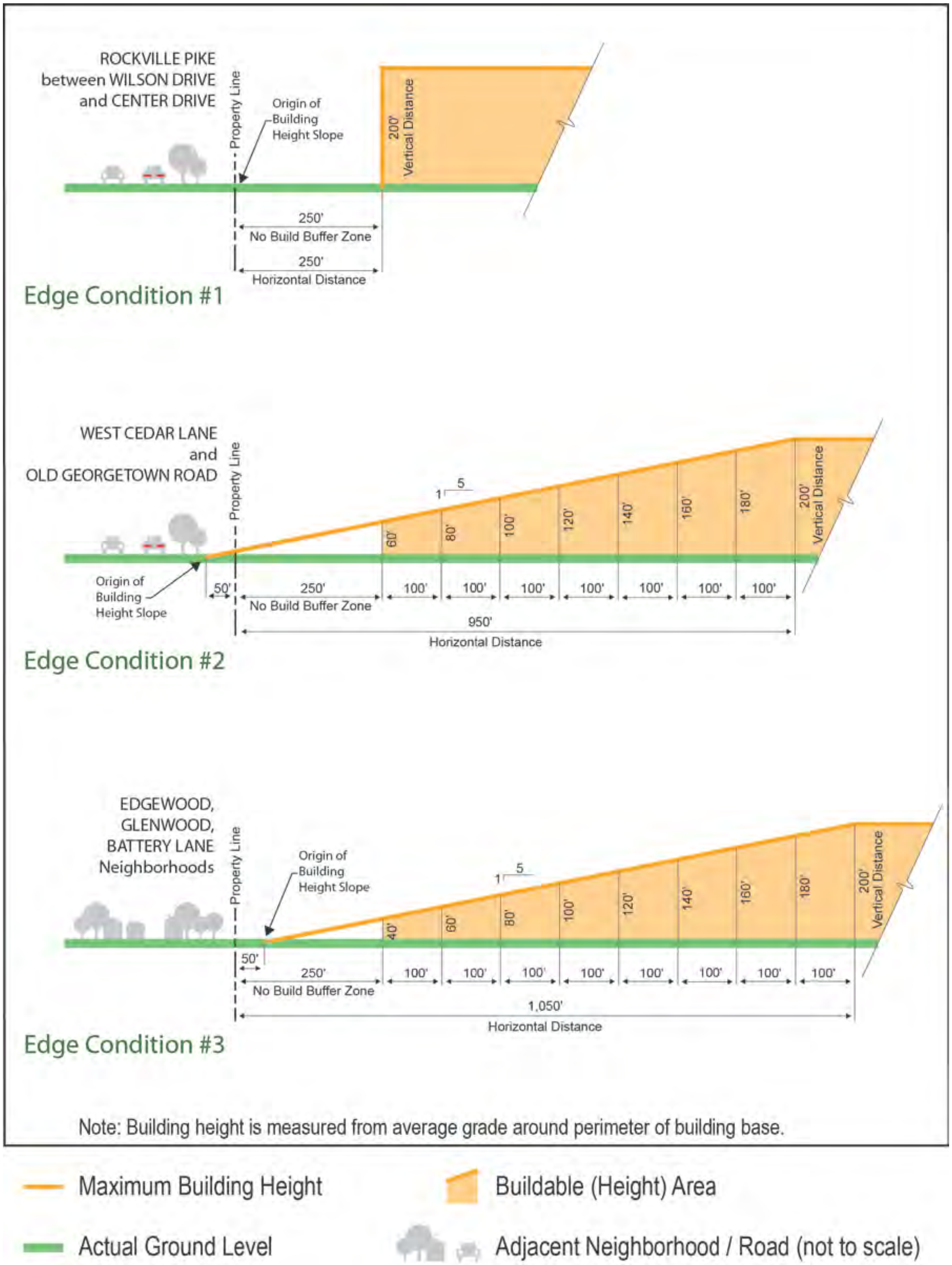


Exhibit 6.2.C. Building Height Envelope Sections for Critical Areas

6.3 Circulation

The master plan proposes to reconnect South Drive in the vicinity of the Clinical Center Complex. The service road adjacent to the power plant is to be relocated south to allow a security buffer for the power plant. A new service road is needed at the southern end of the campus to serve the development that is planned for that area. A new entrance is proposed on the north side of the campus off Cedar Lane. Roadway improvements are need on the service roads in the southern portion of the camps. The master plan is proposing to improve the intersections at South Drive and West Service Road and Lincoln Drive and West Service Road.

6.3.1 Road Standards

6.3.1.1 Roadway Types

The locations of roadway types on campus are presented in Exhibit 6.3.A. In general, lanes are recommended to be 11-feet wide at primary site entries, with the exception of the Lincoln Drive exit where the recommended lane widths are to be 10-feet. Lane widths are recommended to be 10-feet wide in most other areas.

Close attention should be paid to bicycle/vehicle conflict areas. Any new road and intersection configuration needs to ensure that its design include good visibility for joint use by both vehicles and bicycles.

Entrance roadways should be median-divided, except in sections of the northern part of campus where the existing, undivided roadway provides a woodland appearance. Medians should be a minimum of eight-feet wide to allow for an adequate planting area. Where curb lane parking is provided, the parking lane should be 13 or 14-feet wide for off-peak parking and bicycle traffic. Where provided, bike lanes should be a minimum of five-feet wide, clearly designated, and striped to separate them from the main roadway. Following is an explanation of the proposed cross-sections, illustrated in Exhibit 6.3.B and Exhibit 6.3.C.

- Section-A (Exhibit 6.3.B) is designated for major site entries. The roadway provides four moving lanes with marked bike lanes in both directions. The minimum eleven-foot wide lanes are recommended because of the high volumes of traffic anticipated in this area. No curb parking is allowed in this section.
- Section-B (Exhibit 6.3.C) consists of a 30-foot cross-section with one 10-foot travel lane in each direction and one five-foot bicycle lane in each direction. Tree planting areas along with sidewalks on both sides of the roadway is included.

- **Section-C** (Exhibit 6.3.C) is used for typical roadways throughout the campus. This roadway type has one, 11-foot travel lane in each direction. Tree planting areas along with sidewalks on both sides of the roadway is included.

Exhibit 6.3.A. Campus Roadway Type Locations

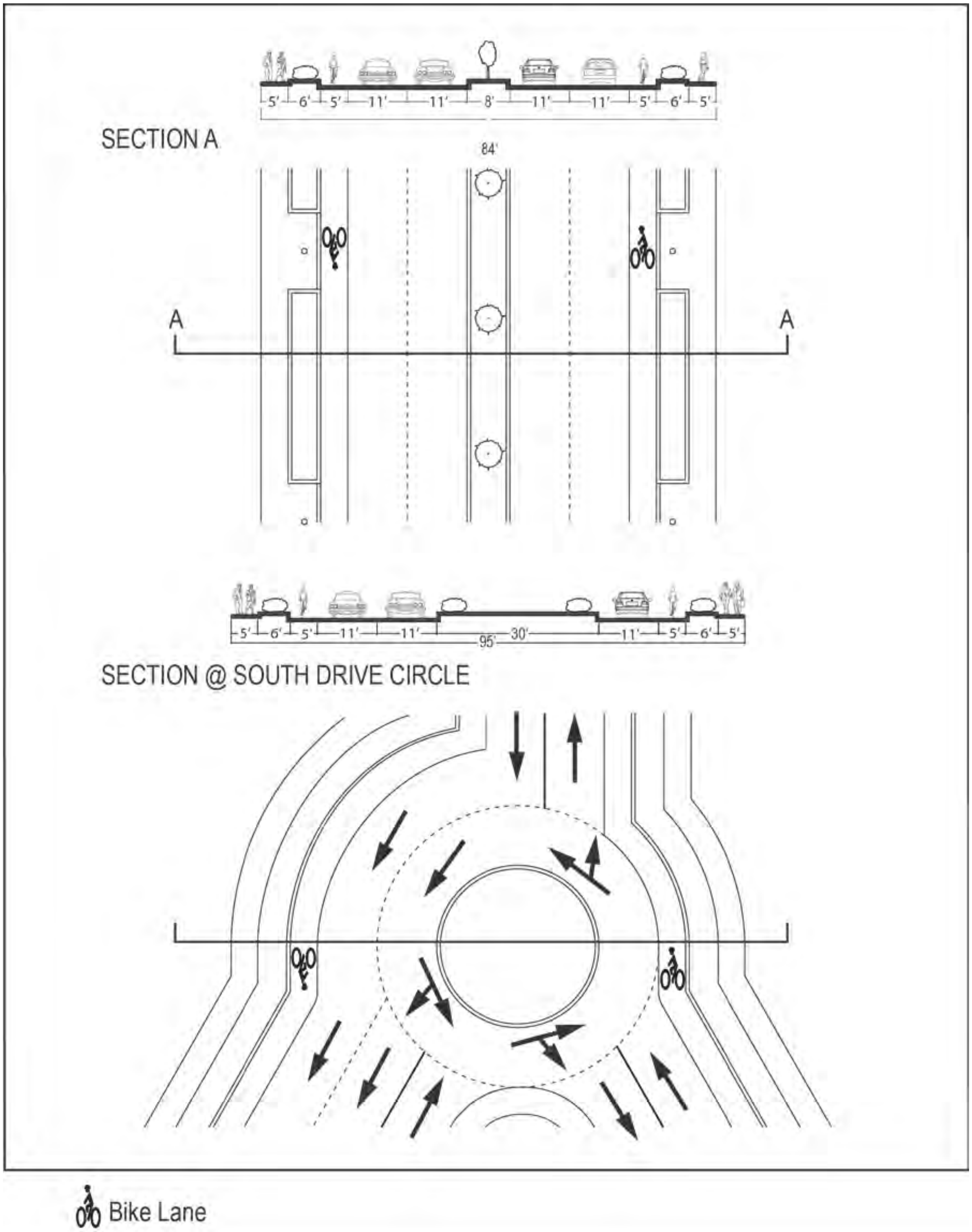


Exhibit 6.3.B. Typical Roadway Sections A

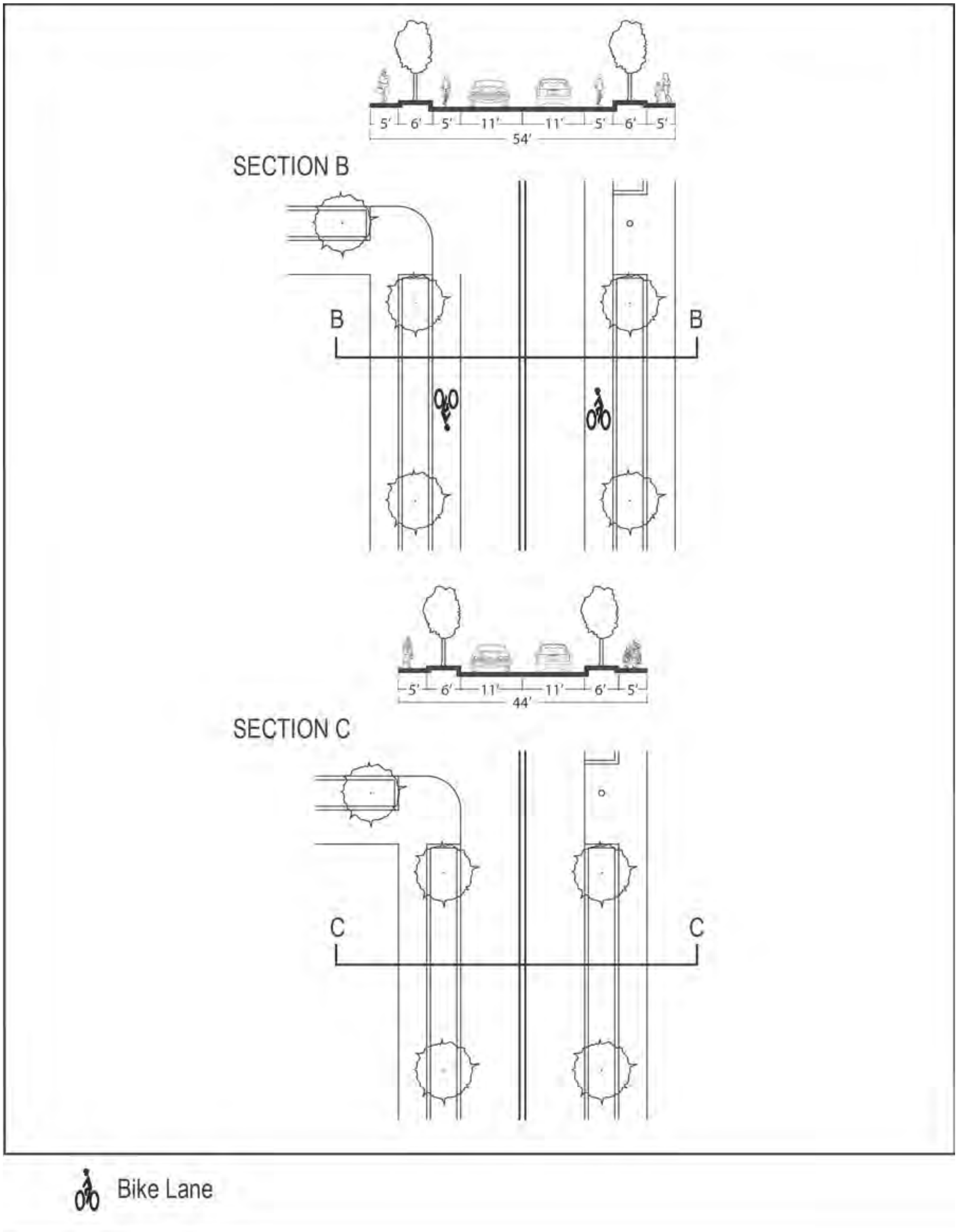


Exhibit 6.3.C. Typical Roadway Sections B and C

6.3.1.2 Open-Section Roads

Traditional closed-section roads are bounded by curbs and channel unfiltered stormwater via gutters into stormwater sewer systems; open-section roads allow stormwater run-off to be filtered through bio-swales into the natural groundwater system. Consider storm water management best practices in design of the roadways and parking lots. Use of curb-less gutters and bio-swales is encouraged when it does not interfere with pedestrian infrastructure and is determined to be beneficial to the over campus storm water management plan. See Exhibit 6.3.D for an example.

Exhibit 6.3.D. Curb-less Gutters and Bio-swale Example

6.3.2 Parking Facilities

Surface-parking areas should be reduced within the campus where possible. Surface parking should be removed from the buffer zones at the perimeter of the campus. Surface parking should be screened at its perimeter with planting, berms or low walls. Parking lots should have interior planting islands to break up large expanses of paved area and to provide storm water infiltration swales.

Parking decks should be integrated into the topography where possible, and should be screened by landscape or have planting areas integral with their perimeters, such as planter boxes or trellises. See Exhibit 6.3.E for examples of parking screening techniques.

Curbside parking should be designated for limited time and off-peak hour use, with appropriate signage and enforcement. Limiting curbside parking to off-peak hours and limited time periods will maintain a reserve of parking spaces intended for off-campus employees coming to the site for part-day activities. This arrangement will also allow increased traffic flow at peak hours by providing extra travel lanes. Accessible parking for persons with disabilities should be placed as near and convenient to buildings as possible.

Careful consideration of the layout, screening and lighting of NIH parking facilities is critical to the safety of the staff, patients and guests on the campus. The NIH Bethesda Master Plan "Parking Facility Guidelines" are based on the Montgomery County Zoning Code "Article 59-E" but modified to suit the needs of this Federal Facility. All new parking facilities should comply with these standards.

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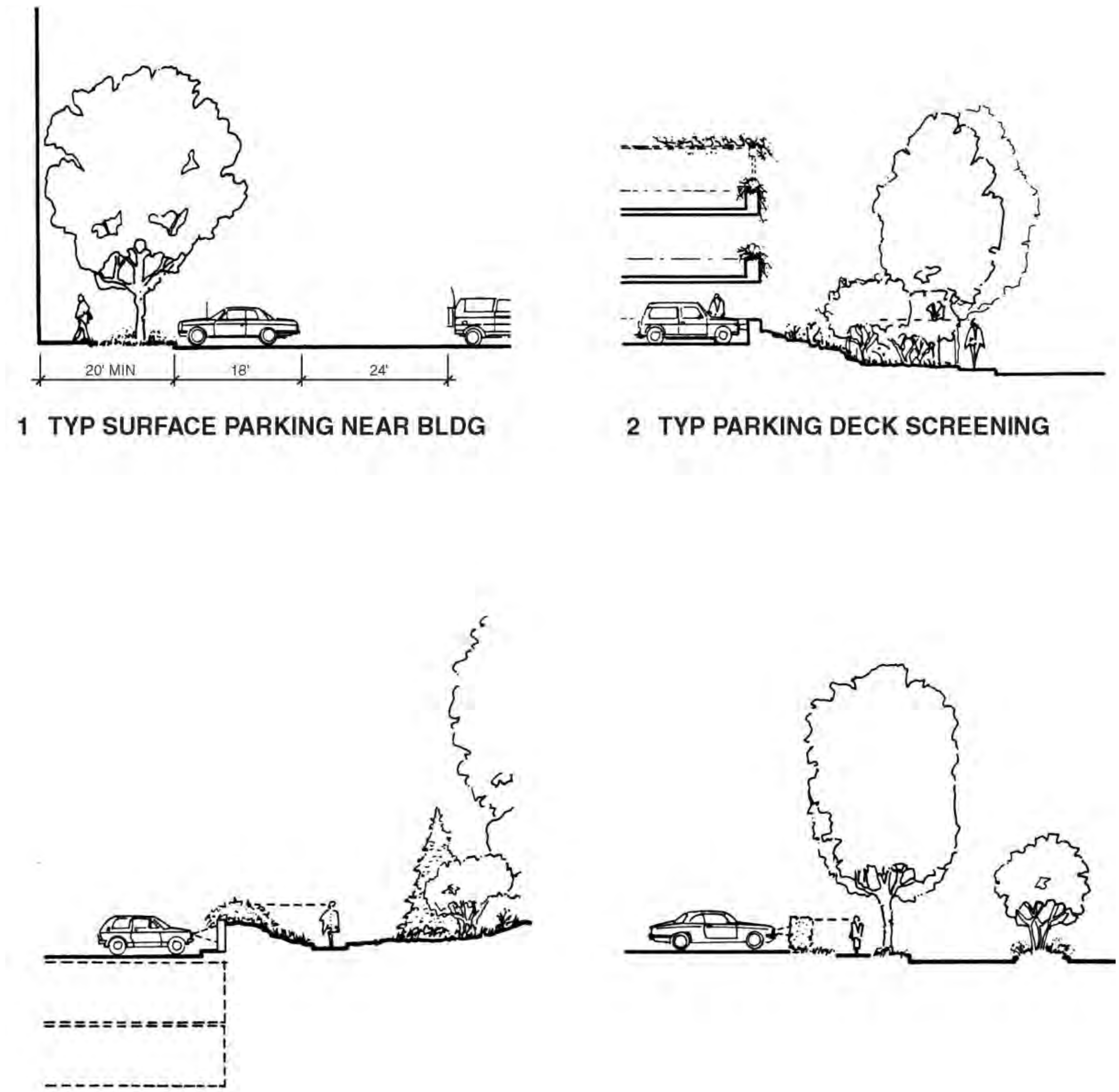

Exhibit 6.3.E. Parking Structures Screening Techniques

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6.3.2.1 Size and Arrangement of Parking Spaces

6.3.2.1.1 Arrangement and Marking

All off-street parking areas shall be arranged and marked so as to provide for orderly and safe loading, unloading, parking and storage of vehicles. Individual parking spaces shall be clearly defined and directional arrows and traffic signs shall be provided as necessary for traffic control. Each space or area for small size motor vehicle parking must be clearly marked to indicate the intended use.

