APPENDIX A: PUBLIC INVOLVEMENT

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TABLE OF CONTENTS

1.0 Introduction 1

2.0 Public Scoping Notification 1

3.0 Public Scoping Meetings 2

4.0 Results of Public Scoping Period 2

5.0 Ongoing Outreach 3

6.0 Attachments 4

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APPENDIX A: PUBLIC INVOLVEMENT

1.0 Introduction

National Environmental Policy Act (NEPA) and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA), codified in Title 40 of the Code of Federal Regulations, Part 1500 (40 CFR 1500), require public involvement during all stages of the preparation of an environmental impact statement (EIS). Scoping, which is part of the overall public involvement process, allows the Federal agency undertaking the action to determine the scope of issues to be addressed in an EIS and identify any significant issues. Through a public scoping meeting, a Federal agency can inform the public of a proposed action and its alternatives and receive comments.

2.0 Public Scoping Notification

To ensure that the full range of issues related to the proposed actions is addressed, the Navy published a notice of intent (NOI) to prepare an EIS in the Federal Register on 19 August 2011, (Attachment 1). The Federal Register publication initiated a 46-day scoping period beginning on 19 August 2011, and ending on 3 October 2011. The NOI provided general information on the Navy's proposed actions, an announcement of public scoping meetings concerning the actions, and contact information for providing comments.

The Navy also placed a notice in the local newspapers: the Washington Post (August 25, 26, and 27), the Washington Times (August 26, 29, and 30), and Montgomery County Gazette (August 29 – Gaithersburg, Bethesda, Potomac, and Rockville). Examples of the public notice are located in Attachment 1.

In addition, notices of the public scoping meetings were mailed to 697 local community associations and members of the general public as well as 70 Federal, state, and local government entities and elected officials. The notice was also posted on the project website: http://www.bethesda.med.navy.mil/nsa/eis.aspx. Attachment 2 of this appendix lists the Federal, state, and local agencies/representatives that were informed of the project prior to the scoping meetings.

The public was invited to provide comments pertaining to environmental issues that should be considered in the development and analysis of alternatives during the 46-day scoping period. Comments were accepted at the public scoping meetings, as well as by mail, email, project website, or telephone.

3.0 Public Scoping Meetings

Two public scoping meetings were held at the Pooks Hills Marriott in Bethesda, Maryland on:

- 7 September 2011, 5 PM to 9 PM.
- 12 September 2011, 1 PM to 5 PM.

The public scoping meetings were a combination of an open house and formal presentation. The first portion of the meeting was an open house format, where information on the proposed actions was displayed on poster boards and knowledgeable Navy representatives were available to answer questions. The open house session was followed with a presentation by the Navy and a public hearing session, which was transcribed by a court reporter.

4.0 Results of Public Scoping Period

Forty one people attended the two public scoping meetings. The attendees included representatives from Federal, state, and local agencies, representatives of community organizations, neighborhood associations, and residents of surrounding neighborhoods. Representatives of the offices of the United States Congress, Maryland General Assembly, Montgomery County Council, and Montgomery County Executive Office also attended the public scoping meetings. Attachment 3 of this appendix lists the meeting attendees.

One comment card was submitted during the two public scoping meetings and one commenter provided comments to a Navy representative. Six attendees provided verbal comments during the two meetings. Additionally, 11 commenters provided comments via email and three provided comments via mail. No comments were received via telephone.

The discussion below provides a summary of the comments provided during the public scoping period.

The majority of the comments from the state and local agencies and the local residents reflected concerns for the potential traffic increase in an already highly congested area. The comments can be grouped into the following major categories:

- Transportation Issues
- Air Quality
- Noise
- Visual Effects
- Biological Resources
- Cultural Resources

Transportation Comments

The comments on transportation were further grouped into the following subcategories:

- **Roadway/Traffic:** congestion of main thoroughfares that affect adjoining neighborhoods; requests for additional intersections to be included in the traffic study.

- **Parking:** concerns that increased parking spaces at NSA Bethesda would increase traffic.

Other Comments

Other comments addressed issues including air quality, noise, visual impacts, construction, property values, biological resources, and cultural resources. Comments on air quality focused on impacts from construction equipment, traffic, and hazardous materials from demolition. Comments on noise were related to construction and roadway issues. Commenters also stated concerns regarding visual impacts from construction and lighting as well as negative impacts to property values. Other comments focused on biological resources and stated the need to protect forest stands and green space and provide a screen for construction. Comments on cultural resources were related to Tower 1 and National Register of Historic Places (NRHP) and National Historic Preservation Act (NHPA) Section 106 consultation.

Attachment 4 includes a matrix that presents the scoping comments and responses to them.

5.0 Ongoing Outreach

The Navy initiated early and frequent coordination with various Federal, state, and local agencies. To ensure effective collaboration and communication, the Navy initiated coordination with the Maryland Historical Trust (MHT) and the National Capital Planning Commission (NCPC) early in the EIS process.

After EIS NOI publication, the Navy initiated formal Section 106 consultation with the MHT as well as the Advisory Council on Historic Preservation (ACHP). The ACHP has responded that based on the documentation provided by the Navy in the early consultation invitation letter dated 17 October 2011, and the presentation during the 10 November 2011 meeting with MHT, NCPC, and ACHP at NSA Bethesda, the agency believes that its participation is not warranted at this stage.

The Navy has also initiated informal consultation with the U.S. Fish and Wildlife Service (USFWS) and the Maryland Department of Natural Resources (MDNR) for Section 7 consultation of the Endangered Species Act. The USFWS has responded that except for occasional transient

individuals, no federally proposed or listed endangered or threatened species are known to exist within the project impact area and therefore, no Biological Assessment or further Section 7 consultation with the service is required.

Additionally, the Navy continues to consult with the Maryland National Capital Park and Planning Commission (M-NCPPC), Maryland State Highway Administration (MSHA), and Montgomery County Department of Transportation (MCDOT) on the EIS traffic study and has conducted the study in accordance with the local guidelines.

Correspondence to date with the agencies is included in Attachment 5.

The Navy also participates in regularly scheduled Bethesda Base Closure and Realignment (BRAC) Workgroups as well as hosts forums at NSA Bethesda to provide timely updates to the community.

6.0 Attachments

The following attachments provide supporting documentation for the Scoping Period and Expanded Comment Period:

Attachment 1: Federal Register Notice of Intent and Public Notice.

Attachment 2: List of the public and government entities that were mailed the notification of the public scoping meetings.

Attachment 3: List of scoping meeting attendees.

Attachment 4: List of commenters and comments/responses from the scoping period.

Attachment 5: Formal correspondence - local, state, and Federal agencies, and elected officials.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
1	Public Scoping Meeting	General Public	The possibility of an entrance from 495 to NMMC. Traffic is terrible on 355 and takes 1/2 hour to pass NSAB. Recognizes that we aren't the whole problem but some relief would go a long way.	Thank you for your comment. As presented the 24 July 2008 Discussion Paper titled, "Bethesda National Naval Medical Center Beltway Access," Maryland State Highway Administration has indicated that given the limited operational effectiveness of direct access ramps on local traffic congestion due to several identified traffic flow and safety concerns, and the environmental constraints associated with a new access point, it would be highly unlikely that the SHA would be able to obtain approval from FHWA for a new Beltway access point at this location. However, a decision regarding pursuing a potential slip-ramp from I-495 will be the jurisdiction of the Maryland State Highway Administration and the Federal Highway Administration.
2	EIS Email	Huntington Terrace Citizen's Association	On behalf of Huntington Terrace Citizens' Association, I request that your Environmental Impact Statement include two additional intersections for traffic analysis: 1. Old Georgetown Road and Battery Lane 2. Old Georgetown Road and Greentree Road I make this request on behalf of the 300 single-family homes in Huntington Terrace, which is located approximately ½ mile west of the Bethesda Naval Medical Center and borders on Old Georgetown Road. At the BRAC briefing to neighboring Citizens Associations on August 22nd, your Commanding Officer explained that, before additional expansion of this campus, another EIS would be completed. His power point presentation indicated that the EIS traffic analysis would study many intersections to the north (on Rt. 355) and east (on Jones Bridge Road, even past Connecticut Ave). However, only two intersections to the west are slated for analysis and both are on Cedar Lane. I expressed at the meeting that our residential community is extremely concerned about additional traffic that BRAC will create and that both Route 355 and Old Georgetown Road are now highly congested during several hours of morning and evening commutes. We anticipate that when BRAC is fully operational in the near future, traffic on Old	Thank you for your comment. The traffic study intersections were selected based on the Maryland National Capital Park and Planning Commission's (MNCPPC) Local Area Transportation Review methodology. The additional intersections identified by the public were considered; however, it was determined that the influence of the proposed actions on those intersections were captured within the existing 17 intersections already proposed for analysis. This methodology was developed in coordination with the M-NCPPC staff, who concurred that the additional intersections beyond the 17 identified are not necessary.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
			Georgetown Road will exceed allowable levels as visitors and employees will access the campus not only to the north and east but also to the west. Please include these additional two intersections on Old Georgetown Road as part of your EIS traffic analysis before further expansion of Bethesda Naval Medical Center.	
3	EIS Email	General Public	There is no need to further burden the taxpayers of this country with this boondoggle of construction at a time when half the commercial and hospital buildings in this entire country are vacant. Where do you get off with this chutzpah, gall and effrontery to bamboozle the overburdened taxpayers of this country with more govt spending. We are in hard economic times. We have no more left for the stupid govt that spends and spends and spends. Did anybody in this govt agency hear that everything is down for America and we are going down the tube. It is clear we do not want this debt. Use what you have or move to a vacant building and use it. There is clearly no need for more construction. Jean public address if required.	Thank you for your comment.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
4	EIS Email	General Public	Despite all the construction and the loss of the Walter Reed property, the Navy has a real chance to offset Naval Med's landscape change with wildlife conservation enhancements. Non-suburb birds such as eastern bluebird and purple martin could have populations here with nestbox construction and maintenance. Landscaping should include native trees, shrubs, and flowers that are not only drought-resistant but valued by wildlife. The state-threatened yellow crowned night-heron nests adjacent and likely uses the pond and nearby mature trees for feeding and roosting. Hopefully an enhanced wildlife conservation program will keep this more-crowded property still important to already stressed species such as those mentioned above. Patients and staff alike will benefit from such measures as well, seeing the wildlife that shares the grounds with them.	Thank you for your comment. The mature landscape of the Bethesda campus is one of its most positive attributes. The mature trees and plant materials provide a park-like, unifying feature and are a pleasing contrast to the increasingly urban character of the area. To ensure that these characteristics are enduring, the proposed projects at NSA Bethesda will adhere to the design guidelines in the 2010 Installation Appearance Plan. The landscape design guidelines include maintaining a landscaped buffer at the southern, eastern, and northern perimeters in consideration of the residential and institutional neighbors and utilizing trails, pocket parks, and landscaping to contribute to a pleasant environment for the patients and their families.
5.1	EIS Email	General Public	I would like to know what measures, Navy Medical is going to use to keep the toxic dust from becoming airborne in Bethesda? Resulting is toxic dust in our homes? Can they spray the buildings with a fire hose, during the process, to keep the dust down?	Thank you for your comment. The Navy will ensure that the fugitive dust would be minimized during construction by control methods such as using water for dust control; installing and using hoods, fans, and fabric filters to enclose and vent the handling of dusty materials; covering open equipment for conveying materials; and promptly removing spilled or tracked dirt or other materials from paved streets or dried sediments resulting from soil erosion.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
5.2	Transcripts	General Public	I hope you guys address the construction dirt and the toxic dust that's going to come from taking down the buildings, because right now it's bad enough. I can't tell you what my vacuum cleaner picks up in the course of a week. So if you can at least address these five buildings with some constructive way of doing it when you take it down, that would be really appreciated. That's all.	Thank you for your comment. The Navy will ensure that the fugitive dust would be minimized during construction by control methods such as using water for dust control; installing and using hoods, fans, and fabric filters to enclose and vent the handling of dusty materials; covering open equipment for conveying materials; and promptly removing spilled or tracked dirt or other materials from paved streets or dried sediments resulting from soil erosion. Additionally, to the extent possible the Navy intends to adhere to the landscape design guidelines in the 2010 NSA Bethesda Installation Appearance Plan. The landscape design guidelines include maintaining a landscaped buffer at the southern, eastern, and northern perimeters in consideration of the residential and institutional neighbors.