6.3.2.1.2 Size of Spaces

Each standard size parallel parking space shall have minimum dimensions of 7 by 21-feet. A parallel parking space is defined as one in which the long side of the space parallels the travel lane.

Each standard size perpendicular parking space shall be a rectangle having minimum dimensions of 8½ by 18-feet. A perpendicular parking space is defined as one in which the long side of the space is a straight line that intersects the travel lane and curb at a right angle.

Each standard size angled parking space shall be a parallelogram having minimum dimensions in accordance with Exhibit 6.3.F. An angled parking space is one in which the acute angle formed by the intersection of the long side of the space and the curb is between 45 and 75 degrees. The width of an angled parking space is measured parallel to the curb or travel lane along the short side of the parallelogram. The length of the space is measured along the side of the parallelogram, from the curb to the travel lane.

If a column or other obstruction is adjacent to a parking space and would interfere with car door openings, then the minimum stall width of that space shall be increased by one foot. The inner face of the column or other obstruction shall form the actual boundary of the space when measuring the width or length of the spaces.

The minimum widths and lengths for parking spaces shall be as prescribed in the following table. A maximum of 15% of parking spaces can be designated for small cars.

6.3.2.1.3 Spaces for Handicapped

Parking spaces for handicapped persons shall be provided in accordance with the standards specified in the GSA “Architectural Barriers Act (ABA) Accessibility Guidelines” for Federal Facilities.

Exhibit 6.3.F. Parking Space Minimum Size Table

Parking Space Angle	Standard Width	Standard Length	Small Car Width	Small Car Length
0^{o} (Parallel)	7'	21'	6'	19.5'
45^{o}-59^{o}	12'	26.5'	N/A	N/A
60^{o}-75^{o}	10'	23'	8.5'	21'
90^{o} (Perpendicular)	8.5'	18'	7.5'	16.5'

6.3.2.1.4 Bicycle and Motorcycle Parking within Parking Facilities

All parking facilities containing more than 50 parking spaces shall provide one bicycle parking space or locker for each 20 automobile parking spaces in the facility. Not more than 20 bicycle parking stalls or lockers shall be required in any one facility.

Bicycle parking facilities shall be so located as to be safe from motor vehicle traffic and secure from theft. Interior storage and lockers are encouraged.

All parking facilities containing more than 50 parking spaces shall provide motorcycle stalls equal to at least two-percent of the number of auto spaces. Not more than 10 motorcycle stalls shall be required on any one lot.

6.3.2.2 Access and Circulation

6.3.2.2.1 Driveways

Interior aisles are vehicular travel-ways with parking stalls along the sides. Entrance and exit driveways are vehicular travel-ways, without parking stalls along the sides. Driveways for one-way movements shall be at least 10-feet in width to allow safe and expeditious movement of vehicles. Entrance and exit driveways shall be separately provided wherever possible. If entrance and exit driveways are combined, the combined driveway shall be not less than 20-feet in width. Aisles designed to accommodate one-way movements shall have the minimum widths shown in Exhibit 6.3.G and based upon the configuration of the adjacent parking spaces. Aisles designed to accommodate two-way movements shall have a minimum width of 20-feet.

Exhibit 6.3.G. Driveway Minimum Width Table

Adjacent Parking Space Angle	Driveway Type	Minimum Aisle Width
N/A	One-Way (Entrance or Exit) Driveway	10'
N/A	Two-Way (Entrance and Exit) Driveway	20'
All	Two-Way Aisle	20'
0º (Parallel)	One-Way Aisle	10'
45º-59º	One-Way Aisle	16'
60º-75º	One-Way Aisle	18'
90º (Perpendicular)	One-Way Aisle	20'

6.3.2.2.2 Walkways

In addition to all required parking spaces and driveways, pedestrian walkways or sidewalks shall be provided in all off-street parking facilities where necessary for pedestrian safety. Such walkways and sidewalks shall be protected from vehicular encroachment by wheel stops or curbs.

6.3.2.2.3 Separation from Parking Spaces

All parking spaces shall be separated from sidewalks, roads, streets or alleys by curbing. All roads, streets, alleys, sidewalks and other public rights-of-way shall be protected from vehicular overhang by wheel stops, curbs, spacing between the right-of-way line and the parking area or other method approved by the director/planning board.

6.3.2.3 Lighting

Adequate artificial lighting shall be provided for surface parking facilities used at night and for structured parking as required by construction codes. Lighting shall be installed and maintained in a manner not to cause glare or reflection into abutting or facing residential premises, nor to interfere with safe operation of vehicles moving on or near the premises.

6.3.2.4 Shading of Paved Areas

Trees must be planted and maintained throughout the parking facility to assure that at least 30% of the paved areas, including driveways, are shaded. Shading must be calculated by using the area of the tree crown at 15-years after the parking facility is built.

6.3.3 Service Areas

All commercial delivery truck traffic will access the NIH campus using the CVI truck on-site inspection facility entrance. The truck entrance is located south of the North Drive employee-only entrance, and only provides access to the inspection facility. Commercial vehicles, which pass inspection, will be allowed to continue onto campus, to their final destination after concurrence with the destination building dock-master to avoid congestion at the destination point.

Since service/delivery areas are necessities for virtually all buildings on campus, the placement and design of these areas must be considered carefully. Generally, the following guidelines should be administered for the design of service/delivery areas, as illustrated in Exhibit 6.3.H.

All major loading areas should be provided at the ends or the rear of buildings. Some short-term delivery service should be provided in short term visitor parking near the front of the buildings. Long-term vendor and contractor parking should be provided in long-term parking facilities. In no case should major loading be permitted on-street or in parking facilities.

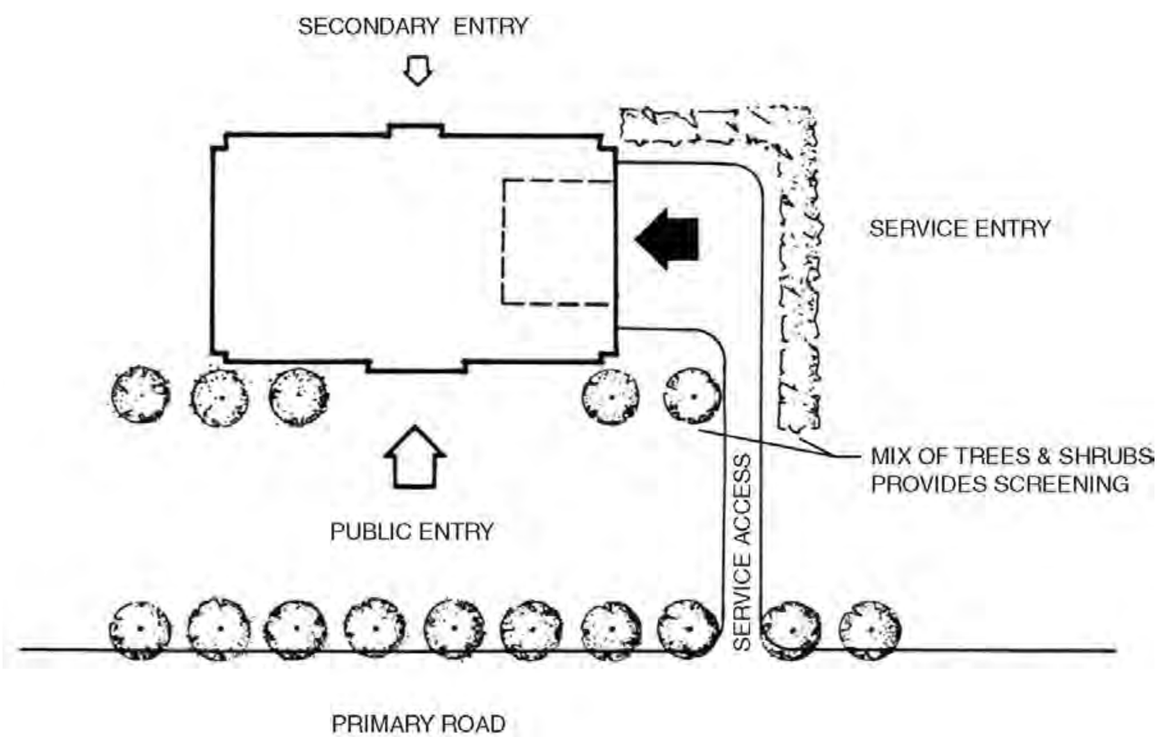

Exhibit 6.3.H. Typical Service and Delivery Area

6.3.4 Pedestrian Pathways

A Goal of the Master plan is to create a campus that is pedestrian-oriented, that promotes walking as the primary means of circulation, and that creates active spaces for gathering. The urban design strategies employed in the Master Plan create a pedestrian-oriented focus for the campus.

Currently there are several areas of the campus that present hazards to safe pedestrian passage such as the loading dock area at the west side of Building-4, shown in Exhibit 6.3.I. Frequently trucks parked in the loading dock project into Memorial Drive blocking the sidewalk forcing pedestrians into the dangerous middle of the street. This location as well as others on campus needs to be studied and revised to allow safe pedestrian travel.

Exhibit 6.3.I. Example of Pedestrian Safety Hazard Area for Study

Internal pedestrian circulation areas consists of a network of tree-lined sidewalks, crosswalks, outdoor green spaces and landscaped plazas with spaces for gathering and interaction, and pedestrian pathways through the green spaces. The plan encourages pedestrian to use the central green space by suggesting building entrances and lobbies be placed on central green. The reduction of paved areas and surface parking, and the clarification of the roadway system will promote walking on campus. Closing some service roadways to through traffic would help to create a safer pedestrian environment. Since access to the multi-level parking garages (MLPs) is provided via perimeter roads, conflicts between pedestrians using the core of the campus would be minimized.

The existing system of extensive pedestrian paths on the NIH campus should be enhanced to increase the capacity of certain highly trafficked areas, make better connections from the campus core to surrounding neighborhoods, and form a more continuous pathway system.

6.3.4.1 Accessibility

NIH has many visitors, staff and patients that have mobility, sight and hearing limitations. Accessibility features to assist these users should be incorporated in all future pathway design. Federal law requirements specified in GSA ABA Accessibility Standard for Federal Facilities must be followed for new facilities. ABA standards should be followed when undertaking major sidewalk and place repairs and renovations to improve campus accessibility. In addition to the mandated requirements for new NIH pathways, the NIH shall plan the following:

- All curb ramps and blended transitions connecting to pedestrian street crossings shall have detectable warning surfaces
- Sidewalks and other pedestrian circulation paths serving new facilities and major renovations shall provide a primary pedestrian access routes and an alternate pedestrian access route to connect all new buildings to all accessible buildings in its cluster, accessible parking spaces and the nearest campus shuttle stop. Exhibit 4.3.K "Campus Accessbility Map" shows the current campus accessible paths, HC parking, accessible entries, shuttle stops, steep slopes and inaccessible entries. Improvements to increase accessibility all campus facilities should be incorporated into all construction projects.

6.3.4.2 Campus Entries

Employee pedestrian access to the NIH campus will be provided for employees at all vehicular and pedestrian/bicycle employee-only gates in the perimeter fence. Pedestrian access to the NIH campus will be provided for NIH visitors through the South Drive Gateway Center entrance located on Rockville Pike at the Cedar Lane entrance. Some of the existing pedestrian-only gates are inadequately sized to accommodate bicycle access (as shown in Exhibit 6.3.J). A survey should be done to identify which gates are difficult to access via bicycle and be modified to facilitate ease of access for bicycle commuters. Additionally, the sensors at all vehicle semaphore controlled entrances should be adapted to sense bicycle traffic. Often times the semaphores will not close after a bicycle passes through the entrance causing the security guard to have to manually close the barrier.

Exhibit 6.3.J. Example of Pedestrian Entrance Inadequately Sized for Bicycles

6.3.4.3 Pedestrian Crossings

Pedestrian crossings of campus roadways should generally occur at intersection points and at the entrance driveways from the County and State road system. It is anticipated that the internal, no signal intersections will operate as three-way stop intersections. This intersection type will facilitate the crossing of small groups of pedestrians. All pedestrian crossings should be clearly signed and lighted, with crossing areas designated by striping, special paving, raised road surface ("speed tables"), or other appropriate marking devices. Medians should be designed to provide pedestrian refuge areas. In addition, the implementation of mid-block pedestrian crossings at certain locations may be provided. Vehicular traffic through these mid-block pedestrian crossing sections is not required to stop if the pedestrian area is clear, but is required to yield to pedestrians in the crosswalk. The mid-block pedestrian crossing area should be clearly signed, striped, and lighted, and may also include a median for pedestrian refuge.

In order to minimize the chance of vehicular-pedestrian conflicts, the NIH should adopt some crosswalk location guidelines to standardize the location of future crosswalks on campus. The following elements should be used as part of a new crosswalk location policy, to regulate when and where future crosswalk installation is appropriate on the NIH campus:

- Crosswalks should be provided at all roadway intersections
- Crosswalks should not be used indiscriminately
- Crosswalks should allow for restriction of parking in the immediate appropriate vicinity for adequate visibility
- Crosswalks should be sited based on an engineering study if located other than at an intersection
- All new and repainted crosswalks should have the "DNA crosswalk pattern" (illustrated in the right-middle example in Exhibit 6.3.K).

A non-intersection crosswalk location should only be considered when all of the following circumstances are present:

- The distance to the nearest intersection exceeds 300-feet
- There is a proven demand for a crossing at the subject location with pedestrian crossing volume that exceeds 100 pedestrians during any one hour, or 150 pedestrians during any two consecutive hours within a 24-hour period
- There is adequate sight-distance and other critical safety conditions are satisfied
- The location of the crosswalk does not conflict with any aspect of the campus plan

If all of these conditions are not satisfied and there are any significant signs of pedestrian activity near the subject crossing location prior to the installation of a crosswalk, then the subject location may warrant the placement of a pedestrian barrier to ensure that pedestrians do not cross at the non-intersection location, but rather walk to the nearest marked crossing location.

When a crosswalk is installed at a location without stop signs it should be built as a "speed-table" (i.e. trapezoidal shaped speed hump), an example is shown in Exhibit 6.3.L. It should have a three-inch elevated, 10-foot wide flat "table" in the center with six-foot wide transition ramps on either side that are gently sloped. The transition slope and crosswalk should be surfaces in colored stamped asphalt and the crosswalk should have the "DNA crosswalk pattern" illustrated in Exhibit 6.3.K.

Pedestrian street crossings at four-lane roads and intersections shall be built as speed-tables and equipped with pedestrian weight activated solar powered "In-Road Warning Lights" augmented by solar powered flashing pedestrian-crossing signs, and audible tone for sight-impaired users.

Exhibit 6.3.K. Examples of Custom Crosswalk Designs

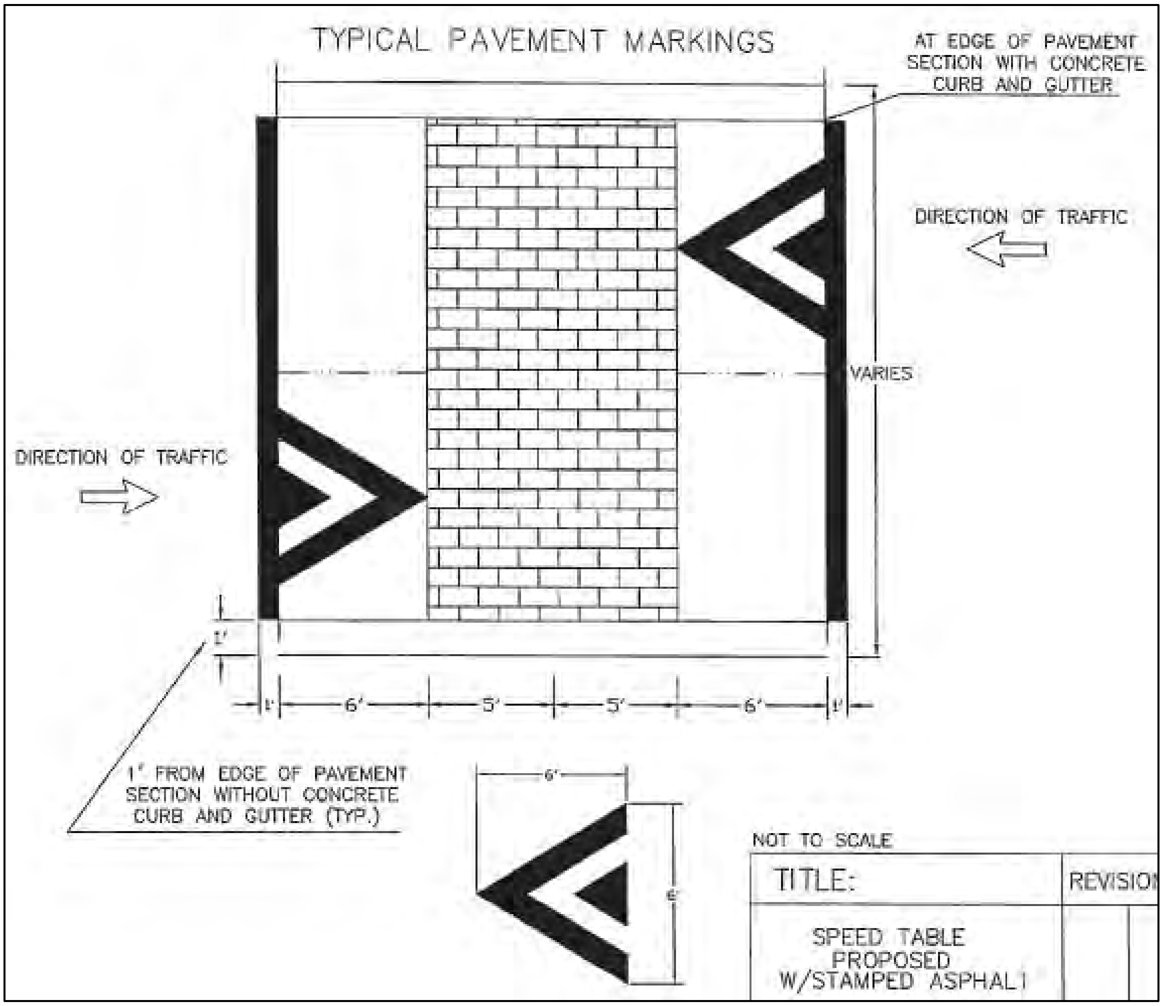

Exhibit 6.3.L. Typical Speed Table

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6.3.5 Bikeways

On-site bikeway facilities are an important element in the promotion of alternative transportation modes for employees of the NIH Bethesda Campus. It is important for the NIH Bethesda Campus to link with the Montgomery County Bikeway System for the broader countywide promotion of alternative transportation modes. Bicycle access is provided for employees at all vehicle entrances and pedestrian/bicycle employee-only gates in the perimeter fence. Bicycle access to the NIH campus is provided for NIH visitors through the South Drive Gateway Center entrance located on Rockville Pike and at the Cedar Lane entrance. For employees choosing to bike to work there are over 80 shower/locker room facilities on campus with more being considered. Surveys have concluded that there is a need and demand for additional covered bike parking including additional bike-racks in parking garages. A pilot bike shelter is proposed at the renovated Building-3 by mid-2012. The preferred bike shelter is shown in the photo to the right.