6	EIS Email	General Public	I am unable to attend the meeting tonight but wanted to alert you to the terrible traffic on Jones Bridge Road headed from East West Highway to Connecticut Avenue during the morning rush hour. This is a new problem for our neighborhood this fall and seems likely to be caused by BRAC. Please let me know if there are plans to do anything to alleviate this problem. As it is it is almost impossible to get out of the neighborhood in the morning rush hour.	Thank you for your comment. The Navy is conducting a traffic study, which will be a part of the EIS and will provide impact analysis on traffic due to the proposed actions. Based on the results of the traffic study, the Navy will identify potential mitigation measures, as appropriate, which will be coordinated with the local and state transportation agencies as a part of the continued dialog on the proposed projects.
7	EIS Email	General Public	I recommend that the EIS include consideration of light pollution from any new buildings or parking lots. Buildings associated with the BRAC construction and parking lots adjacent to our neighborhood (Parkview and East Parkhill Avenue) resulted in a significant increase in unwanted bright light all night. We appreciate some changes in lowering light intensity and use of shades. I hope that better planning will go into any new construction near the base perimeter.	Thank you for your comment. The EIS will analyze the impacts from the proposed actions, including visual impacts and will also identify potential mitigations measures, as appropriate.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
8	EIS Email	General Public	The increased building and parking density on base will probably result in the loss of green-space and wild-life habitat. I suggest that the EIS include a section on wildlife habitat preservation and remediation. This could easily be included in the Statement of Work for landscape architects. There are world-class experts associated with the nearby Audubon Naturalist Society at Woodend www.audubonnaturalist.org <http://www.audubonnaturalist.org/>). I am sure your neighbors would be glad to help.	Thank you for your comment. The EIS will include, under Biological Resources Section, the impacts analysis on Wildlife and Vegetation. The mature landscape of the Bethesda campus is one of its most positive attributes. The mature trees and plant materials provide a park-like, unifying feature and are a pleasing contrast to the increasingly urban character of the area. To ensure that these characteristics are enduring, the proposed projects at NSA Bethesda will adhere to the design guidelines in the 2010 Installation Appearance Plan. The landscape design guidelines include maintaining a landscaped buffer at the southern, eastern, and northern perimeters in consideration of the residential and institutional neighbors and utilizing trails, pocket parks, and landscaping to contribute to a pleasant environment for the patients and their families.
9	EIS Email		I see that there is a historic preservation part of the EIS plan. I am not sure that people at the Navy Med campus realize that the land the hospital is on received incoming artillery fire during the Civil War resulting in the death of soldiers. As you protect and commemorate the historical aspects of the base, this would certainly be worthy of a memorial of some sort. I am sure someone knows where that shell hit. Here is info some info on this: Civil War Defenses of Washington, Fort Reno: http://www.nps.gov/cwdw/historyculture/fort-reno.htm "During Early's assault of Fort Stevens on July 11th and 12th, 1864, the heavy guns of Fort Reno lent little support value, as there was a fear the long range guns would hit the Union Army's advanced pickets. One of the shells that was fired from Fort Reno by a 100-pounder Parrott Rifle traveled 3 1/2 miles south of the fort, killing four Confederates where the present day Bethesda Naval Hospital is located in Bethesda, Maryland. Because Fort Stevens was reinforced on July 12, 1864, it was never taken by the Confederate army, nor was the capital city ever reached."	The Navy is coordinating with the Maryland Historical Trust pursuant to the process identified in Section 106 of the National Historic Preservation Act to ensure that all potential historic, architectural, and archaeological impacts of the proposed projects would be properly evaluated within the EIS.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
10	EIS Email		My only comment directly on this slide set concerns slide 11 titled "Traffic Study Intersections - External". There was no supporting text for this slide but it appears that intersections marked in red will be part of the Traffic Study/ Transportation Management portion of the EIS. Intersections marked include roads leaving the area to the north (Rockville Pike), to the west (West Cedar Lane), to the south (Wisconsin Avenue) and to the east (Jones Bridge Road). The other main route for people leaving the Navy Med Campus area is to the northeast along Cedar Lane with rush hour traffic connecting to Beach Drive, Connecticut Avenue, Summit Avenue and Knowles Avenue in Kensington. For example, six intersections are marked next to the base and east of the base on Jones Mill Road while no intersections are marked on Cedar Lane going east after Rockville Pike. It is clear that Cedar Lane receives a significant amount of morning and afternoon rush hour traffic from Navy Medical as well as NIH, Stone Ridge School and longer distance commuters. Based on personal experience, I recommend that the following intersections be included in the traffic flow analysis: * Cedar Lane and Beach Drive * Beach Drive and Connecticut Avenue * Cedar Lane and Saul Road * Summit Avenue and Knowles Ave (Route 547) * Knowles Avenue (Route 547) and Connecticut Avenue (Route 185) * Morning traffic flow over one remaining eastbound lane of Cedar * Lane bridge over Rock Creek and impact on neighborhood access to Cedar *Lane from adjacent neighborhoods	Thank you for your comment. The traffic study intersections were selected based on the Maryland National Capital Park and Planning Commission's (MNCPPC) Local Area Transportation Review methodology. The additional intersections identified by the public were considered; however, it was determined that the influence of the proposed actions on those intersections were captured within the existing 17 intersections already proposed for analysis. This methodology was developed in coordination with the M-NCPPC staff, who concurred that the additional intersections beyond the 17 identified are not necessary.
11	EIS Email		Air Quality	Thank you for your comment. The EIS will analyze the impacts from the proposed actions, including air quality impacts and will also identify potential mitigations measures, as appropriate.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
12	EIS Email		Noise	Thank you for your comment. The EIS will analyze the impacts from the proposed actions, including noise impacts and will also identify potential mitigations measures, as appropriate.
13	EIS Email		Contamination/Chemical/Biological Disposals-I'm very concern regarding soil/air contamination and proper disposal of chemical and biological waste. What measures have the Navy Hospital implemented to avoid accidents or carelessness that can impact the environment?	Thank you for your comment. The Navy follows all applicable regulations and has strict procedures in place for handling of chemical and biological wastes, such as separation of such wastes from other wastes at the point of origin. The EIS will analyze the impacts from the proposed actions, including hazardous waste and will also identify potential mitigations measures, as appropriate.
14	EIS Email	General Public	Traffic Impact-We only have access to our neighborhood via Cedar Lane which can be accessed via Rockville Pike and Beach Drive, with the expansions at the Navy Hospital that means more personnel and visitors to the facility that will cause major traffic issues for the local residents in the area. I know from previous notices that the Hospital is offering personnel a $250 per month credit if they take public transportation, although that might help a little, but Is there any plans to minimize this problem?	Thank you for your comment. The traffic study to be included in the EIS will be based on the post BRAC conditions and the data collected in 2011 will be used as the baseline for evaluation of the future impacts analysis in the EIS. The traffic study will analyze the traffic impacts of the proposed actions using locally approved methodology and will also identify potential mitigation measures, as appropriate. Additionally, the Navy is also updating the Installation Transportation Management Plan (TMP) at the same time and the goal of the TMP is identify options to single occupancy vehicle commuting.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
15.1	EIS Email	General Public	Below please find my concerns about the new construction at your site and BRAC. My name is Bharati Sanghvi. I live at the west end of Pooks Hill Road. My concern is about increased traffic as a result of new construction at your site and BRAC. During 7-9 am and 4-6 pm right turn on Linden Avenue from Pooks Hill road going west-to-east (and left turn from other direction) is not allowed and to go to Old Georgetown Road we are forced to go on Wisconsin Avenue increasing the traffic on already congested Wisconsin Avenue. Linden Avenue is a county Road and you may not have direct control over it, but I would like you to be aware of the problem many (those living on Pooks Hill Road or neighboring road as well as people driving on Wisconsin Avenue) of us are facing. You may not have direct control but the projects you have affect the traffic in the surrounding area and you can help us make our case understood by others. Everyone knows Wisconsin Avenue at pick hours is very congested. BRAC adds to the usual heavy pick hour traffic on Wisconsin Avenue. The new construction at your site will add congestion. I am a member of Traffic solutions with BRAC committee. Our mission is improving traffic flow among the corridors leading to Bethesda Naval Hospital, particularly in the Pooks Hill environs to improve our quality of life. We are sure you have considered different ways of addressing the traffic issues.	Thank you for your comment. The Navy continues to consult and collaborate with local and state transportation agencies to address critical transportation issues to the surrounding communities and to coordinate the implementation of improvement measures, however, a decision regarding restrictions on local streets are under purview of the Montgomery County DOT.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
15.2	EIS Email	General Public	There is one more option that can reduce some traffic on Wisconsin Avenue. When going east on Pooks Hill Road, right turn on Linden Avenue is not allowed during 7-9 am and 4-6 pm and at those times going west on Pooks Hill Road left turn on Linden Avenue is not allowed. To the best of our knowledge, this restriction was put over 30 years back. Since then many things have changed and it is time to revisit this decision. Should the needs/preferences of 20 dwellings on those 2 blocks of Linden Avenue be given priority or 4000+ (4000 persons living on Pooks Hill Road + traffic on Wisconsin Avenue) be taken care of? Whatever were the reasons for the restriction, the situations have changed especially BRAC has added to the already congested traffic on Wisconsin Avenue. And it is time to revisit the situation. The argument that kids play on Linden Avenue is not a strong argument for the above restriction. Kids are not supposed to play on the road, and by any means it is not a dead-end road and the convenience of a larger group should be taken care of rather than causing inconvenience to a larger group for taking care of a very small group. For many it is not clear that there are about 4,000 persons living on Pooks Hill Road especially because Promenade complex has 1000. For going to Old George Town Road, we have to use Linden Avenue. During 7-9 am and 4-6 pm., we have to go east, get on Wisconsin Avenue and get off on Alta Vista Road, adding to already crowded Wisconsin Avenue. During these hours, this is the only exit from Pooks Hill Road! During the 7-9 am and 4-6 pm, Linden Avenue does not become one-way street because buses are allowed to go on Linden Avenue. Allowing only local traffic during those hours to turn right on Linden Avenue will still stop the traffic coming off 495 and entering 495 again at Wisconsin Avenue.	Thank you for your comment. The Navy continues to consult and collaborate with local and state transportation agencies to address critical transportation issues to the surrounding communities and to coordinate the implementation of improvement measures, however, a decision regarding restrictions on local streets are under purview of the Montgomery County DOT.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
15.3	EIS Email	General Public	Lifting off the restriction for Local traffic only will take care of the road condition of Linden Avenue, reduce some traffic from already congested Wisconsin Avenue, there will still be two outlets from Pooks Hill Road all the time and will give a relief to people on Pooks Hill Road and indirectly to those using Wisconsin Avenue as well as taken care of the concern that Linden Avenue is not built for more traffic. Issuing permits for local traffic can be done as a one-time permit to reduce the burden on the county. It is time to revisit the problem and its possible solution. We should move with the time. Please let me know if I can help you in any way. Thank you.	Thank you for your comment. The Navy continues to consult and collaborate with local and state transportation agencies to address critical transportation issues to the surrounding communities and to coordinate the implementation of improvement measures, however, a decision regarding restrictions on local streets are under purview of the Montgomery County DOT.
16	EIS Email	Montgomery County Department of General Services	The Montgomery County Department of General Services is in receipt of the notice of intent to prepare an environmental impact statement at the Naval Support Activity in Bethesda, Maryland. Thank you for the opportunity to comment. Generally, the application is consistent with Montgomery County's program and objectives. As you are aware, Montgomery County has been coordinating with the State of Maryland, the Department of the Navy and the National Institutes of Health to reduce traffic and gridlock in the area. It was noted that this project will add two new parking garages with a total of 900 spaces that will accommodate the estimated future capacity of one million visitors per year. Long term future construction will eliminate several hundred surface parking spaces and the Department of the Navy will greatly reduce the ratio of parking spaces to personnel. Please find the attached State of Maryland Clearinghouse form for your reference. Please contact me directly if you have any questions at 240-777-6192 or gossont@montgomerycountymd.gov	Thank you for your comment. The Navy does not anticipate dipping below 1:3 NCPC ratio as a result of proposed action .