6.3.5.1 Bicycle Storage and Parking

There are currently 1,003 bicycle parking spaces on campus. Based on a current campus population of approximately 20,000 employees there is bicycle parking/storage space for about 5% of the campus population. There are currently 80 shower/locker facilities on campus accommodating 0.4% of the campus population. The Green Building Council's LEED recommendation for new building construction is to provide bicycle parking/storage for 5% of the anticipated building occupancy in addition to 0.5% shower/locker facilities for the building's occupants. As a result, the current bicycle parking/storage and shower/locker facilities are close to meeting the LEED standards. Therefore, any new building construction or remodeling should provide bicycle storage and show/locker facilities in accordance with the LEED requirements unless future demands require an increase amount of facility construction.

6.3.5.2 Signage

Bicyclists should be encouraged by signage and policy to walk their bikes in congested pedestrian areas not served by roadways. In addition to the NIH specially designated bikeway facilities, bicyclists can ride in the outer travel lane along roadways. All internal roadways on the Bethesda Campus are signed for speeds of 20 to 25 miles per hour. At those posted speeds, it is expected that bicyclists can safely share the road system with vehicles to circulate throughout the campus. The Master Plan proposes installing the new "R4-11" bicycle traffic "May Use Full Lane" signs on shared roadways to clarify the dual-use nature of campus roads. Dual-use vehicle-bicycle roads should be clearly marked with a bicycle lane in the right side of each direction of travel. See Exhibit 6.3.M for examples.

Exhibit 6.3.M. Dual-Use Signage and Marking Examples

6.3.5.3 Bikeway Maintenance

It is important that the roadway be regularly maintained and cleared of debris, and that drainage grates be installed flush to the road surface with ADA compliant narrow openings so that bicycle (and wheelchair) wheels do not get caught in drainage grates.

6.3.5.4 Bike Share

To extend the attractiveness for NIH employees to use alternative modes of transportation to and from work, the location of "bike-sharing" stations should be considered around the campus. A station at the "Medical Center" Metro station on the east side of campus and another station near Suburban Hospital on the west side of campus has been suggested to potential commercial vendors for consideration along with other locations in Montgomery County. For example, bike-sharing would allow an employee to pick up a bicycle at one bike-sharing station, ride to or from NIH, and drop it off at another bike-sharing location across the campus or across town. A successful bike-sharing program is already operational in Washington, DC and northern Virginia.

6.3.6 Mass Transit

Metrorail and local bus service is provided to the NIH Bethesda Campus at the Medical Center Metro Station on the Red Line. This station and related transit node is located near the intersection of South Drive and Rockville Pike.

Because of the size of the Bethesda Campus and its edge location of the Metrorail station, it is necessary to provide a means for employees using Metrorail to get to and from the various employment centers around campus. The NIH currently operates internal campus shuttle bus routes. Shuttle riders transfer between the two systems at the NIH Gateway Center, in order to travel between interior campus locations and off-campus NIH facilities. This bus service is provided as a part of the Transportation Management Program (TMP).

All shuttle bus stops should meet the requirements specified in GSA ABA Accessibility Standard for Federal Facilities and provide adequate covered waiting area at the stop or at nearby buildings. The on-campus shuttle bus stops are located in close proximity to most major destinations or building clusters. However, there may be a few shuttle bus stops located directly in front of building entrances, as determined later by the operators of this system. The Employee Transportation Services Office (ETSO) currently acts as a liaison with WMATA and Montgomery County Ride-On. This liaison allows for the coordination of the NIH shuttle bus, WMATA, and Ride-On bus services.

6.4 Building and Site Performance Standards

6.4.1 Compliance with Codes

In accordance with 40 U.S.C. 3312 each HHS building shall be constructed or altered, to the maximum extent feasible, in compliance with one of the nationally recognized model building codes and with other nationally recognized codes including mechanical and electrical codes, fire and life safety codes, and plumbing codes. Due consideration shall be given to all State and local zoning laws as if the project were not being constructed or altered by a Federal agency[1].

[1] HHS Facilities Program Manual Volume I, Department of Health and Human Services May 2006

6.4.2 Campus Way-finding

6.4.2.1 Exterior Signage

The NIH is in the process of completed a comprehensive signage plan. The plan includes recommendations for the upgrade or replacement of the existing signage system according to sign type, location, graphic quality, physical condition and maintenance, accuracy of information, and adequacy of the amount of signage. The categories of signage which will be addressed include the following:

- Orientation: site maps near campus entries and area maps in the core of the campus
- Direction: to major campus buildings and areas, both for vehicles and pedestrians including notations of accessible routes for persons with disabilities
- Identification: campus entry signage and exterior building and place signage
- Regulatory/Safety: traffic and parking control, safety, and warning signage
- Information: transit information, public announcements, etc.
- Interpretive: NIH tour signage, plant species signage, etc.

Based on recommendation of the signage plan, perimeter signs that identify visitor and staff entries and coherently identify the NIH campus and create a positive first impression of the institution were installed in 2009. Other recommendations of the plan have not been implemented but are anticipated in the future. These include:

- At the juncture of each entry path (including pedestrian/bicycle paths) with primary roadways there must be clear directional signage to major campus buildings.
- Where possible, a vehicular pull-off with a campus map should be provided at each major vehicular entry path.
- Signage should be consistent and become a clear orientation tool.
- Signage character should be clearly legible and should be of a quality appropriate to a world-renowned institution.
- There should be design compatibility among all campus sign types.
- Signage placement should also be carefully considered to avoid visual clutter.
- Specifically, regulatory and traffic signage should be reviewed to determine if more compatible signage designs can be implemented rather than the standard uniform roadway signs which are now used.

6.4.3 Fencing and Retaining Walls

6.4.3.1 Walls

Natural stone walls have become strong visual elements within the NIH campus. The warm tans and cool greys of the stone blend well with many building and paving materials and they establish a link between various parts of the site. Where retaining walls or low walls are required, stone walls should be used to establish a strong visual marker, to retain slopes and to connect visually to the other stone walls on campus. The materials and detailing of new walls must be consistent with those already established (as shown in Exhibit 6.4.A. Typical Campus Retaining Wall Exhibit 6.4.A). The stone color, coursing and cap details should match the existing walls. Additional criteria for stone walls include:

- Locate stone materials from the same quarry wherever possible
- Avoid incompatible decorative caps or finials
- Retaining wall design must be performed by a licensed structural engineer
- Locations of walls or other vertical obstructions must comply with GSA ABA Accessibility Standard for Federal Facilities

Exhibit 6.4.A. Typical Campus Retaining Wall

6.4.3.2 Fencing

Security elements to restrict access to elements within the campus security fence are sometimes required. Fences can frequently be avoided by use of other methods such as bollards, large boulders, precast concrete objects, or grading to prevent vehicular access. These options should be considered before a fence is constructed. Fences are not conducive to an open comfortable public space. When it has been determined that a fence is the only viable option, the type of fence should be chosen based on:

- Visual Impact
- Fences in the vicinity
- Security requirement
- Maintenance

See Exhibit 6.4.B for typical security fence at the Bethesda campus.

Exhibit 6.4.B. Typical Campus Fence

6.4.4 Landscape Design and Planting Criteria

Proposed Landscape Concepts and Planting Patterns for the NIH Bethesda Campus are presented in Exhibit 6.4.C. Landscape sections for particular areas around campus are depicted in Exhibit 6.4.D. Further guidance is given in the NIH Bethesda "Urban Forest Stand Delineation and Conservation Plan".

6.4.4.1 Planting Patterns and Scale

The size of trees, shrubs, and planting beds should be considered with respect to their scale relationship to the NIH Campus buildings, roads, and spaces. In general, plantings should be simple and conceived in broad masses that are appropriately scaled to their location on campus. In addition, there should be a hierarchy of plantings, ranging from large, primarily native tree and shrub groupings along roads and entrances, down to small garden scale plantings and floral display beds in courtyards and pedestrian gathering areas.

Plants can serve to punctuate and reduce the scale of stairs, walls, terraces, and building facades through the use of hanging, twining, or climbing plants. These plants can help the buildings and spaces become part of the landscape. Plants should be used to soften the edges of buildings, paths, and outdoor areas. An example of this is the climbing roses that are trained along many of the brick and stone walls in the historic section of the Bethesda Campus. These ornamental shrubs create a pleasant experience for pedestrians throughout the spring, summer and fall while decorating the fences and walls.

The first choice of plants selected for use on the NIH Campus should be species indigenous to the mid-Atlantic Piedmont Region, possess appropriately long-lived characteristics, and have visual traits that offer refined intrinsic beauty to reflect the enduring quality of the institution. The overall design of the campus planting should be simple and seek to evoke a mood of tranquility to complement the existing natural and surrounding plantings. It is also recommended that the supplemental use of annuals and perennials be encouraged in the campus to create an uplifting campus environment for NIH visitors and employees.

Care should be exercised in the use highly ornamental plants. As a general rule, exotics that easily propagate should not be used anywhere on campus nor should any exotics be used in the more natural perimeter landscape. They should only be used in the central core areas, in association with water features, enclosed courtyards, and internal landscape spaces between buildings and parking areas.

The natural forms of plants should be retained through restrained, proper pruning techniques. This is most important when considering shrubs. Shrubs should be planted in arrangements that allow for their natural shape to be retained through periodic renewal pruning. Adequate space must be allowed for plants to grow, particularly near paths and buildings, in order to avoid heavy shearing of these plants which often make them unnatural and unattractive. Tree pruning should start early in the life of campus trees to ensure that a proper form is established and the canopy is promoted and trained to a sufficient height to provide clear visibility beneath trees for autos and pedestrians, and to allow adequate light to lawn areas below. Selection and placement of plant materials should be made in accordance with lighting and security cameras to avoid obscuring views and creating hard to see places. Trees and shrubs must be kept away from the perimeter fence to prevent their use for climbing over the fence.

6.4.4.2 Buffers and Perimeter Screening

There are three primary long-term objectives for enhancing the perimeter landscape and buffer areas of the NIH Campus. The first objective is preservation. The existing stands of large native trees and areas of natural vegetation that currently provide screening and buffering to the surrounding residential areas are to be maintained. The second objective is managed re-naturalization. As surface parking areas are removed from the campus perimeter, these areas will need to be replanted with native varieties of plant material to extend and augment the buffer plantings. In addition, open lawn and mowed turf-grass areas, not designated for recreational purposes, should also be planted or reforested in order to reduce grounds maintenance areas. These areas need to have a natural appearance, with understory native tree/shrub massing. The third objective will be general environmental improvements as a result of the first two objectives. Preservation and reforestation will provide the direct environmental benefits of cooling, enhanced storm water management, erosion control, water quality, increased species diversity, and reduced water and energy consumption for grounds maintenance.

With these objectives in mind, aesthetic design consideration should be focused on maintaining some open views into the site to visually prominent buildings and landscape features from Rockville Pike and Old Georgetown Road. These areas may benefit from the use of high canopy trees and understory plantings to filter and direct these views. Reforested areas should not be designed as strict restorations of the existing woodland communities that naturally occur in the region, but rather as general compositions and structures that simulate the plant communities of the Piedmont Region, implemented to complement the existing landscape patterns and provide spatial definition to the NIH campus. In addition, any reforestation, screening, and buffering in the perimeter areas will require careful study and fine tuning to ensure that design consideration to the campus safety and security is maintained.

6.4.4.3 Plant Material Palettes

Potential uses and combinations of plants may take on many forms in the landscape development of NIH. For example, plants may be used primarily in cultural associations such as hot/sunny, cool/moist, or dry/shade garden conditions to name a few. Other material uses can be based on purely aesthetic considerations such as color or textural combinations used in accent or screening applications, and to control scale and spatial hierarchy within the central core of the Bethesda Campus. Finally, trees and plants can be displayed in numerous programmatic arrangements, such as grouping together plants with similar traditionally held medicinal values, or to display medicinal plants with exceptional seasonal qualities, for winter, spring, summer, and fall garden themes. These plant groupings may be signed in an interpretive manner so that their uses can be better understood and appreciated. As mentioned previously, care should be exercised in the use and location of these materials.

6.4.4.4 Street Tree Recommendations

The primary planting objective for main campus entry roads and the road system should be to define the campus streets as continuous spatial corridors and to create a uniform appearance. The use of a uniform tree type and spacing will help control the variation of landscape, building conditions, and setbacks along the campus streets. As a general rule, the Master Plan recommends the use of large deciduous trees along streets in order to form a continuous canopy that will provide foliage at a height from 15 to 60 feet above the ground, while allowing open views below the branches.

The "London plane tree", which grows in numerous locations throughout the NIH campus and is commemorated as the "Tree of Hippocrates" near the Natcher Building, is proposed as the keystone tree planting for the central campus bosques. Due to its symbolic importance and ability to survive in an urban setting, this species is proposed to be used in bosques within the Campus Core, both to frame the Central Quadrangle and help form and articulate important building entries and gathering spaces. It is also recommended that the plane trees be used in allèe plantings between the road section north of the Clinical Research Center. These dense formal stands would also serve to reduce the scale of the buildings and provide more intimate spaces for patient and staff use.

Suggested street tree planting of the primary entry from Rockville Pike consists of a double row of street trees. Planting along the interior road system on both sides of the streets are proposed as a single row of street trees, consisting of combinations of willow, laurel and saw-tooth oaks to reduce monoculture concerns yet maintain a consistent size and similar tree form. Other entries to the campus should have informal tree plantings which relate to the indigenous types present, such as lindens, thorn-less honey-locusts, white and red oaks, and disease resistant ash. These trees may also be planted with understory groupings of ornamental trees, evergreens and shrub plantings. In general, street trees should be selected which have deeper root systems in order to reduce potential future damage to walks and roadways. Additional tree species for consideration include silver and weeping lindens, “Crownright” pin oaks, and “Halka” honey-locusts, which have a more uniform upright structure.

6.4.4.5 Detailed Streetscape Layout Recommendations

The typical streetscape proposed by the Master Plan is shown in Exhibit 6.4.E. Where possible, roadways should be bounded by planting strips of a minimum dimension of six-feet to accommodate street tree planting. Within the planting strip there should be occasional paved areas for access to the curb lane of the street, and in highly traversed areas, continuous paving with tree grates may be required. Also accommodated within the planting strip are streetlights, information kiosks, and roadway regulatory and directional signage.

Beyond the planting strip is the pedestrian walkway, which is recommended to have a width of six feet minimum where space permits. In locations where room permits, walkway widths of six feet allow two wheelchairs to pass in opposite directions as well as accommodating small service vehicles. Paths and walkways will generally be constructed of concrete or asphalt; however, special paving patterns and materials should be used to highlight key areas such as plazas and major building entrances. It is recommended that a standard quality paving material be used throughout the campus to ease maintenance and enhance campus coherence. Also within this zone should be seating areas associated with building entries, bus and shuttle stops, and pedestrian gathering places. These should be furnished with comfortable benches, trash receptacles, pedestrian lighting and landscaping.