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
17.1	Transcripts	General Public	As I was saying, I'm a neighbor at 8525 Hawkins Lane. This is a historic district. There are 15 houses on the lane. It's a gravel road and we're very concerned with the construction because of what we have seen so far; the pollution, the traffic and the noise. We've already seen our trees cut down between the there's a fence that borders our neighborhood and the medical unit, and the trees have been cut down already. And we can hear the construction. We can see the trucks at all hours of night, mornings, it doesn't matter. The trucks are going up and down. They've built a there's a two lane road right next to our on the fence. We are very concerned. 6:00 in the morning we're wakened up by the trucks backing up. It's only going to get worse if these are allowed to go on.	Thank you for your comment. The EIS will analyze the impacts from the proposed actions, including visual and noise impacts and will also identify potential mitigations measures, as appropriate. To the extent possible the Navy intends to adhere to the landscape design guidelines in the 2010 NSA Bethesda Installation Appearance Plan. The landscape design guidelines include maintaining a landscaped buffer at the southern, eastern, and northern perimeters in consideration of the residential and institutional neighbors.
17.2	EIS Email	General Public	Noise pollution -The perimeter road construction on the facility has become unbearable during regular business hours. Our neighborhood was very quiet prior to this construction now it all day all we hear are the road construction machinery. More construction only means more noise.	Thank you for your comment. The EIS will analyze the impacts from the proposed actions, including visual and noise impacts and will also identify potential mitigations measures, as appropriate. To the extent possible the Navy intends to adhere to the landscape design guidelines in the 2010 NSA Bethesda Installation Appearance Plan. The landscape design guidelines include maintaining a landscaped buffer at the southern, eastern, and northern perimeters in consideration of the residential and institutional neighbors.
17.3	EIS Email	General Public	And the other issue that I said is the noise. I mean, now that they cut down the trees, we can hear everything, all the construction that's going on. And that's not even the start of this major addition that you'd like to propose. By cutting down the trees, all that noise just comes right through. We only have a chain link fence separating the facility and our lane. It's unsightly. What we see now, it's dirt and the trucks going by. Is that right for us? We've been on the lane for more than 48 years. It's not fair.	Thank you for your comment. The EIS will analyze the impacts from the proposed actions, including visual and noise impacts and will also identify potential mitigations measures, as appropriate. To the extent possible the Navy intends to adhere to the landscape design guidelines in the 2010 NSA Bethesda Installation Appearance Plan. The landscape design guidelines include maintaining a landscaped buffer at the southern, eastern, and northern perimeters in consideration of the residential and institutional neighbors.

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ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
18	EIS Email	General Public	Impact on Property values - the increased noise and sight of the construction site has affected the rental properties on the lane - nobody wants to rent or live next to a construction site with noise and dust issues. EIS should at a minimum consider the building of an attractive fence or barrier to reduce the noise as well as overlooking into a construction site.	Thank you for your comment. The Navy will ensure that the fugitive dust would be minimized during construction by control methods such as using water for dust control; installing and using hoods, fans, and fabric filters to enclose and vent the handling of dusty materials; covering open equipment for conveying materials; and promptly removing spilled or tracked dirt or other materials from paved streets or dried sediments resulting from soil erosion. Additionally, to the extent possible the Navy intends to adhere to the landscape design guidelines in the 2010 NSA Bethesda Installation Appearance Plan. The landscape design guidelines include maintaining a landscaped buffer at the southern, eastern, and northern perimeters in consideration of the residential and institutional neighbors.
19.1	Transcripts	General Public	The traffic. I can't get out of my house anymore. I have to leave by 6:30, otherwise I cannot make a left turn on Jones Bridge and I can only go right. The same thing happens in the afternoons. How long does it takes over an hour to get to go from Wisconsin Avenue onto Jones Bridge and so that I can make a left turn to get into my lane. Forget about trying to leave the lane between 4:00 and 6:00 in the afternoon. Why? Because it's impossible to make a left turn on Jones Bridge. I have to plan activities to make sure that I turn right instead of going left. So this already having an impact. How much more are we supposed to take on this? And the fact that, yes, you're adding 900 more----you would like to add 900 more parking facilities, that means that 900 more vehicles are going to be coming down and parking. And is that entrance going to be on Jones Bridge? How is that going to affect some more our ability to get out of our lane and go onto either Connecticut or Wisconsin? And this is something that the neighbors, our 15 houses, are going to be deeply affected.	Thank you for your comment. The Navy does not anticipate dipping below 1:3 NCPC ratio as a result of proposed action because 900 spaces from the proposed actions . As a part of the EIS, the Navy is conducting a traffic study, which will analyze the traffic and parking impacts of the proposed actions. Additionally, the Navy is also updating the Installation Transportation Management Plan (TMP) at the same time and the goal of the TMP is identify options to single occupancy vehicle commuting.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
19.2	EIS Email	General Public	Traffic - has become a nightmare during rush hours. We have difficulties leaving our lane at 6 30 a.m. because of the number of vehicles heading towards the hospital. The traffic on Jones Bridge at 4 00 p.m. has also become an issue. Adding 900 new parking spaces would only encourage 900 more vehicles to be on the road and it is likely that Jones Bridge road will become completely congested with all these additional vehicles.	Thank you for your comment. The Navy does not anticipate dipping below 1:3 NCPC ratio as a result of proposed action. Additionally, as a part of the EIS, the Navy is conducting a traffic study and updating the Installation Transportation Management Plan (TMP). The goal of the TMP is identify options to single occupancy vehicle commuting.
19.3	EIS Email	General Public	In addition if the 900 additional parking spaces are going to be built entrance or access to these spaces should be spread among the various entrances to reduce the impact on Jones Bridge Road. Another idea is to stagger classes at the University so that students and staff enter and depart the facility at different hours not just at peak rush hours. -	Thank you for your comment. The Navy does not anticipate dipping below 1:3 NCPC ratio as a result of proposed action. As a part of the EIS, the Navy is conducting a traffic study, which will analyze the traffic and parking impacts of the proposed actions. Additionally, the Navy is also updating the Installation Transportation Management Plan (TMP) at the same time and the goal of the TMP is identify options to single occupancy vehicle commuting.
20	EIS Email	General Public	Air pollution and public health - Hawkins Lane neighborhood is too close to the proposed construction sites which would add more pollutants in our airspace. Hawkins Lane is home to a number of small children and older residents who are more susceptible to developing health issues. Trees have already being cut down so there are no natural barriers to slow down the pollutants from travelling to our lane.	Thank you for your comment. The EIS will analyze the impacts from the proposed actions, including air quality impacts and will also identify potential mitigations measures, as appropriate. The Navy will ensure that the fugitive dust would be minimized during construction by control methods such as using water for dust control; installing and using hoods, fans, and fabric filters to enclose and vent the handling of dusty materials; covering open equipment for conveying materials; and promptly removing spilled or tracked dirt or other materials from paved streets or dried sediments resulting from soil erosion. Additionally, to the extent possible the Navy intends to adhere to the landscape design guidelines in the 2010 NSA Bethesda Installation Appearance Plan. The landscape design guidelines include maintaining a landscaped buffer at the southern, eastern, and northern perimeters in consideration of the residential and institutional neighbors.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
21	Written Letter	National Capital Planning Commission	Thank you for the opportunity to participate in the scoping for the preparation of an Environmental Impact Statement (EIS) at the Naval Support Activity Bethesda (NSA Bethesda). National Capital Planning Commission (NCPC) staff understands that the EIS will analyze the environmental impacts of implementing the proposed actions within the 2012 NSA Bethesda Master Plan, which is currently under development by the Department of the Navy. Our comments are provided below.	Thank you for your comment.
22	Written Letter	National Capital Planning Commission	Land Use Resources NCPC staff understands that within the EIS the Navy is evaluating proposed actions that include the redevelopment of medical facilities at the Walter Reed National Military Medical Center, expansion of the Uniformed Services University of Health Services, and the development of other support facilities at NSA Bethesda. The EIS should evaluate the consistency of these proposed actions with land use policies in the Commission's Comprehensive Plan for the National Capital (Comprehensive Plan) as well as local land use plans and policies. For example, the proposed actions appear to be consistent with the policies of the Comprehensive Plan's Federal Workplace Element, which encourages: • The modernization, repair, and rehabilitation of existing federally owned facilities for new federal workplaces before developing new facilities. • The utilization of available federally owned land or space before purchasing or leasing additional land or building space. • The minimization of development of open space by selecting disturbed land or brownfields for new federal workplaces or by reusing existing buildings or sites.	Thank you for your comment. The EIS will analyze the land use impacts from the proposed actions, including the consistency with the applicable area plans and policies. The proposed actions are all within NSA Bethesda and the majority of the proposed projects are within previously disturbed areas.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
23	Written Letter	National Capital Planning Commission	Employment and Installation Population NSA Bethesda's information package for the EIS scoping states that the proposed actions will enhance and support, but not add to, missions and functions of the installation. It is unclear from this statement if the proposed action will result in an increase in patients, visitors, and employees at the installation. The EIS should clearly define and evaluate the environmental impacts of any potential increase in patients, visitors, or employees associated with these proposed actions together with associated environmental impacts for ongoing projects previously considered under NEPA and the 2008 update to the installation's master plan (approved by the Commission on February 5, 2009).	Thank you for your comment. The proposed actions will enhance and support, but not add to missions and functions of the installation, medical center or the University. Therefore, the increase in Medical Facilities staff is anticipated to be limited to support staff. For the University Expansion, the incoming staff is from off-base facilities that will be consolidated at one place and these personnel are already part of the institution in the area and currently travel back and forth to the NSA Bethesda. Additionally, because the Medical Facilities Development is right-sizing of the already existing facilities, increase in patients or visitors are not anticipated. The EIS will evaluate the impacts of on patients, visitors, or employees from the staff number increases from the proposed actions and will also evaluate the cumulative effects of the proposed actions in the context of the known, ongoing activities and identify the potential programmatic effects of the proposed actions in the context of the potential future development opportunities. Therefore, the EIS will analyze the environmental effects of the 2012 NSA Bethesda Master Plan relative to the implementation of the proposed actions in this EIS.
24	Written Letter	National Capital Planning Commission	Transportation Understanding that the EIS will include a traffic study based on post Base Realignment and Closure (or BRAC) conditions, it is unclear if this condition includes the direct link from the Medical Center Metrorail Station to the installation's south gate. The EIS should fully evaluate the transportation impacts that will result following completion of this direct link. The EIS should also clearly reflect the proposed number of parking spaces at the installation. The Comprehensive Plan provides policy guidance on the permitted number of parking spaces per employee (the parking ratio) at federal facilities in the National Capital Region. The parking ratio for federal installations in suburban areas within 2,000 feet of Metrorail stations is 1:3. The EIS, and associated traffic	Thank you for your comment. The Navy does not anticipate dipping below 1:3 NCPC ratio as a result of proposed action. As a part of the EIS, the Navy is conducting a traffic study, which will analyze the traffic and parking impacts of the proposed actions. Additionally, the Navy is also updating the Installation Transportation Management Plan (TMP) at the same time and the goal of the TMP is identify options to single occupancy vehicle commuting.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
			study and Transportation Management Plan (TMP) should evaluate the ability of the installation to maintain this parking ratio over the operative timeframe of the 2012 NSA Bethesda Master Plan, or provide clear descriptions of the obstacles that may preclude the installation from meeting the parking ratio. Additionally, the EIS should specify the proposed measures that will implement the TMP, which must be submitted for NCPC review, and should address the following: • Current demand for employee and visitor/contractor parking spaces • Future demand for employee parking • Future parking demand for visitors/contractors • Strategies to reduce parking demand by employees • Strategies to reduce parking demand by visitors/contractors NCPC staff encourages the Navy to continue its efforts to promote use of public transportation and other non-single occupancy vehicle modes of transportation, including METRO, commuter rail and bus service, carpooling, and shuttle service. These efforts should continue to be included within the TMP. NCPC staff also has other transportation concerns related to the cumulative impacts of increased traffic when considered along with planned State and County transportation improvements, and other public and private development, in the vicinity of NSA Bethesda. The EIS should include a comprehensive analysis and projection of cumulative traffic impacts, as well as proposed off base minimization / mitigation measures.	
25	Written Letter	National Capital Planning Commission	Cultural Resources The proposed action to develop new medical facilities includes the demolition of multiple buildings and the construction of new facilities including a parking garage and a medical facility adjacent to Building 1. NCPC staff has concerns how this proposed action and related alternatives may impact the historic qualities and aesthetics of the	Thank you for your comment. To ensure effective collaboration and communication, the Navy initiated coordination with the Maryland Historical Trust as well as the National Capital Planning Commission early in the EIS process. After EIS NOI, the Navy initiated Section 106 consultation with the Maryland Historical Trust and has provided copies of the communication to the National