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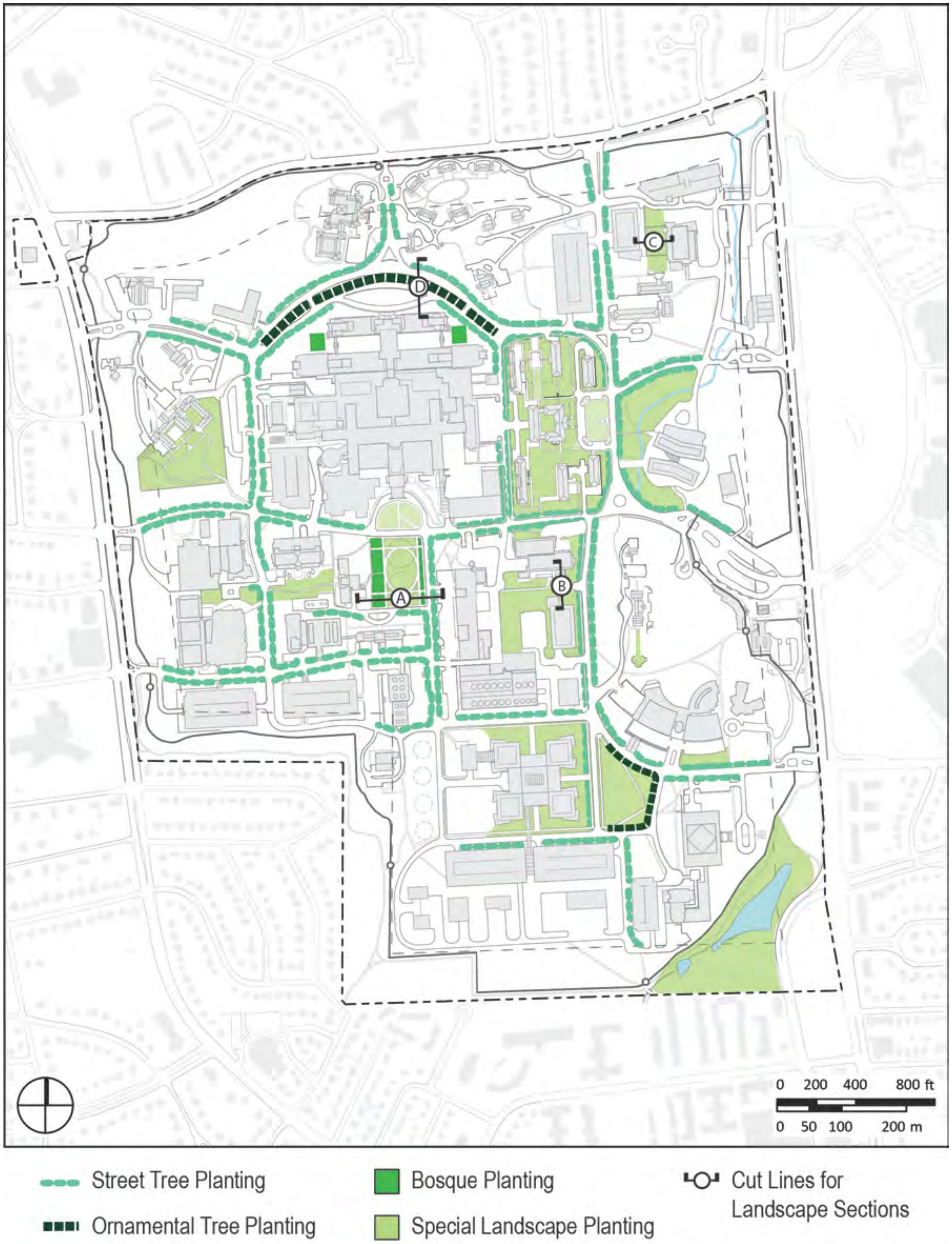

Exhibit 6.4.C. Campus Planting Patterns

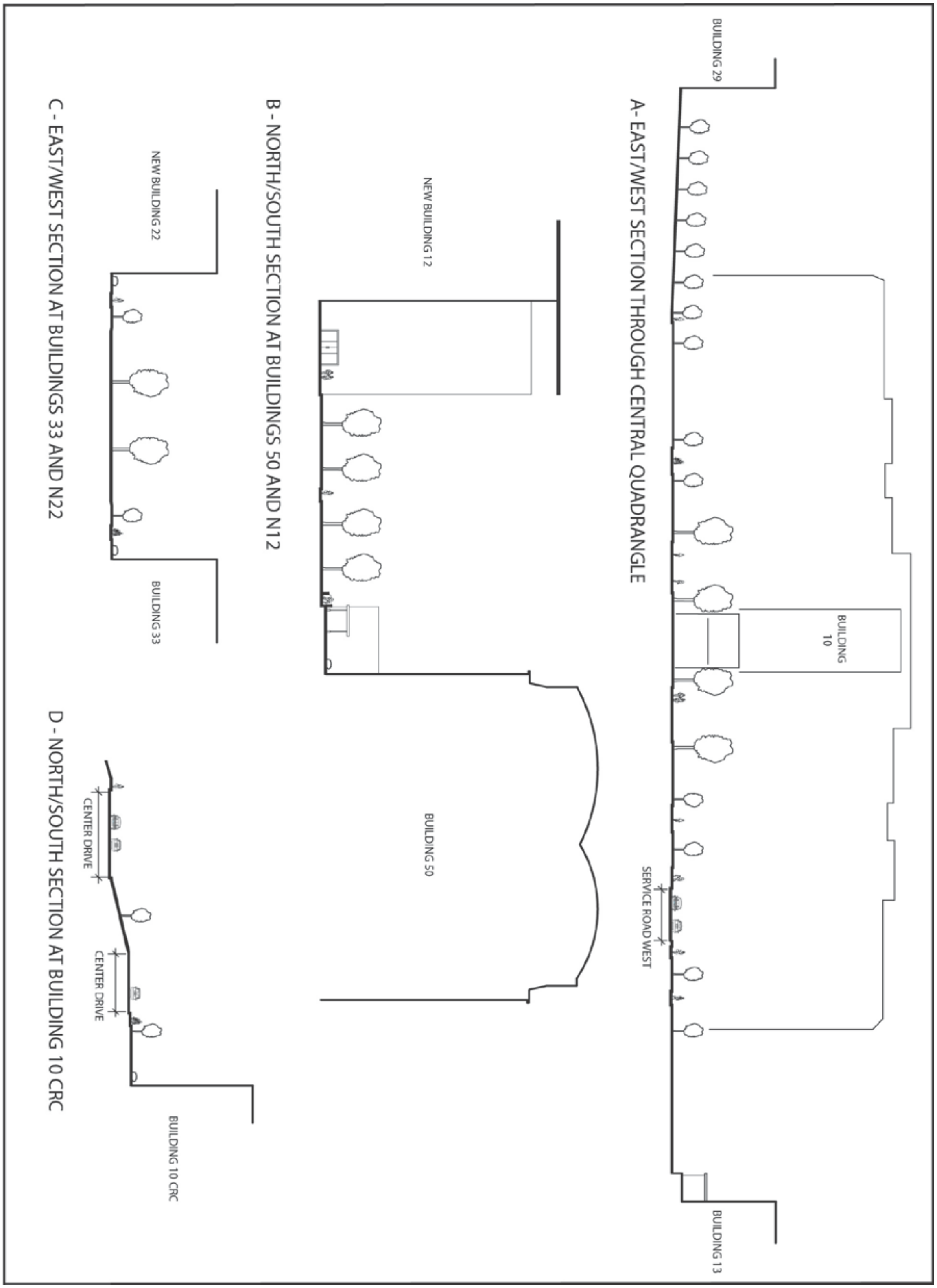

Exhibit 6.4.D. Special Areas Landscape Sections

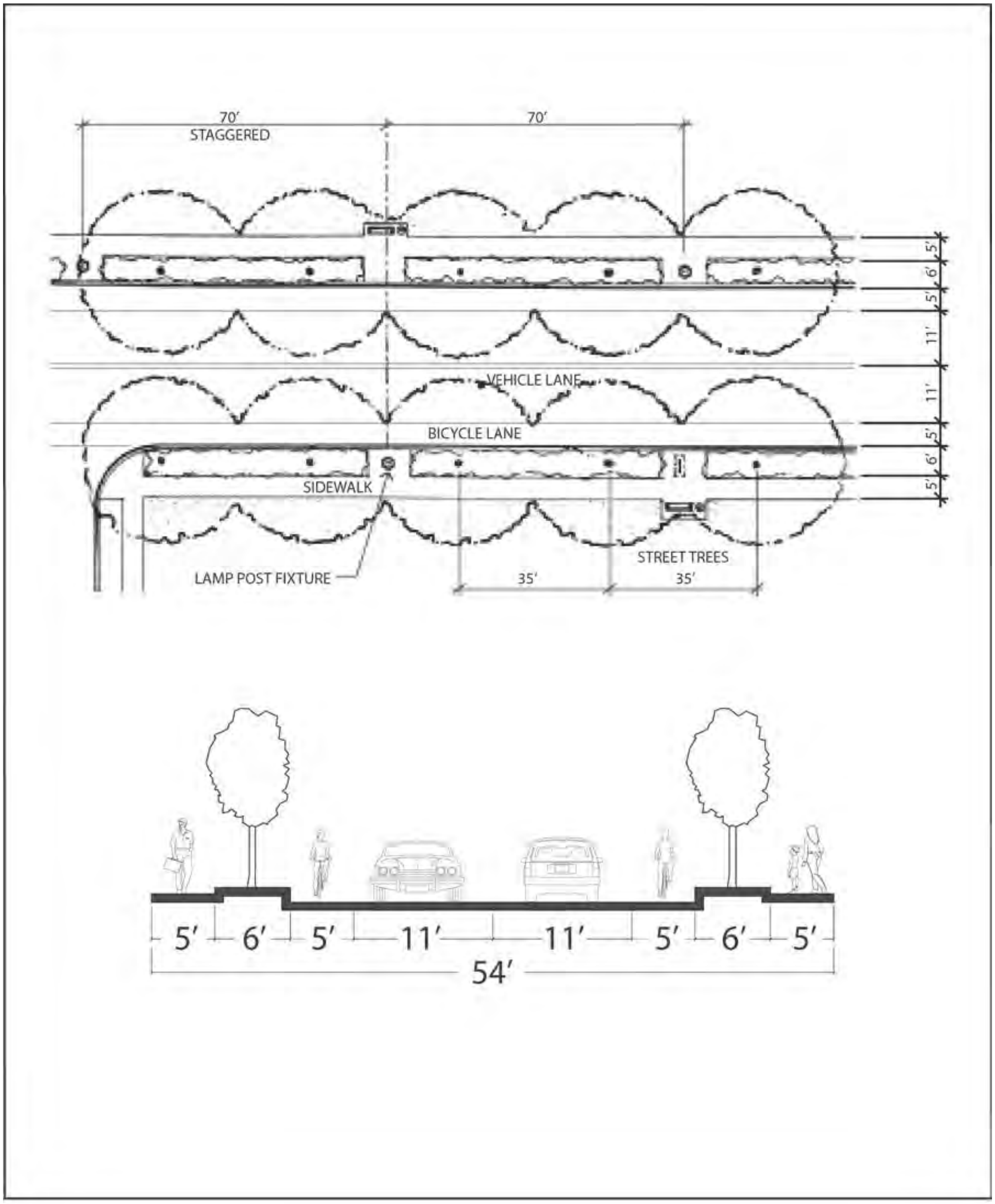

Exhibit 6.4.E. Typical Streetscape Plan

6.4.5 Exterior Lighting

The NIH has completed a Route-355 Street-scape Plan (December 2008) prepared by Rhodeside & Harwell consultants in association with Metropolitan Architects & Planners, Inc. The lighting recommendations made in that plan are applicable to the entire campus. The study recommendations for street, pedestrian way, and bollard luminaire types are shown in Exhibit 6.4.F. A study should be done to identify the existing NIH Campus internal campus lighting that needs to be upgraded. The study will include recommendations for the upgrade or replacement of exterior campus lighting according to light fixture type, location, light quality, fixture and lamp condition, and adequacy of the number of light fixtures. Categories of lighting addressed include the following:

- Street: For vehicular safety and general campus illumination
- Intersection: Special lighting at roadway intersections
- Pedestrian: For pedestrian safety and path marking
- Building: To identify building entries and provide security
- Safety/Security: For areas of the campus that pose danger or require surveillance
- Signage: At major entry locations and for key directional and orientation signage
- Service Areas: Special lighting at service areas
- Special Features: Building or landscape highlighting, special outdoor spaces or monuments.

Exhibit 6.4.G illustrates the major Master Plan lighting concept recommendations. The major campus entry roadways should be of a single lighting character to identify them as entryways. Within the campus core, lighting for major pedestrian pathways should create a consistent and unified framework which reflects the hierarchy of the principal paths. Branching out from this central framework, lower intensity pedestrian lighting should provide a network of lighted paths connecting all building groups on the campus. Of particular importance is the creation of well-lighted and secure pathways to the Metro station, for employees and visitors. In general, lighting should be less intense at the periphery than at the core. Full-cutoff light fixtures, which allow no light to be emitted above a designated horizontal plane, should be used wherever possible throughout the campus to eliminate light pollution.

Exhibit 6.4.G also delineates a light control zone at the north and south ends of the campus. In these areas, special attention should be given to avoid spillover lighting into adjacent neighborhoods. Increased landscape screening should be provided in the buffer zone, and special architectural light screens should be considered where necessary.

There are currently many lighting fixture types on the NIH campus. The Master Plan recommends that all defined campus lighting systems (major pedestrian framework, primary entries, etc.) each be of a single-fixture type. Individual building projects may continue to differentiate fixture types for buildings and surrounding area lighting, within a complementary style to other campus lighting. In general, roadway light fixtures should be between 25 to 30-feet high, while major pedestrian path fixtures should be between 12 to 15-feet high. Secondary pedestrian path fixtures may be pole-mounted luminaires or bollard type fixtures.

Fixture lamps should be selected for energy savings, light quality, and maintenance characteristics. LED, Metal halide, high-pressure sodium, or compact fluorescent lamps are preferred. Mercury vapor lamps are discouraged. Additionally, it should be recognized that simply increasing lamp wattage is not always the correct solution to a perceived lighting problem. Other factors such as light direction, light quality, surface reflectance, and contrast with surrounding areas can affect perceptions of security and character.

Additional criteria for lighting design:

- Light levels must meet but not exceed ANSI/ASHRAE/IESNA standards.
- LED lighting or other high efficiency, low maintenance fixtures should be used.
- Locations of lighting poles must be in compliance with Maryland SHA bicycle and pedestrian design guidelines


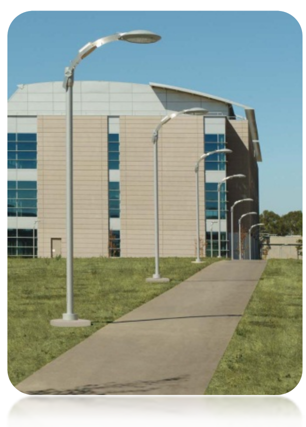


Exhibit 6.4.F. Preferred Street, Pedestrian Way, and Bollard Luminaires

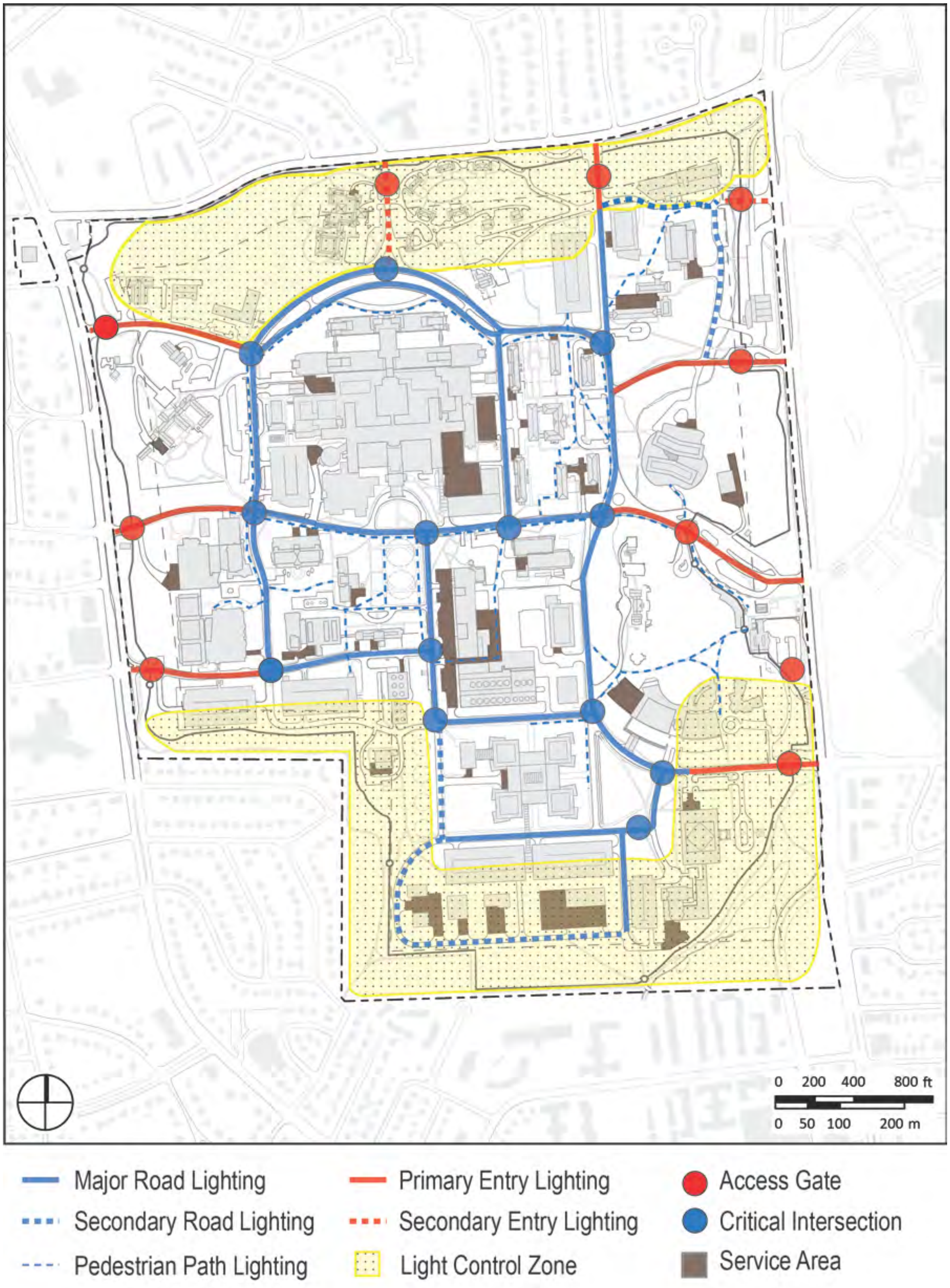

Exhibit 6.4.G. Lighting Concept Plan

6.4.6 Open Space

6.4.6.1 Major Proposed Open Spaces

In general, enclosed open spaces are perceived to be comfortable in scale if the proportion of the width of the open space to the height of surrounding structure is between 2.5:1 and 3.5:1. Spaces, which have a proportion greater than 2:1 create an "urban" feel, and require significant, shadow considerations.

The proposed building clusters described in the following section already are formed around the genesis of viable urban spaces (with the exception of the totally new "South Research Cluster"). In some areas the buildings form well designed and landscaped outdoor areas. In other clusters the buildings and/or the landscape forming the outdoor areas are incomplete and need rather minor upgrades to planting, paving, lighting, furniture, etc. to make them desirable, usable activity spaces. Lastly, in other instances, there will be new buildings or renovated buildings proposed adjacent to existing outdoor areas. It is imperative that during the design of these new or renovated buildings that the buildings incorporate lively activities in their ground-level interiors. These activities should front directly onto, and be accessible from, the organizing outdoor space of the cluster. These active outdoor spaces will provide opportunities to promote collaboration and interaction within the research community.