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
			installation's National Register Historic District and Building 1. In particular, NCPC staff has considerable concern regarding potential impacts from new construction to the significant viewshed on the Rockville Pike side of the installation. The EIS should clearly identify any potential adverse impacts to this historic landscape with any alternative development plans considered. For the last three to four years most of the historic lawn in front of Building 1, a contributing element to the National Register Historic District, has been used for construction storage or staging for BRAC-related projects (beginning approximately in 2008 through today). NCPC staff does not support the use of the historic lawn for future construction storage or staging. Therefore, we encourage the Navy to identify and evaluate in the EIS other sites for construction uses that would not obstruct this important primary viewshed. All development alternatives considered within the EIS should be evaluated under a primary goal of preserving this significant viewshed in its historic state, both during future construction activities and after construction is completed. Also, NCPC staff is currently unaware of the status of the Section 106 consultation for the proposed actions and related alternatives being considered. As such, NCPC requests to be a consulting party within the Section 106 process, which we recommend occur concurrently with development of the EIS in order to identify and address impacts to historic resources. The Section 106 consultation process, and any agreement document such as a Programmatic Agreement or Memorandum of Agreement, should be completed prior to concluding the EIS. NCPC staff appreciates the opportunity to participate in this phase of the EIS and looks forward to continued involvement in the EIS process and the development of the 2012 NSA Bethesda Master Plan.	Capital Planning Commission. In addition, NCPC participated in a meeting with the Navy, Maryland Historical Trust, and Advisory Council on Historic Preservation in November 2011 regarding the proposed actions. The Navy acknowledges the Commission's concerns the use of front lawn for construction storage and staging and will take that into consideration in selecting a site for such purposes. Additionally, for the proposed underground parking in the front lawn, the EIS will evaluate three alternative above-ground sites in different areas of the installation.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
26	Written Letter	Parkview Association	My late husband and sons and I arrived at our house at 9314 East Parkhill Drive, Bethesda, MD., 20814, in September 1963. This is in the Parkview neighborhood of Bethesda. In the intervening time between then and now I have several times served as President and Co-president of the Association. There have been many attempts to disturb the residential nature of our neighborhood. Now we have the Walter Reed Army Hospital on the Naval Hospital grounds, and you are now envisioning some enlargements and modernization of some medical laboratories associated with the Navy and USUH's. My main environmental worry is whether the conduits bringing in our purified Water supply and taking away our sewage drainage from our area are large enough with much more utilized and populated National Naval Med. Center and Walter Reed Army Hospital and improved USUH. If these older conduits are too small and have to be replaced with larger ones, then that construction would affect a much larger area in Bethesda than erecting buildings on the Naval Hospital grounds. I request that this topic be addressed in the EIS statement.	Thank you for your comment. The EIS will analyze the utilities impacts from the proposed actions, including the capacity of the utilities providers to accommodate the proposed projects.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
27	Transcripts	Sacks Neighborhood Association	Thank you. Hi, my name is Robert Smythe. I am the president of the Sacks Neighborhood Association. The Sacks Neighborhood is the single family development of 60 homes just south of Downtown Bethesda, just north of Bradley Boulevard. And I have a couple other reasons for wanting to be here tonight. I'm a D.C. native. I was born in D.C. while my mother was a medical technician at Walter Reed Army Medical Center and my brother is a former Navy pilot who fortunately did not need the facilities that you offer here, but we were glad they were there anyway. Time is short. I think you ought to allow a little more time, but let me just welcome the Army and the medical professionals to Bethesda. We're glad to have you here. The combination of NIH, Navy Medical and the Uniformed Services University really does make a world class medical complex and we hope you guys will continue doing some of the ground breaking work that you've done already here in the past decades. Since the purpose of this meeting is to give you some input about scoping, which means the scope of the environmental impact statement, let me flag two or three, three or four things that I think are most important. I might also include the comment that I worked at the President's Council on Environmental Quality during the years that we wrote the rules for the NEPA process, so I'm glad to see you here carrying them out. I was in the room when we invented the word "scoping." Had an argument about that, but it stuck and it's now a worldwide term used in environment impact assessment.	Thank you for your comment.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
28	Transcripts	Sacks Neighborhood Association	I guess there are some obvious concerns. My experience in dealing with environmental impact statements is that there are two areas of analysis that don't get adequate treatment often, and those have to do with the off site effects. Talk about we're going to take down this many trees and we're going to build roads here. But the fact is that the impacts of this facility are going to be quite measurable on this community, those of us who live near here and who have to try to drive up Wisconsin Avenue. It took me half an hour to get here from my house less than three miles away in the current traffic situation, so that I think is going to only get worse, and it needs to be looked at. Off site effects also include not just the traffic from people that you're hiring to work here, but your vendors, and this place has daily deliveries of trucks and medical facilities and medical equipment that will add and will increase as you finish your reconstruction. The impacts during construction, off site impacts are a major concern to us because of the fact that we already have gridlock on Wisconsin Avenue and this could basically shut down the road as a thoroughfare, and I think the EIS needs to address that very carefully.	Thank you for your comment. As a part of the EIS, the Navy is conducting a traffic study and it will analyze the traffic impacts of the proposed actions, including construction traffic and will also identify potential mitigation measures, as appropriate. Additionally, the EIS will analyze three alternative sites to the underground parking garage that are in the northeast and south areas of the installation.
29	Transcripts	Sacks Neighborhood Association	Perhaps second consideration is let's say the fact that we don't have a whole lot of green space in Downtown Bethesda anymore. It's been chewed up gradually for, you know, various justifiable reasons, but the Navy Medical Complex and NIH have been two nice big green areas that are close to our homes and our community, and we've seen then encroached on, you could say for good reasons, but the fact is that they aren't building anymore green space around here. And we've lost some at NIH, we've lost a chunk here at Navy Medical and we are jealous of our green space and would like to make sure that the EIS deals with protecting as much of what you do have as green space. I'm not talking about parking lots. Open space is not a parking lot. It's something green or with trees on it. And I think that should be carefully looked at.	Thank you for your comment. The EIS will include, under Biological Resources Section, the impacts analysis on Wildlife and Vegetation. The mature landscape of the Bethesda campus is one of its most positive attributes. The mature trees and plant materials provide a park-like, unifying feature and are a pleasing contrast to the increasingly urban character of the area. To ensure that these characteristics are enduring, the proposed projects at NSA Bethesda will adhere to the design guidelines in the 2010 Installation Appearance Plan. The landscape design guidelines include maintaining a landscaped buffer at the southern, eastern, and northern perimeters in consideration of the residential and institutional neighbors and utilizing trails, pocket parks, and landscaping to contribute to a pleasant environment for the patients and their families.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