6.4.6.1.1 North Research Cluster

The design of the "North Research Cluster" will recognize, respond to and reinforce the existing formal plaza between Buildings 31C and 33. The Building-31 complex will be demolished. In its place a new four-story 287,808 gsf laboratory building (N22) will be constructed partially within the footprint of Building-31C. The design of the new laboratory building should respond to its location on the existing plaza by offering outdoor sitting and landscaping that will augment the formal character of the plaza as well as provide pedestrian access from MLP-10. The north end of the building should formally respond to the proposed new vehicle/pedestrian entrance from West Cedar Lane by providing an appropriate visual terminus to the new campus access.

The Master Plan locates both N22 clear of the existing stairway/ramp system connecting the Building-6 laboratory complex to the formal plaza west of Building-33. The design of N22 should provide pedestrian connections to the stair/ramp system.

A new campus entry will be formed on Cedar Lane and a new road between Cedar Lane and Center Drive is proposed in the Master Plan.

6.4.6.1.2 Administrative Cluster

The heart of the "Administrative Cluster" is the "Historic Core" of the NIH Bethesda campus. The Historic Core is anchored by Building-1, the first building constructed on the campus. Surrounding Building-1 are four historic buildings currently used as laboratories (Buildings 2, 4, 5, and 8) and one historic laboratory building currently being adapted for administrative use (Building-3). The bilateral symmetry of the NIH Building-1 creates a visual east-west axis that aligns with a similar bilateral symmetrical axis from the WRNMMC historic Building-1 tower. This common visual axis unites, across time and space, the origins of these two important historical federal buildings from the pre-World War-II period of the Franklin Delano Roosevelt presidency. FDR was personally involved in the location and design of both world renowned federal facilities.

There are two major new buildings proposed to be located in the Administrative Cluster. A new information technology (IT) building (Building-N7) is proposed north of Building-1 between Buildings 2 and 4. The location and massing of Buildings 3 and 5, located on the south of the Building-1 east-west visual axis, is mirrored north of the axis by the location and massing of Buildings 2 and 4. The location of the historic Building-8 is not mirrored on the north side of the Building-1 axis. The Master Plan proposes to locate Building-N7 north of the east-west axis to complete the symmetrical order and organization of the Historic Core. Additional space requirements for the IT building will be located below grade to the west of N7. The remaining historic laboratory buildings (Buildings 4, 5 and 8) will be adapted for administrative use.

Most surface parking is proposed to be removed from the Historic Core and relocated into the new MLP-14 garage to the north. The remainder of the recovered spaces between the buildings in the Historic Core should be developed into a linked series of usable, tree-shaded vest-pocket parks and landscaped walkways with attractive low-level lighting, pedestrian paving, seating, tables, and other appropriate site furnishings.

The historic anchor and its commemorative plaque, symbolic of the NIH beginnings as the "Marine Hospital Service", should be relocated and incorporated into the existing ceremonial plaza in front of Building-1. The anchor's current location, in an isolated traffic island, is difficult and unsafe to access. As a result, the symbol of the NIH origin is accessible only to the most adventurous risk-takers. By relocating the anchor and plaque to the plaza in front of Building-1 they could be easily seen, read, and understood by more NIH staff, visitors and patients.

The Building-31 complex, containing most IC functions, is proposed to be demolished. Replacement spaces will be housed in the proposed 601,039 gsf, 17-story, Building-N21 located on the present Building-21 waste storage facility site. Building-21 is proposed to be demolished and its functions relocated to a new building located in the "South Research Cluster". The Building-21 site is located adjacent to the Metro station campus pedestrian entrance and is directly opposite the administrative Historic Core making it an ideal location to relocate the IC functions.

However, the Building-21 site contains some significant potential constraints to be considered when designing a new building. Perhaps the most significant is the potential toxic condition of the site. As a waste treatment, storage and disposal site, it should be tested for contamination (see Hazardous Waste and other material in the Environmental Impact Statement). The costs of removing any contaminants should be incorporated into a demolition and new construction cost estimate. Secondly, the site has high ground-water levels making below-grade construction difficult and expensive. Delineation of the horizontal and vertical limits of the 100-year flood-plain will determine the site's buildable area.

As an IC administrative site, the new building N-21 has an opportunity to be designed featuring an elevated outdoor terrace overlooking the natural NIH Stream. The terrace could be an extension of the cafeteria and incorporate tables, chairs and umbrellas for outdoor dining. Bridges connecting the plaza surrounding Building-N21 to South and Center Drives will allow the direct flow of pedestrians from the Metro entrance to Building N-21 and from N-21 to the Historic Core. At least one of the pedestrian bridges must be configured and reinforced to accommodate emergency vehicles. Vehicle access to the bridge could be controlled by removable bollards.

In summary, the Building-21 site's juxtaposition to the campus Metro entrance and the administrative Historic Core offers an ideal location for administrative functions but its choice for a building site must be tempered by considerations of potential significant difficult site development costs. Careful building, site, and engineering design will be critical to the success of a new building in this environmentally sensitive location. Additionally, protection of the existing stream and surrounding mature vegetation during construction will be of paramount importance.

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6.4.6.1.3 East Research Cluster

The "East Research Cluster" design capitalizes on the use of the existing plaza and service drive adjacent to and south of the Louis Stokes laboratory building (Building-50). A new six-story, 256,538 gsf laboratory building (Building-N12) is proposed to be built adjacent to the pedestrian-paved service drive south of the Building-50 plaza on the site of demolished Buildings 12, 12A and 12B. The existing combination of the nicely lit service drive with its stamped-asphalt paving adjacent to the pleasant wood, vine-covered pergola (Exhibit 6.4.H) in the plaza of Building-50 forms the setting for the location of the new laboratory building. The design of Building-N12 should address its location adjacent to the existing service drive/pedestrian walkway. The service drive/plaza could serve as both an outdoor sitting area featuring a replacement sandwich shop for the one lost to the demolition of Building-12B as well as a secure main entrance plaza. The Master Plan indicates no changes in the existing entrance plaza at the northeast corner of Building-50.

Exhibit 6.4.H. Pergola and Plaza South of Building 50

6.4.6.1.4 Biomedical Research Education Cluster

The "Biomedical Research Education Cluster" is anchored by significant historic buildings. Most notably are the "National Library of Medicine" (Building-38) with the adjacent "Lister Hill Building" (Building-38A and the MLP-7) and the "Fogarty International Center" (Buildings 16 and 16A). The "Natcher Building" (Building-45) is the most recent addition to the cluster along with the child-care center (Building 64) and the "Gateway Center" (Building-66).

Due to change in program priorities and direction at the time of its construction, the Natcher Building was not built to its intended design. The Master Plan proposes to complete the intended construction of the Natcher Building with an 87,461 gsf addition. The addition will relieve some space demands for the National Library of Medicine. The addition and its attendant landscape will complete the outdoor spaces initially designed for the entire building.

There are no plans to modify or add to the existing exterior spaces around the National Library of Medicine buildings. The construction of the "South Pond", a Montgomery County SWM facility southeast of Building-38A, is scheduled for completion during 2013. The South Pond will alter the landscape and views at the southeast corner of the NIH campus.

6.4.6.1.5 Center Research Cluster

The most dominant building on the NIH Bethesda campus is the massive "Clinical Center Complex" ("CCC", Building-10). It is located at the north-central area of the campus in the "Center Research Cluster". Accompanying the CCC in the Center Research Cluster are Buildings 7, 9, 30, 49, 59, 59A, and MLP-9.

South of the dominant CCC is a large outdoor space located in the approximate center of the campus. It is used primarily as a large parking lot drawing vehicle traffic from the campus perimeter entrances, across pedestrian walkways, to the campus center. As a result, the centrally located parking lot generates many potential points of conflict with pedestrian traffic compromising their safety. The Master Plan proposes to relocate the displaced surface parking to future parking garages MLP-12 and MLP-13 at the south side of the campus and MLP-14 located at the northeast side of the campus. The existing paving and paving-base will be removed and the area improved with a new soil-mix, landscape planting, lighting, site furnishings, and pedestrian paving. The creation of a new "Central Quadrangle" will reduce the vehicle traffic flow to the campus center in addition to providing improved storm water quality and quantity management.

Most importantly however, the Central Quadrangle will become the active outdoor heart of the NIH campus where staff members can mingle, collaborate and relax. The Central Quadrangle will contain open space for multiple activities including ceremonial gatherings, displays, vendor's pavilions, kiosks, and recreation. The edges of the Quadrangle will be defined by allèes with pedestrian pathways. There should be as much mixed-use variety at the building edges of the Mall as possible.

Building-30 is proposed to be converted from existing laboratory space into physician's offices. As a result, the east side of the building, facing the proposed "Central Quadrangle", has the opportunity to be upgraded to reflect its important location on the central outdoor space of the campus. The ground-level interior and exterior spaces should reflect "openness and lively uses" to help activate the outdoor heart of the campus. Shaded, landscaped, paved terraces with seating and other site amenities will be critical to the success of the Central Quadrangle.

Similarly to Building-30, Building-29 (scheduled for adaptive reuse) needs to address its important location as the southern terminus of the Central Quadrangle. During its adaptive reuse phase, the ground-level of Building-29 should be designed to also accommodate "openness and lively uses" to help activate the Quadrangle.

Previous Master Plans have shown a north-south oriented Central Mall connected to a crossing east-west open space. The construction of the east-west open space will require the demolition of Buildings 13 and 30. This Master Plan, with its emphasis on adaptive reuse and sustainability, proposes to leave both buildings in place. However, as previously stated, during the adaptive reuse design phase, Building-30 needs to specifically address its location on the new Central Quadrangle. Likewise, Building-13 needs to respond to its location facing the Central Quadrangle. Currently loading docks for Building-13 face the proposed Quadrangle. Any future adaptive reuse of Building-13 should specifically address how the north end of the building can become an important positive contributor to the Quadrangles' activity. Building-13 could be partially extended to the Service Road with the addition containing ground-level mixed-use activities.

6.4.6.1.6 West Research Cluster

The "West Research Cluster" contains the Building-29 complex (see the "Center Research Cluster" above), the "Porter Neuroscience Research Center" (Building-35, phase-II is currently under construction), Building-37, the "Dale and Betty Bumpers Vaccine Research Center" (Building-40), and the "Silvio Conte Laboratory (Building-49). A 46,200 gsf addition to Building-40 is proposed. The north-south Convent Drive bisects The West Research Cluster. On the east side of Convent Drive there is currently a landscaped open space occupying difficult sloping topography between Building-49, Building-30, and the Building-29 complex (Exhibit 6.4.I). The Master Plan does not specifically address any design changes to this plaza. However, the adaptive reuse design of Building-30 should improve and reinforce the connection from Building-30 and the open space between Building-49 and the Building-29 complex.

Exhibit 6.4.I. Plaza Near Building-30

On the west side of Convent Drive, a new landscaped plaza will be constructed with the second phase of the Porter Neuroscience Research Center. This plaza is north of the second phase building. It will link to the landscaped area, east of Convent Drive, between Buildings 29, 30, and 49. The construction of the new plaza at the Porter Neuroscience Research Center establishes an opportunity to improve the quality of the paved area south of Buildings 37 and 40. These two buildings will join the new plaza. They need a redesigned landscape plaza that acknowledges and links their new relationship with the Porter Neuroscience Research Center to promote informal meeting and collaboration.

6.4.6.1.7 South Research Cluster

The site for the "South Research Cluster" will require the demolition of the Building-14 complex, Building-25, Buildings 41 and 41A, multiple temporary trailers, and parking lot-41. As a result, there will not be an existing open space central to this research cluster. The

Master Plan proposed to create a new four-story, 774,504 gsf research laboratory building (N14) housing multiple IC programs. Housing for dogs is not proposed for the new Animal Research Facility (Building N-9) near the CCC. Instead housing for dogs and their dog-runs (Building N24) are proposed west of Building N14

Open spaces at the South Research Cluster are proposed to surround the N14 laboratory building with a formal landscaped entrance facing a new frontage road to the east. Access from proposed parking garages MLP-12 and MLP-13 to N14 will be via a covered elevated walkway above a new east-west access road separating the laboratories from the structured parking.

South of the parking garages are located new facilities for grounds maintenance (Building-N20 and the replacement facilities for the displaced waste management complex (Buildings N19, N19A, and N19B.) The existing service road directly adjacent to and south of the power plant (Building-11) will be relocated farther south to allow for adequate space between the new road and the existing power plant.

6.4.7 Street Furniture

Well-designed street furniture makes the sidewalk realm more comfortable and life on the sidewalk more convenient. Benches provide places to rest, read, have informal discussions, or have lunch. Properly distributed trash receptacles help to keep the campus clean. In addition to providing amenities, street furniture can also provide a buffer from the noise and commotion of vehicles in the street. *To maintain consistent appearance within the campus, fixture design, color, and materials must be approved by the NIH Architecture Design Review Board.*

Currently site furnishings on campus are not well coordinated either by style or location. The Master Plan recommends that street furniture be organized in a way that maximizes safety, comfort, and function for all users. In addition to location considerations, the design of street furniture should be simple and compatible with the existing built environment.

Seating, receptacles, bollards and bicycle racks should be functional, easily maintained, and aesthetically compatible throughout the campus. The use of durable materials for site furnishings is encouraged. These elements will not only provide pedestrian scale and comfort, but also visually unify the campus environment (Exhibit 6.4.J). Special emphasis should be given to increasing seating areas through the use of low seat-walls, picnic tables, and benches throughout the campus, in order to improve the quality and location of outdoor places for eating and relaxation within the extensive grounds of the campus.

Exhibit 6.4.J. Kiosk North of Building-50

6.4.7.1 Outdoor Seating

There are many types of exterior seating used on the Bethesda Campus. These include outdoor tables, chairs, benches, seating walls, steps, planters, and raised tree beds. The design and location of seating should respond to how their surrounding space is used. Seating should be provided in areas where people are likely to congregate near cafeterias, shuttle stops, and plazas. Additionally, streets with significant pedestrian traffic should have frequent opportunities to sit, rest, and wait.

The best location for seating is a protected location (i.e. beneath a street tree or overhang) that does not interfere with the pedestrian flow. Care should be used when placing benches to ensure they do not interfere with entrances to buildings, heavily used loading zones, parked vehicles, access to fire hydrants, snow removal and other potential conflicts. Seating should be provided for a minimum of two people. Single seats may be provided as long as they are in groups of 2 or more. Seating can be integrated into buildings and street walls.

Armrests provide stability for those who require assistance sitting and standing. Seating without armrests allows a person in a wheelchair to maneuver adjacent to seating or slide onto it easily. Seating should be constructed of a durable material and should integrate aesthetically with the surrounding architecture and street furniture. Exhibit 6.4.K shows an example of outdoor seating currently on the Bethesda Campus, and that recommended.

Exhibit 6.4.K. Campus Outdoor Seating Examples (Left) and Preferred (Bottom Right)

6.4.7.2 Bicycle Racks

Bicycle racks should be installed as part of all construction projects that bring new employees to the Bethesda campus. At a minimum, the racks should accommodate bikes for 5% of the building population (GSA Facilities Standards P-100, LEED recommended standard).

Racks should be located near the main and secondary entries to the building. A minimum clearance of 5'-0" should be maintained between the nearest element of an unoccupied bicycle rack and any adjacent street furniture, light poles, curb cuts or building entries. Racks should not be installed so parked bicycles obstruct the pedestrian flow as well as not obstruct access to fire hydrants.

Good bicycle parking designs maximize capacity, maintain an orderly appearance, are secure, and are simple to use. Some bicycle rack designs that are available commercially do not meet these criteria, and therefore should not be used on the NIH campuses. Bicycle racks should be constructed of a durable material and should integrate aesthetically with the surrounding architecture and street furniture.

Approved bicycle rack designs must meet the following criteria:

- The rack should support the frame of the bicycle at two points
- The rack should support different bicycle frame sizes and styles
- The rack should be simple and easy to use
- The rack should allow easy locking of the frame at least one and preferably both wheels

Exhibit 6.4.L shows the preferred storage/shelter for bicycles on campus. Refer to the "NIH 2008 Amenities Guideline" for more guidance regarding bicycle racks.

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Exhibit 6.4.L. Preferred Campus Bicycle Racks

6.4.7.3 Outside Refuse Containers

Outside Refuse Containers shall be located near parking lots, parking structures and outside eating areas. They shall conform to the NIH standard design (recommended per the aforementioned Route-355 study) shown in Exhibit 6.4.M. More information can be obtained from the Office of Research Facilities Division of Environmental Protection.

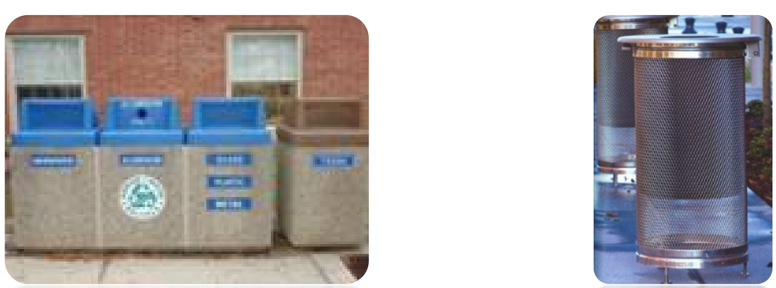

Exhibit 6.4.M. Typical Campus Refuse Containers

6.4.7.4 Bollards

Bollards are permanent or temporary posts or objects used to create an unobtrusive boundary between different modes of transportation and realms of the street. Their main functions are to protect pedestrians, bicyclists, buildings, and specified areas from vehicular access and highlight traffic calming measures. They also provide for amenities such as bicycle parking and lighting.

Bollards can be fixed, flexible, retractable or removable. They can be designed to withstand heavy impacts, or give way on impact. Flexible and retractable bollards are intended to deter vehicle access, but allow entry for emergency vehicles. Bollards come in all shapes and sizes, from standard posts, to bell bollards and storm water planters. The most important design feature when using bollards is visibility. Bollards must be clearly visible in all lighting conditions for all users, particularly pedestrians and motor vehicles. Lighting and colors that provide contrast to the surrounding environment should be used. Proper size and spacing should balance restricting vehicular access and provide a clear pedestrian path free from obstructions

Bollards can be used to:

- Restrict vehicular access to car-free zones
- Prevent delivery trucks from using sidewalks
- Provide security measures for buildings and infrastructure
- Narrow turning radii to reduce vehicular speeds around corners
- Create protected space for street furniture
- Protect storm water management features such as rain gardens, storm water planters, and green-curb extensions
- Bollards can provide other amenities such as bicycle parking, lighting, litter and recycling receptacles, and art.

Consider creative designs for bollards when they are in public spaces. For example, a design could use precast animal or geometric shapes around the childcare centers; or bollards could be designed as informational kiosks about research or the history of campus buildings. Bollards could serve as part of the directional way-finding for the campus or be imprinted with the NIH logo. An example of standard type bollards is shown in Exhibit 6.4.N.

Exhibit 6.4.N. Precast Concrete Type Bollard with NIH Logo Example

6.4.8 Environmental Sustainability Planning

Create a state-of-the-art sustainable campus environment that stewards NIH's resources and promotes the health of the natural world.

In support of the National Institutes of Health's mission to apply knowledge to "extend healthy life", the Master Plan for Bethesda Campus seeks to create a healthy human environment that is restorative to the health of the natural world. The Master Plan goes beyond the minimum standard of limiting the impacts on the site and the environment and seeks to create a sustainable campus. The NIH Bethesda Master Plan integrates sustainability policies outlined by HHS. These policies include other Federal sustainability regulations including:

- 2011 The HHS Sustainable Buildings Plan
- the HHS Strategic Sustainability Performance Plan
- Energy Policy Act of 2005 (EPA Act 2005), Executive order 13423 (EO 13423)
- Energy Independence and Security Act of 2007 (EISA 2007) and EO 13514

These current regulations may change in the future. Each future project would be designed to meet the sustainability regulations in place at that time.

6.4.8.1 The Guiding Principles

The 2006 Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding "Guiding Principles" are included in the "NIH Design Requirements Manual". They are:

- Employ Integrated Design Principles
- Optimize Energy Performance
- Protect and Conserve Water
- Enhance Indoor Environmental Quality
- Reduce Environmental Impact of Materials

Refer to the "NIH Design Requirements Manual", Section 1-10: "Sustainable Design" for further guidance.

6.4.8.2 The HHS Strategic Sustainability Performance Plan and the HHS Sustainable Buildings Plan (2006)

The HHS Strategic Sustainability Performance Plan (SSPP) is the framework for the Department's overall sustainability program. The HHS Sustainable Buildings Plan (SBP) is a collection of policy, procedures, guidance and tools designed to summarize and record the Department's program to incorporate sustainable measures into building assets. The SBP supplements the HHS SSPP. The SBP has been developed to reflect the requirements of Executive Order (EO) 13514.

6.4.8.3 New Construction and Major Renovation

All construction projects and major renovation projects shall incorporate the "Guiding Principles" into their planning, design, construction, operation, maintenance, and decommissioning processes. Construction projects under the scope of this policy, which have a total project cost equal to or greater than $10 million, shall also obtain a third party certification that meets the requirements of a multi-attribute green building standard or rating system developed by an ANSI-accredited organization.

Every new federal building for which planning is initiated in 2020 or later shall be designed to achieve zero-net energy by 2030. A zero-net energy building is defined as "a building that is designed, constructed and operated to require a greatly reduced quantity of energy to operate, meet the balance of energy needs from sources of energy that do not produce greenhouse gases, and therefore result in no net emissions of greenhouse gases while being economically viable."

All new federal buildings shall be designed to reduce fossil fuel-generated energy consumption by the following percentages as compared with fossil fuel-generated energy consumption by a similar building in fiscal year 2003 (as measured by Commercial Buildings Energy Consumption Survey or Residential Energy Consumption Survey data from the Energy Information Agency):

- 2010 55% reduction
- 2015 65% reduction
- 2020 80% reduction
- 2025 90% reduction
- 2030 100% reduction

Site development and planning for construction projects and major renovations shall be in accordance with "Technical Guidance on Implementing the Storm Water Runoff Requirements for Federal Projects" under Section 438 of the "Energy Independence and Security Act", EPA document number EPA 841-B-09-001, dated December 2009. This storm water guidance document implements Section 438 of the Energy Independence and Security Act (EISA) of 2007 and EO 13514 Section 14. The document was developed in conjunction with other federal agencies and provides a step-by-step framework that will help federal agencies maintain pre-development site hydrology by retaining rainfall on-site through infiltration, evaporation/transpiration, and re-use to the same extent as occurred prior to development.

When adding capital assets to the real property inventory, OPDIVs shall conduct an alternatives analysis to identify opportunities to consolidate and dispose of existing assets, optimize the performance of the agency's real-property portfolio, and reduce associated environmental impacts.

6.4.8.4 Existing Buildings

All existing buildings shall be assessed for compliance with the Guiding Principles to ensure that HHS is moving towards 100% compliance. At least 15% of the applicable HHS building inventory, owned and direct leases over 5,000 gross square feet, must incorporate the sustainable buildings practices in the Guiding Principles by FY 2015. All improvement, repair and maintenance projects in existing buildings not defined in the paragraph above shall incorporate the Guiding Principles to the maximum extent feasible.

HHS components shall ensure that rehabilitation of federally owned historic buildings utilizes best practices and technologies to promote long-term viability. Rehabilitation work shall be in accordance with "HHS Program Manual Volume-I", Section 3-3. EO 13287 Preserve America and Section 110 of the National Historic Preservation Act (NHPA) also direct agencies to give some preference for locating in historic buildings and districts. This language is compatible with those directives and would be closely integrated with those policies in the Federal Management Regulations (FMR). In addition, HHS policy provides guidance on real property disposal (HHS Facilities Program Manual, Volume 2, Section 5-1), which includes adaptive reuse and the evaluation of disposal properties for HHS reuse. HHS integrates the Guiding Principles into historic properties where possible, provided the modifications meet the Secretary of Interior's "Standards for the Treatment of Historic Properties (and Rehabilitation)", 36 CFR 68 and 36 CFR 67 respectively.[2]

6.4.8.5 Building Rating Systems

Laboratory and research buildings consume five times as much energy and water than a typical administration building (National Institute of Building Sciences, 2009). Water intensive processes within laboratories are due to year-round demands for cooled air provided through water-cooled chillers, for equipment cooling and sanitization processes for cleaning cages and animal housing.

Due to the water intensive nature of processes within animal facilities and laboratory research buildings, large gains in conservation are likely to be realized through sustainable laboratory design implementation. Sustainable laboratory design aims to conserve and efficiently use energy and water, reduce harmful substance and wastes, improve work environments to increase productivity, efficiently use materials and increasingly use post-consumer materials.

The main goals of sustainable building design and operation are to:

- Maximize the potential of the site
- Minimize the energy and resource consumption
- Protect and conserve water
- Use environmentally preferable products and materials
- Enhance indoor environmental quality
- Optimize operational and maintenance practices

Either LEED or Green Globes certification is encouraged to achieve these goals. The two programs differ in the sustainable features emphasized. LEED certification designs place

[2] Department of Health and Human Services (HHS) Sustainable Buildings Plan, April 2011

more emphasis on the innovation of sustainable sites, the use of sustainable materials and resources. For certification according to LEED 2009 (v3), at least 40 points out of 100 must be obtained for the lowest certification level. The Green Globes certification emphasizes reduction of energy use, project management, and emissions. Certification is based on the points earned for each sustainability category on a sliding scale up to 1,000 points. Certification through either system can be used to achieve the goals mandated by the current regulation.

6.4.8.5.1 LEED Green Building Rating System

Designed by the US Green Building Council, the LEED Green Building Rating System is a voluntary, consensus-based, international standard for developing high-performance, sustainable buildings and has been adopted by many federal agencies as a means of achieving some of the goals of current environmental EOs. LEED was created to define green building by establishing a common standard of measurement while promoting environmental, economic, health and community benefits. LEED provides a complete framework for assessing building performance and meeting sustainability goals. Based on well-founded scientific standards, LEED emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, CO2 emissions reduction, stewardship of resources, and indoor environmental quality all based on a 100-point rating scale. LEED recognizes achievements and promotes expertise in green building through a comprehensive system offering project certification, professional accreditation, training and practical resources (USGBC, 2008).

The Master Plan for the NIH Bethesda Campus anticipates that the construction of new buildings and infrastructure would meet or exceed the standards represented by the level of certification applicable at the time of design and construction within the LEED Green Building Rating System. New construction would be executed sequentially in phases, each with a component of site work and infrastructure. The Master Plan design sets up a framework that would allow new buildings to achieve a number of the credits necessary for LEED certification. In some cases, the strategies employed would be used for individual buildings sequentially. In other cases, the site is treated as a whole under the guidance of the "LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects." Credits that could be earned under this Application Guide are noted below. Components of the Master Plan could qualify for the following credits within the Sustainable Sites, Water Efficiency and Innovation in Design sections. Other credits under the LEED rating program are building specific and, therefore, each building must independently meet the requirements of those credits.

6.4.8.5.1.1 Sustainable Sites

- Credit SS 1 - Site Selection: All the new facilities proposed in the Bethesda Master Plan would redevelop an existing site. This credit can be achieved because reuse of the existing campus promotes the preservation of green-fields and green spaces elsewhere and is an efficient way to reuse the land resources of the NIH. (1 point)
- Credit 4.1: Alternative Transportation-Public Transportation: Bethesda is eligible as a campus credit since each building is within the required 1/2-mile walking distance from a subway station. (6 points)
- Credit 4.3 - Alternative Transportation, Low Emitting and Fuel Efficient Vehicles: Preferred parking for low-emitting vehicles could be provided within the structured parking garages should the NIH elect to provide this option to its employees or within its motor pool. (3 points)
- Credit 4.4 - Alternative Transportation, Parking Capacity: Parking on the Bethesda Campus will meet the Transportation Management Plan requirements and 5% of parking is preferred parking[1] for carpools or vanpools. (2 points)
- Credit 5.1 - Site Development, Protect or Restore Habitat: The Master Plan meets this by recommending that as the entire site (LEED NC minimum is 50% excluding the building footprint, 20% including the building footprint) will be planted with native or adapted vegetation. (1 point)
- Credit 5.2 - Site Development, Maximize Open Space: The Master Plan does provide vegetated open space areas adjacent to buildings that are equal in area to the buildings' footprints. (1 point)
- Credit 6.1 – Storm Water Management, Quantity Control: The Master Plan outlines a strategy for treating the two-year storm on-site through a combination of Best Management Practices. (1 point)
- Credit 6.2 – Storm Water Management, Quality Control: By treating the two-year storm, more than 90% of the average annual rainfall would be treated on-site. (1 point)
- Credit 7.1 – Heat Island Effect, Non-Roof: This credit is met by placing more than 50% of the parking spaces under roof. (1 point)
- Credit 8 – Light Pollution Reduction: Low, cut-off fixtures and setbacks from property lines would keep night-time illumination focused on the ground and within the site boundaries. (1 point)

6.4.8.5.1.2 Water Efficiency

- Credit 1– Water Efficient Landscaping: This credit can be met because no new irrigation is planned, other than to establish new plantings. (2-4 points)
- Credit 2 – Innovative Wastewater Technologies: Water conserving urinals and dual-flush toilets can reduce potable water use for building sewage conveyance by 30 - 50% relative to the baseline FEMP compliant building. (2 points)
- Credit 3 – Water Use Reduction, 30%-40% Reduction: Low-flow fixtures and water reuse strategies could reduce water use by more than 40% relative to the baseline FEMP-compliant building. (2-4 points)

6.4.8.5.1.3 Innovation in Design Credits

Within LEED-NC, design teams may receive additional credits where performance exceeds the thresholds established in the balance of the rating system. Further, credits may be achieved, at the discretion of the US Green Building Council, for innovative practices that are not covered under other provisions of the rating system. An innovation credit is warranted if activities and/or programs inspired by a LEED project are applied to the campus as a whole, thus delivering a correspondingly larger environmental benefit. Several potential credits are enumerated below. A project may receive up to five credits for innovative practices, one credit for participation by a LEED accredited professional, and up to three credits for Exemplary Performance.

- Credit 1.1 – Innovation in Design: Having 40% of the site in vegetated open space meets the standard for exemplary performance under Sustainable Sites. (1 point)
- Credit 1.2 – Innovation in Design: Waterless urinals, dual flush toilets and low-flow fixtures would reduce water use by more than 40%, meeting the standard for exemplary performance under Water Efficiency. (3 points)
- Credit 1.3 – Innovation in Design: Sustainable Sites Credit 5.1 calls for 50% of the site to be planted or maintained in native vegetation. The new central green space and other green areas account for a large part of the site. (1 point)

6.4.8.5.1.4 LEED Certification

Basic LEED Certification requires that 40 credits be earned. As outlined above, through implementation of the Master Plan, buildings seeking certification could start with 27 to 31 of the 40 required for certification.

Note that this analysis of LEED Certification is based on LEED for New Construction – Version 3, 2009, the version of the LEED Green Building Rating System in effect at the time of the drafting of the Master Plan. Future buildings designed for the Bethesda Campus will meet or exceed the applicable sustainability regulations in place at that time.

6.4.8.5.2 Green Globes

The Green Building Initiative (GBI) created the Green Globes rating system which is utilized by many federal agencies as a means of achieving some of the goals of EO 13423.

The GBI promotes building practices that emphasize energy efficiency, healthier and environmentally sustainable buildings in residential and commercial construction. This program offers opportunities for recognition and certification in design, construction and/ or operation of the building. Green Globes assesses areas in energy, indoor environment, site, water, resources, emissions, and project/ environmental management.

6.4.8.5.3 Labs21

LEED and Green Globes do not have specifications directly addressing laboratory buildings or animal facilities. "Labs for the 21st Century" (Labs21) was created as a partnership between the US Environmental Protection Agency, the US Department of Energy, and the International Institute for Sustainable Laboratories that seeks to improve energy efficiency and environmental performance of the nation's labs on a voluntary basis (Labs21, 2008). This program bridges the gap in current implementation strategies (i.e., Green Globes, LEED) for sustainable design associated with laboratories.

Considering Labs21, the NIH Bethesda Campus should utilize their criteria as a means to design and evaluate the performance of sustainable laboratory buildings. Labs21 incorporates and encourages the utilization of multiple sustainable design considerations, but focuses primarily on energy efficiency improvements. Labs21 provides the following tools to enhance the sustainable laboratory design skills and knowledge of stakeholders and professionals:

- Training (design courses) and other educational sources such as a design guide, case studies and best management practice guides
- Roundtables
- Conferences
- The Labs21 Environmental Performance Criteria system. These tools facilitate laboratory stakeholders in achieving LEED or Green Globes certification.

According to Labs21, laboratory-type facilities represent an important segment of the national building stock, especially when considered in terms of energy intensity and overall consumption. Energy intensities in laboratories are often five-times higher than those found in ordinary (non-laboratory) buildings, such as offices. In the case of clean rooms (including bio containment laboratories), intensities are 10-100 times higher, depending on classification. Implementation of sustainable strategies in the design and operation of laboratories can provide an overall energy savings potential of 50%.

6.4.8.6 Sustainability - Water

Water efficiency strategies outlined in the "Labs21 Environmental Performance Criteria" address implementation of strategies associated with laboratory equipment and processes. Recommended strategies include use of closed-loop cooling systems, reuse of treated process wastewater, non-potable water sources in feasible operations, using floor-wash machines instead of hosing, substituting vacuum pumps instead of aspirator fittings, and modifying SOPs to reduce water use where feasible. These sustainable features would yield savings in water consumption. These recommendations can be utilized as the foundation of sustainable design in laboratories and may be useful in extension to animal care facilities.

Water intensive operations within animal facilities are due to a variety of equipment utilized in animal husbandry and experimentation. Water consumptive equipment in the animal facilities are cage-rack tunnel washers, rack-washers, reverse osmosis (RO) water purification systems, automatic water systems and bottle fillers, autoclaves, clothes washers, and showers for personnel. The campus, in its current design, is composed of disconnected animal facilities. Inherent water savings would be achieved with the consolidation of animal facilities initiating during Phase-1.

Although the largest conservation gains may be realized within laboratory and animal facilities, water saving features may be implemented in other facility types to reduce the overall consumption. The following is a list of specific sustainability features which shall be considered in the design phase for all buildings and be implemented during the construction phase of the Bethesda Master Plan.

6.4.8.6.1 Storm Water

- Collection and use of rooftop rainwater runoff for sanitary uses or landscape irrigation
- Bio swales for storm water conveyance
- Bio retention
- Filter strips in the central green spaces
- Tree-box filters

6.4.8.6.2 Water Conservation

- Reuse of cage-wash water
- Use of grey-water
- Low-flow and/or self-closing faucets
- Low-flow toilets
- Low-flow urinals

Water conservation in Federal buildings is mandated by EO 13514. Beginning FY 2008, water consumption should be reduced through life-cycle cost-effective measures by 2% annually relative to the FY 2007 baseline. The reduction efforts shall continue to year 2020 or total 26% by the end of fiscal year 2020.

An additional mandate included in EO 13423 by the Department of Energy, is the auditing and reporting of water consumption in at least 10% of facility square footage annually. Strategies enabling NIH to achieve water consumption reductions are outlined in Best Management Practices (BMPs) created by the Federal Energy Management Program (FEMP). These strategies are for use in both current buildings and as a guide in sustainable design for new construction.

The list of BMPs was created based on the previous Executive Order 13123 which required federal agencies to reduce water consumption through cost-effective improvements. These BMPs have been revised based on the interpretation of EO 13423 in order to facilitate the implementation of sustainability features in existing and future buildings (DOE, 2008).

The revised FEMP Water Efficiency BMPs are listed as follows:

- BMP 1 – Water Management Planning
- BMP 2 – Information and Education Programs
- BMP 3 – Distribution System Audits, Leak Detection and Repair
- BMP 4 – Water-Efficient Landscaping
- BMP 5 – Water-Efficient Irrigation
- BMP 6 – Toilets and Urinals
- BMP 7 – Faucets and Showerheads
- BMP 8 – Boiler/Steam Systems
- BMP 9 – Single-Pass Cooling Equipment
- BMP 10 – Cooling Tower Management
- BMP 11 – Commercial Kitchen Equipment
- BMP 12 – Laboratory/Medical Equipment

- BMP 13 – Other Water Use
- BMP 14 – Alternate Water Sources

According to legislative orders and revised BMPs, water management planning is the first step to a successful water conservation strategy. The development of a comprehensive water management plan involves metering, monitoring, auditing and evaluating water use in the Bethesda Campus facilities. Recommendations from a Water Consumption Study on water saving techniques should be incorporated into existing facility operating management plans and guide decisions on sustainable features to be included in future buildings.

6.4.8.7 Sustainability - Energy

Energy conservation targets for buildings within the Master Plan would be met on a building by building basis. The Master Plan promotes energy efficiency and savings within buildings through site layout strategies. For many buildings within the Master Plan, the dominant building orientation has the long axis running east to west. This orientation provides the greatest opportunities for energy efficient building design.

Glazing on the long north side is ideal for day-lighting with little summer heat gain. The corresponding glazing on the south can be easily shaded from the high mid-day summer sun to limit heat gain, but can allow penetration into the building of lower winter sun to gain desired heat during that time of year. The short building elevations are to the east and west where low-angle morning and afternoon sun have less day-lighting potential because of uncomfortable glare that causes blinds to be used to block daylight.

Using a combination of the following strategies, in addition to others that may be available at the time of design and construction, can provide increased building energy efficiencies:

- Day-lighting
- Lighting control systems (i.e., photo sensing devices, occupancy sensors)
- Reflective white or light-colored or planted green roof systems (see Exhibit 6.4.O).
- Heat Recovery (e.g. heat wheel, heat pipe)
- Energy monitoring and control system (EMCS) with direct digital control (DDC)
- On-site energy generation (e.g., photovoltaic panels, solar water heating; see Exhibit 6.4.P).

Exhibit 6.4.O. NIH Bethesda Gateway Center Green Roof

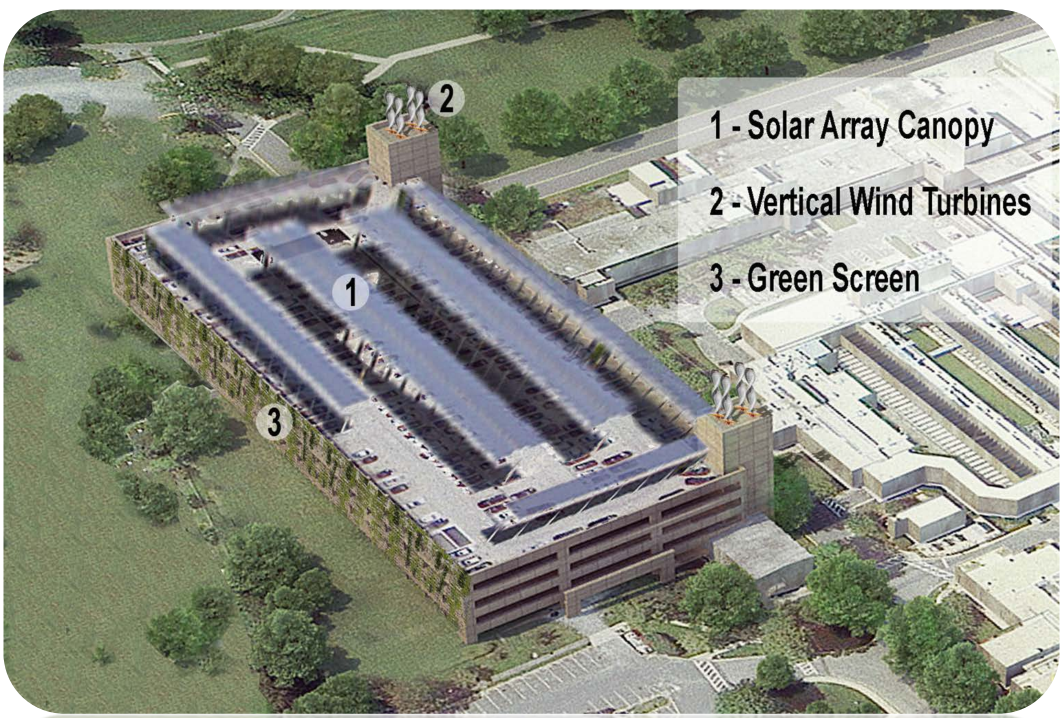

Exhibit 6.4.P. Sustainable Parking Garage Concept

6.5 Master Plan Implementation

6.5.1 NIH Facilities Decision Making Proces

The NIH Facilities decision making process is illustrated in Exhibit 6.5.A and further described below. The implementation of the Master Plan is based on a linear progression toward fulfilling the programmatic needs projected by the Master Plan. The actual growth and replacement rate on campus will depend on evolving national policy and budget decisions. The phasing illustrates issues and subsequent strategies affecting sequencing such as project priorities, replacement and demolition, and critical continuity of campus functions including services and infrastructure.

Establishing the framework and character of the campus is an important consideration. Emphasis should also be placed on projects which replace obsolete structures or which allow a more efficient use of land resources.

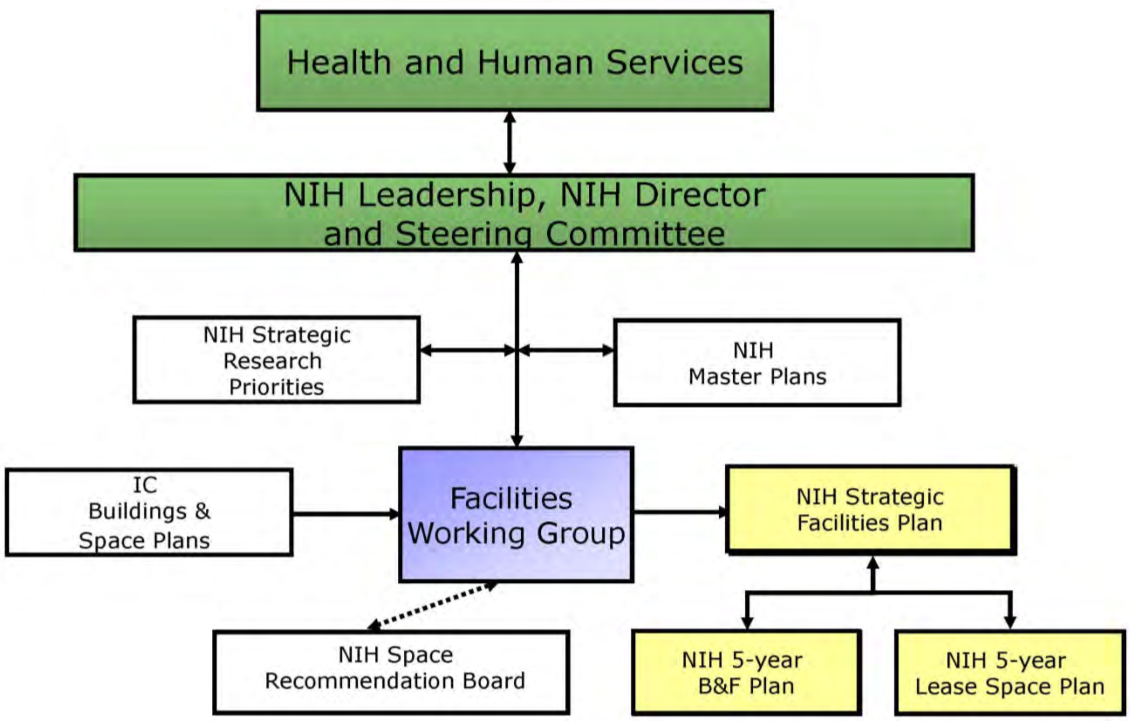

Exhibit 6.5.A. NIH Facilities Decision Making Process

6.5.2 NIH Strategic Facilities Plan

The NIH Strategic Facilities Plan is a suite of facility solutions designed to satisfy NIH's programmatic needs. Solutions could involve a combination of reallocating existing space, renovating existing buildings, constructing new facilities, adding space to existing buildings, acquiring new or replacing expiring leases, and property disposals. Collectively, these actions provide the strategic facilities approach to address the space needs of the various NIH research and administrative functions.

6.5.2.1 Buildings and Facilities Strategies Endorsed by the NIH Facilities Working Group

- Optimize use of NIH sites to support science enterprise.
    - Upgrade NIH IT systems while optimizing/reducing the number of data centers/server rooms.
    - Use Director's Reserve space from PNRC-II and the Building-29 complex to best align research programs.
- Provide safe, modern research space.
    - Continue renovation of the Building-10 core to support "bench-to-bedside" research by:
        - renovating the E-wing;
        - continuing to stabilize and manage Building-10;
        - renovating the ACRF; and
        - Converting the G-Wing to clinical offices.
    - Plan adaptive reuse of Building 30 and the Building-29 complex to decompress programs from Building-10.
    - Plan for a new centrally located vivarium.
- Sustain/improve existing facilities by modernizing assets to:
    - Reduce energy consumption;
    - Meet Executive Order 13514;
    - Achieve a Condition Index (CI) > 90.
- Plan to reduce lease space costs by utilizing government owned facilities.

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6.5.3 Trans-Intramural Research Program Scientific Themes Endorsed by the Facilities Working Group

6.5.3.1 Proposed projects must meet NIH Director's Themes

- Genomics and other high throughput technologies
- Translating basic science into new and better treatments
- Using science to enable health care reform
- Focusing on global health
- Reinvigorating the biomedical research community

6.5.3.2 Three Top Priority Themes

- Clinical is the top priority
- Animal Facilities, particularly the ARC to replace the Building-14/28 complex, due to a crisis in capacity and utility support that threatens NIH AAALAC accreditation.
  - Recommend a study of the ARC to locate it in the center of campus.
  - The ARC serves the most ICs, so it has the highest priority of the proposed projects.
  - Animal models are essential for IPS and translational studies.
- Renovate Bldg-29 complex
  - This project is the "Best bang for the B&F buck".
  - The project can support all themes.

6.5.4 Building and Facilities Prioritizations

Building and Facilities (B&F) prioritizations are recommended by a committee of Scientific Directors and Executive Officers for FWG concurrence. Proposals are prioritized in three sections, depending on information available.

1. Projects with sufficient information with a "program of requirement's (POR) and estimate to be considered for the funding in an annual B&F Plan.
2. Projects that are being studied in a current fiscal year could be proposed for design in the next annual B&F Plan. Priority dictates the order in which the POR and estimates are completed.
3. Projects that need further study before they are ready to be designed. Priority dictates the order in which studies are accomplished.

6.5.5 Project Prioritization Model

NIH has developed a B&F project prioritization model to evaluate NIH's facility needs from a scientific programmatic and a facilities impact. Select committees from the scientific and facilities committees meet annually to evaluate potential projects. Projects that score high are forward to FWG for recommendation for funding.

6.5.5.1 IC Program Impact

- Program impact
  - Mission Criticality and/or Intramural Program Affected for IC Projects
    - Mission Critical: Per HHS, NIH Director, or ORF Director, representing FWG directives
    - Supports new, high-priority research programs
    - Support existing high-priority research programs
    - Supports strong new research programs
    - Supports strong existing research programs
    - Facility or research program minimally impacts IRP mission
- Project impact
  - Number of customer affected on a specific campus
    - Entire campus
    - Entire building
    - Partial building
  - Building use
    - Laboratories (including clinical and vivaria)
    - Industrial including Central Utility Plant
    - Office
    - Other institutional uses (include child care)
    - Service
    - Housing
    - Parking structures
    - Warehouses
  - Returns leased space to government owned facilities
    - Returns leased laboratories and other leased space to government owned facilities
    - Does not return leased space to government owned

6.5.5.2 Functional Obsolescence

- Building Function to Support Current Approved Program
  - Building requires major upgrades or need some adjustments to support current program
  - Building can support current program

6.5.5.3 NIH Facility Impacts

- Facility Evaluation
  - Building Condition Index (CI)
    - CI below 65 or project will increase CI to >90
    - CI between 65 and 85 or Central Utility Project
    - CI above 90 or project involves new construction
  - Regulatory Impact
    - Must be addressed within two years
    - Should be addressed within three to five years
    - Can be addressed in conjunction with a future new construction or an R&I project
    - No impact to life safety
  - Building Systems Risk of Failure Impacting Life Safety and Critical Mission Function
  - Sustainability
    - Makes extraordinary contribution to sustainability goals
    - Makes significant contribution to sustainability goals
    - Makes a small contribution to sustainability goals
    - Makes insignificant contribution to sustainability goals
  - Operating Cost Impact
    - Will decrease operating and maintenance cost
    - Will not affect operating and maintenance cost
    - Will increase operating and maintenance cost

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6.5.6 Phasing Strategy

The Master Plan is to be implemented in four 5-year phases. To develop phasing strategies the Master Plan must take into consideration the NIH facilities decision making processes as well as previous decisions made by the FWG. Also the Master Plan must take into consideration research program scientific themes. The FWG has endorsed the following strategies: Optimize use of NIH sites to support science enterprise; provide safe, modern research space; and sustain/improve existing facilities by modernizing assets. In August 2010 the FWG endorsed the replacement of Building 31 with new construction on the current site of Building 31.

There are several objectives that the phasing strategies of the Master Plan must address:

- replace Building 31,
- construct laboratory facilities to replace research programs housed in older historic laboratories that are functionally obsolete,
- provide new research space for leased laboratories or programs from other NIH sites that will return to campus as well as housing the intramural research programs for newly created ICs,
- assure reliability of chill and industrial water; and
- consolidate NIH data centers.

6.5.6.1 Install Underground Chilled Water Storage Tank

To ensure reliability of chilled water supply, a new five million gallon underground chilled water storage tank it is recommended for installation. This effort will take five years to implement. The site for the water storage tank is under a large parking lot in front of Building 10. NIH must first construct a parking structure to accommodate lost parking spaces. The parking structure will also accommodate the parking spaces lost in parking lot 4 and 4A due to the construction of the New NIH Consolidated Data Center and the parking spaces lost to the proposed addition to Building 1; in fact most of the parking spaces in the NIH Historic Core will be converted to green and open space. The parking structure will also accommodate the parking spaces lost in Lot-41 due the proposed construction of the waste management facility.

6.5.6.2 Construct New Laboratory Building (N14)

A new laboratory building is recommended to replace research programs in older and historic laboratory buildings as well accommodate research programs from other sites. The site of the new laboratory building is occupied by NIH's animal research facilities. It will be 10 years before this project is realized. The new laboratory facility will require other capital projects to be constructed before it can be complete and usable. The Central Plant will require expansion of its steam generation capacity. New infrastructure in the form of roads and utility tunnels are required. Buildings 7 and 9 need to be demolished to make way for a new Animal Research Center; however, the large animals will not be a part of the new animal research facility. This means that Building 28 must remain in operation until it is replaced. After the demolition of the 14 complex and Buildings: 18, 32, and 41, then the new large animal facility will be constructed and Building 28 will be demolished and the new laboratory building can be constructed.

6.5.6.3 Replace Building 31 on the Building 21 Site

In August 2010 the FWG decided to replace Building 31, which has deteriorated with age and wear and can no longer be economically rehabilitated. In order to build the replacement for Building 31 on the Building 21 site, it will take approximately 10 years and the following need to occur: Construct new Buildings19, 19A, 19B, and 19C (Waste Management Facilities), bundled with a new Southern Service Road with the necessary site utilities infrastructure and intersection improvements at South Drive/Service Road West, and at Lincoln Drive/Service Road West. Demolish Building 21 and cleanup the site. Renovate Building-13 to accommodate ORS staff located in Building-31. Construct New Building-21 (IC Headquarters). The NIH police station is also housed in Building 31 and a new Police Station needs to be constructed. The site for the new police station is on the Building 22 site. Building 22 houses NIH's grounds maintenance functions. A new grounds maintenance facility N-20 will be constructed on the 41 parking lot on the south side of the campus. Once the grounds maintenance facility is in operation then Building 22 will be demolished to make way for the NIH Police Station.

6.5.6.4 Construct New Laboratory (N12)

This laboratory building is proposed to house a research program from another site and intramural research programs for a newly established institute. The building is to be located on the Buildings 12 and 22 sites. It is estimated that it will take 11 years to be realized. First Building N7 new NIH Data Center must be constructed on parking lots 4 and 4A in the NIH Historic Core District and N20 new grounds maintenance must be constructed on Parking

Lot-41 and the Building 12 complex and Building 22 will be demolished to make way for the new laboratory building.

6.5.6.5 Construct New Laboratory (N22)

This laboratory building proposes to house leased laboratories returning to the campus as well as intramural programs for a research center. Building N22 is to be located on site of 31C. It will be 11 years before this project is completed. Building 31 must be razed to make way for the new laboratory Building.

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6.5.7 Phasing

The following describe the implementation of the Master Plan in five-year increments over the next twenty years. The purpose of the phasing analysis is to give guidance to the sequence of projects to be constructed on campus, to emphasize the priority of key developments, and to illustrate potential future development conflicts. Of particular importance is the development of a strategy to relocate or replace key functions to accommodate new construction in the central areas of the site closest to Metro access.

Major activities are identified within a five-year period. These activities include pre-project planning, funding, design, construction and occupancy. Pre-project planning includes:

- the development of programs of requirements
- concept design
- budget estimates
- project definition rating index
- B&F prioritization scoring
- approval of NIH governing bodies
- preparation of the Facilities Project Approval Agreement

Following nomination of projects by the FWG to IC Directors at the annual NIH budget retreat, request for funding starts with project scoring. Then, the project is forwarded to the US Department of Health and Human Services Capital Investment Review Board (CIRB) for approval. Next, it is forwarded to the Secretary's Budget Council for consideration in the Department's budget request. From there it is sent to the Office of Management and Budget (OMB) for consideration for inclusion into the President's Budget and finally to Congress. The Master Plan assumes for planning purposes using design-bid-build as the facilities delivery method and those time frames are included in the phasing plan.

Facilities must be complete and usable. Therefore, this plan bundles necessary site infrastructure and utilities with the proposed building.

Three phases are detailed in the following sections. The building demolition and surface parking removal projects necessary to make way for the three Master Plan phases are shown together first in Exhibit 6.5.B. Next, the construction and renovation projects are summarized separately. However, work that cannot be completed in Phase III will be completed in Phase IV.

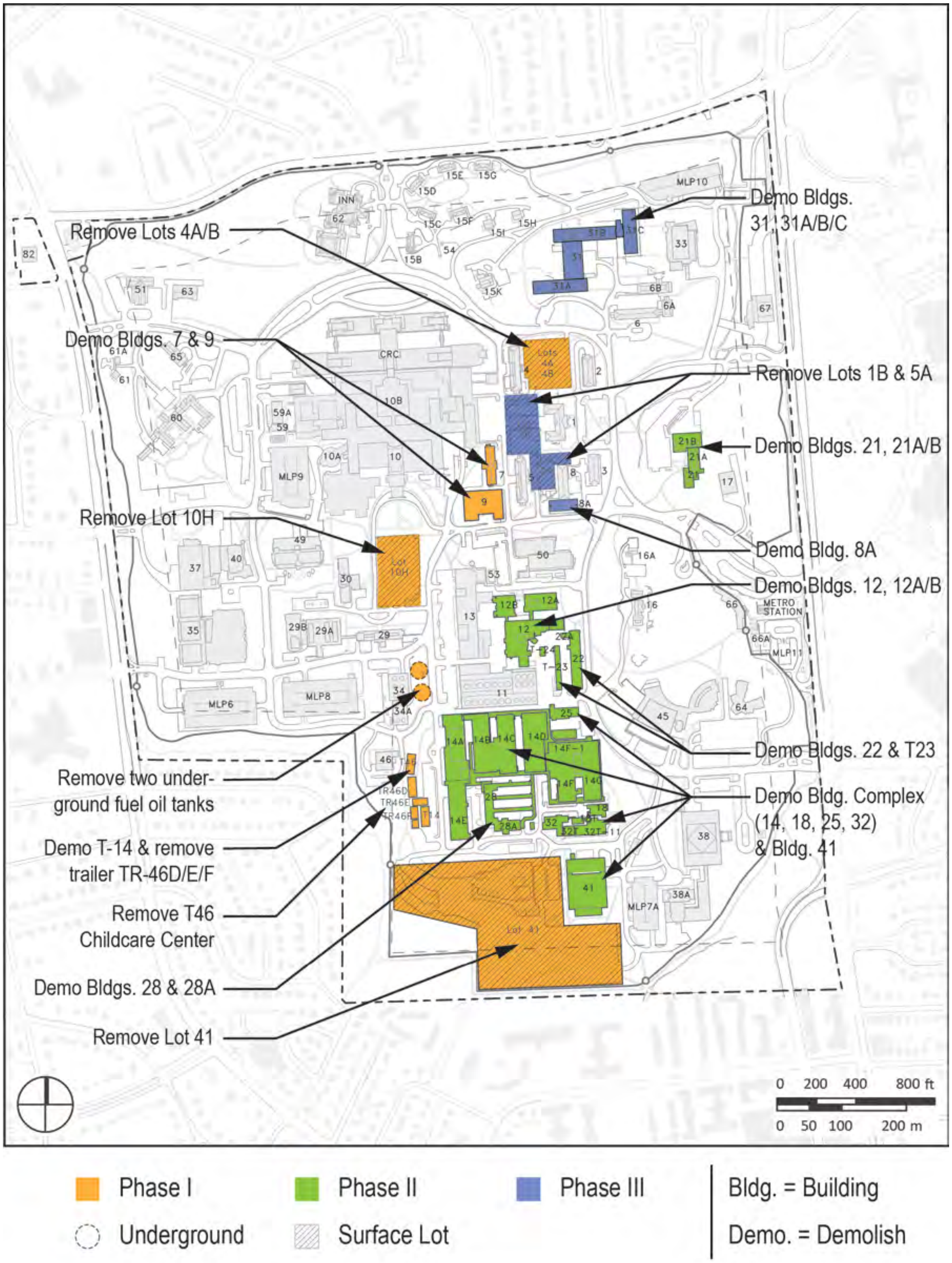

Exhibit 6.5.B. Demolition Phasing Plan

6.5.7.1 Phase-I

Phase-I includes the following projects that flow as shown in Exhibit 6.5.C:

- Complete Building-35 Porter-II (Under Construction).
- Construct New Building-N23 Northwest Childcare Center (Funded).
- Demolish Builiding-T46 Childcare Center and Building-T14. Remove trailers southeast of the Building-46 electrical substation: TR-46D, TR-46E, and TR-46F.
- Remove the existing fuel storage tanks that are underground to the east of Building-34. Install in their place a vault with four new fuel oil storage tanks southeast of Building-46.
- Remove parking Lot-41.
- Renovate Building-29A laboratory.
- Demolish Buildings-7 and 9.
- Renovate Building-34 Central Chilled Water Facility.
- Renovate or Replace Building-10 S&T Wings (starting with Transfusion Medicine).
- Convert Building-10 G-Wing labs to offices.
- Renovate Building-10 E Wing.
- Construct addition to Building-40 laboratory.
- Adaptively Reuse Building-29.
- Construct New Building-N9 the (ARC, Building-D) bundled along with South Drive reconnection, pedestrian bridges to Buildings-10, and necessary site utility infrastructure.
- Construct MLP 12 with a potable water storage tank.
- Install five million gallon underground chilled water storage tank Construct landscaped central quadrangle over the underground tank.
- Construct New Building-N7 for the NIH Data Center. Bundle with utility-loop connected to Memorial Drive and Center Drive. Remove central surface parking lots 4A, 4B, and 10H, and replace with temporary stacked-parking in garages. Provide new pedestrian malls and green space at these former parking lots to improve pedestrian safety and storm water management.
- Construct Addition to Natcher Building (A45).

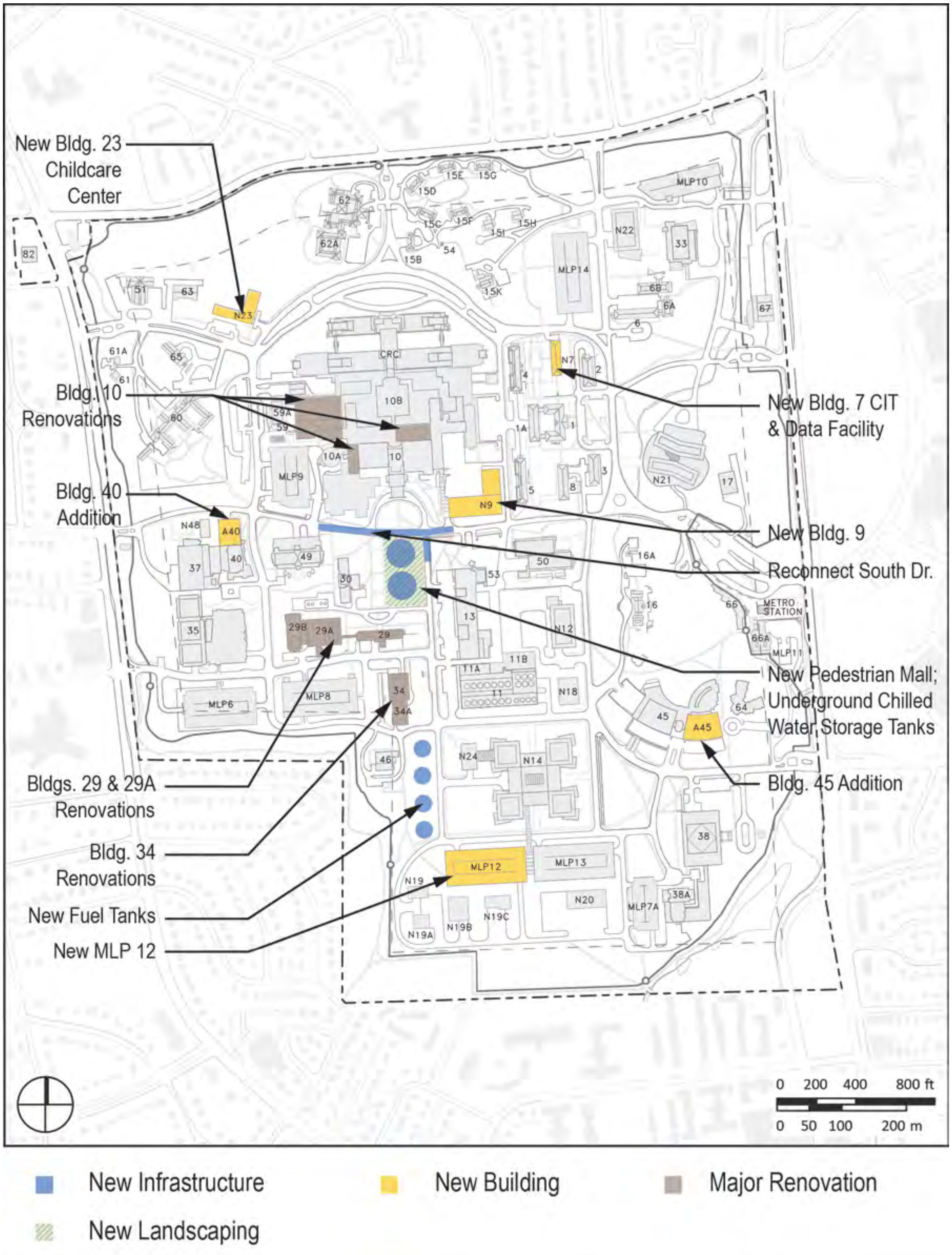

Exhibit 6.5.C. Phase I Site Plan

6.5.7.2 Phase-II

Phase-II includes the following projects that flow as shown in Exhibit 6.5.D:

- Construct New Buildings N19, N19A, N19B, and N19C (Waste Management Facilities), bundled with a new Southern Service Road with the necessary site utilities infrastructure and intersection improvements at South Drive/Service Road West, and at Lincoln Drive/Service Road West.
- Demolish Building-21.
- Construct New Building-N21 (IC Headquarters) along with two pedestrian bridges. One bridge must have structural capacity, width and configuration to hold emergency vehicles. Renovate Building-13 to accommodate ORS staff located in Building-31.
- Demolish Buildings: 14, 18/32, 25, and 41, and provide temporary housing for labs in Building-41.
- Construct New Building-24 large animal facility.
- Demolish Building-28.
- Construct New Building-N14 laboratory complex bundle with the following projects:
  - Relocate and upgrade service road to become a collector road adjacent to the power plant to extend Lincoln Drive.
  - Improve existing roads in the southern cluster.
  - Construct frontage road in front of New Building-N14 and new access road to parking garages.
  - Landscape and add green space.
  - Construct MLPs 13.
  - Construct pedestrian bridges from N14 to MLP-12 and MLP-13.
  - Expand Power Plant Building-11B.
  - Construct utility tunnel.
- Demolish Buildings 12, 12A and 12B.
- Construct new Building-N20 Grounds Maintenance Facility.
- Demolish Building-22.
- Renovate Building-10 West Distal Wings (H & J Wings).
- Construct New Building-N18 Police Station.

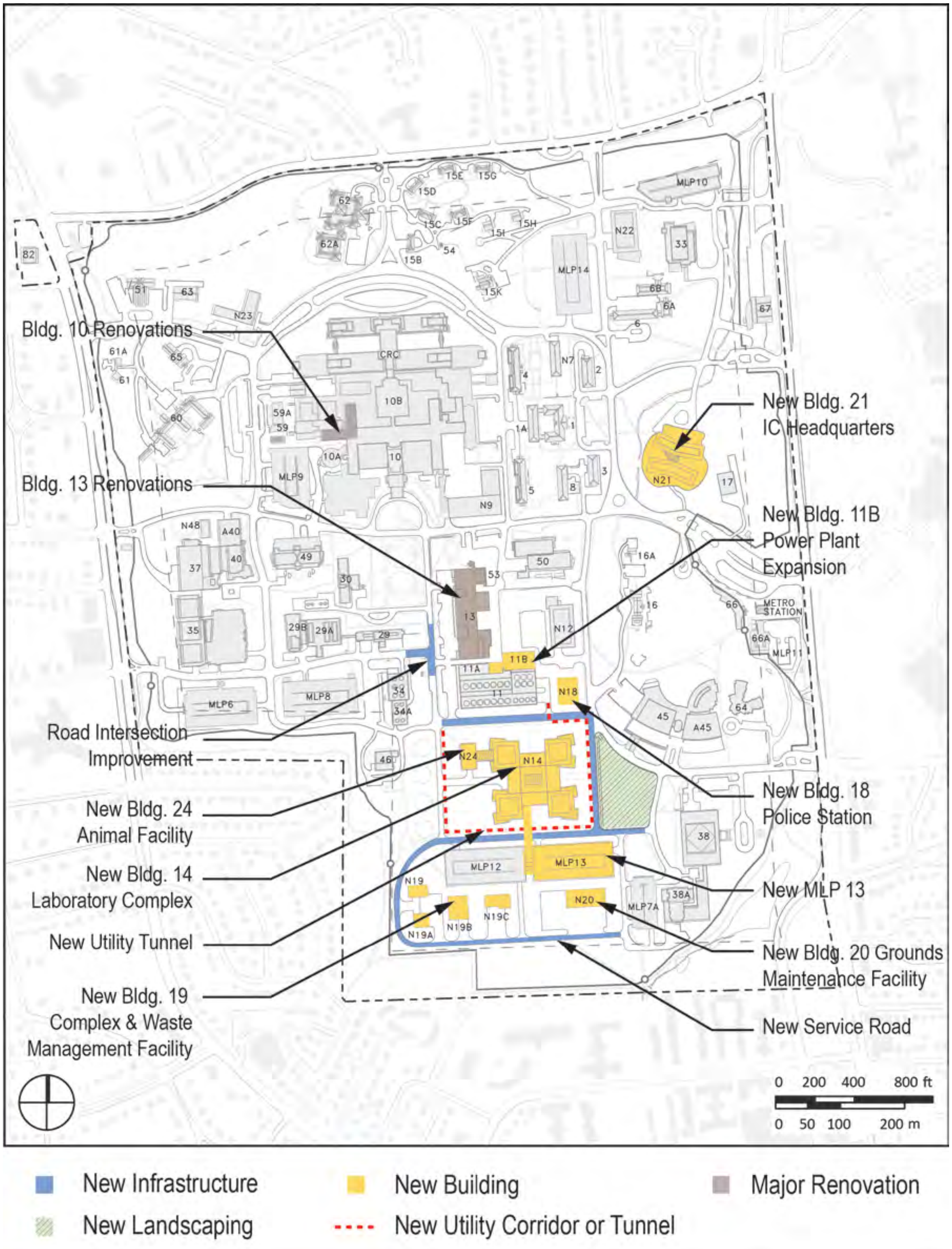

Exhibit 6.5.D. Phase II Site Plan

6.5.7.3 Phase-III & Phase-IV

Phase-III includes the following projects that flow as shown in Exhibit 6.5.E.

- Demolish Building-31.
- Renovate Buildings 4, 5 and 8 for administrative space. Construct Addition to Building-1.
- Construct MLP-14.
- Construct new laboratory Building-N12 and bundle with necessary utility infrastructure.
- Construct new internal road and new government vehicle parking lot & gas station.
- Construct new laboratory Building-N22 and construct new road from existing Center Drive to Cedar Lane.
- Renovate Building-10 ACRF.
- Renovate Building-10 East Distal Wings (A, B, C, & D Wings).
- Renovate Building-30.

Work not completed in Phase III will be completed in Phase IV.

6.5.8 Summary

Subject to future priorities, approvals, and funding decisions, the possibilities proposed herein are summarized in the Illustrative Master Plan and Conceptual Rendering at the end of this chapter in Exhibit 6.5.F and Exhibit 6.5.G.

The Master Plan strives to be consistent with a long term vision of the NIH Bethesda campus, and respectful of the people and environment of the campus, community and region.

Realizing the 2013 Bethesda Campus Comprehensive Master Plan is a way to support and improve future scientific collaboration in advancing and realizing the vision of the National Institutes of Health -- "Turning Discovery in to Health" – for the benefit of people worldwide.

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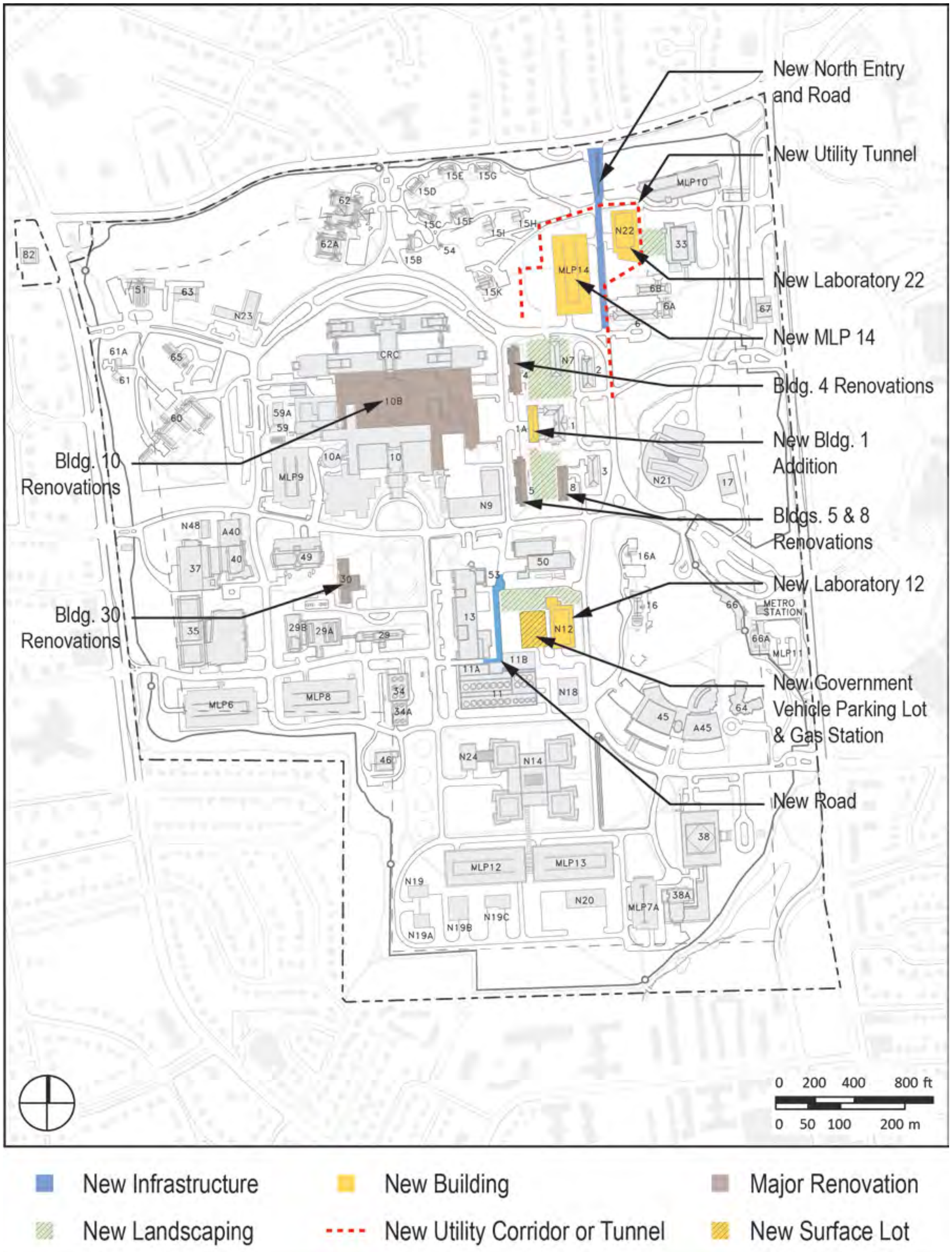

Exhibit 6.5.E. Phase III Site Plan

Exhibit 6.5.F. Illustrative Master Plan

Exhibit 6.5.G. Conceptual Rendering of Illustrative Master Plan

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END OF CHAPTER 6.

END OF MASTER PLAN.