30	Transcripts	Sacks Neighborhood Association	The EIS process requires mitigation for the loss of environmental resources. And mitigation, as you can find in the regulations at 1508.20 include avoiding impacts, minimizing impacts and substituting, you know, more environmental green space or wildlife habitat for what you've lost. And I think you need to pay attention to the definitions of both of direct and indirect impacts and of mitigation for impacts that cannot be eliminated. I should say that my experience as an environmental professional is that EISs done by contractors often have significant weaknesses and the weaknesses are that they're too big, they contain a whole lot of extraneous information and they--- Yes, okay. The third thing I think that's important is design. We haven't heard anything about the design. The county requires new developers to use to LEED standards for green buildings and I think the higher the level that you strive for, the better it is for the owner of the facility and for the community. And I would say that we'd like to see discussion of what LEED standard you're going to meet with the construction.	Thank you for your comment. The proposed projects will be designed in compliance with the applicable federal mandates as well as DOD and Navy guidelines and policies and will meet, at the minimum, the LEED Gold standards and will also adhere to the Low Impact Development guidelines.
31	Transcripts	Sacks Neighborhood Association	And finally, there's an executive order that requires an environmental mitigation --- well, let me finish an environmental management system for the operation of the facility that involves both energy and environmental conservation. We'd like to see that environmental management system plan addressed in the EIS. It's hard to say what you want to say for a complex process in five minutes, but I just had a couple other points to make. I kind of skirted over my comment about not being fond of contractor prepared EISs. There are certainly some notable exceptions to my rule of mediocrity and I hope you guys will be one of those in that exception. But the purpose of the document is to lay out indirect and direct short term and long term impacts and what's going to be done about those major impacts. That's what the document should be. The CEQ regulations say they should not be longer than 300	Thank you for your comment. The EIS will be prepared to meet the CEQ regulations on impact analyses and conciseness to the extent possible.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
			pages, ideally not longer than half that. I'd like to see you try that. That takes a good writer and a good editor to focus on what the real issues are not include, you know, long lists of species or, you know, background documents. Those can be available online or however, so let's have a decision document here and not a master's thesis. That would be nice. And, you know, I'm encouraging you to do that. I think you can and I know contractors who have and I'd like to see you do it.	
32	Transcripts	Sacks Neighborhood Association	Second, I guess it's important to look at the relationship of what you're doing to what BRAC has proposed and what's going to come after, and that's where I think the traffic concern is greatest to us. I don't think the BRAC analysis did an adequate traffic analysis. Traffic models and I've looked at a number of traffic studies and I'd never seen a traffic study that overestimated the amount of traffic that occurred afterwards. They're usually underestimating, but there's not a lot of ground truth done after they're written. They're we did the traffic study and what happens in reality is often ignored. And I think you ought to be tough on what you're relying on if you're relying on anything from BRAC. And I hope that we see a real recognition that traffic doesn't just mean vehicles. It means people on foot, as when I came up here and, you know, 20 or 30 people crossed in the short green light that they had to cross Wisconsin Avenue to get to NIH and to the Metro. I think you need to consider that, not only during your construction when it's worse, but during the operation of the facility.	Thank you for your comment. The traffic study to be included in the EIS will be based on the post BRAC conditions and the data collected in 2011 will be used as the baseline for evaluation of the future impacts analysis in the EIS. The Traffic Study will analyze the traffic impacts of the proposed actions using the Montgomery County-approved methodology, including pedestrian traffic and will also identify potential mitigation measures, as appropriate.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
33	Transcripts	Sacks Neighborhood Association	And as I said, the last point I made was that environmental management systems. This is a industry invented protocol and certification process. It's not a regulation, but it dovetails very well with NEPA and the EIS, which is the preconstruction environmental analysis. Environmental management systems are done by many industries to show how they're going to operate their facility from through the whole life cycle of a facility. There are certification levels under internationally agreed standards that I think we'd like to hear you guys address, whether it's ISO 14,000, or it's a federal equivalent. I think that the Navy and the Army and military together need to look at that carefully, because frankly, it's the way most industries operate to get the most efficient and environmentally sound management of their facilities. There have been environmental management systems done for military facilities. I'd like to see one done for this facility, and it doesn't have to be in the EIS because it comes after it, but it needs the plan for it ought to be addressed there. I'd like to see that, along with what LEED level of design you're going to adopt, because I think those are important to the military, to the medical professionals, as well as to those of us who live around here. It saves everybody money, it reduces energy consumption, it makes generally the operation of the facility a lot safer and cleaner. So, those are things I'd like to see addressed in the EIS. That's what the purpose of scoping folks is to tell them what are the real issues that we want them to address. They can't give us the answers today, but they can hear what we want to see in that document when we get a chance to review it. So, those are my expanded comments. Thank you for the opportunity to do it.	Thank you for your comment. The proposed projects will be designed in compliance with the applicable federal mandates as well as DOD and Navy guidelines and policies and will meet, at the minimum, the LEED Gold standards and will also adhere to the Low Impact Development guidelines.
34	Transcripts	General Public	Okay. I just have three quick questions. One is in the new expansion with the new buildings, is there going to be an increase in the student population? I notice you didn't refer to students.	Thank you for your comment. The University Expansion is to consolidate already existing activities that are dispersed in various locations on- and off-base and is not anticipated to increase student numbers.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
35	Transcripts	General Public	The second question is we live in a town house that's at the corner of Jones Bridge and Wisconsin, so we get to view the problem that lots of neighbors are having in the area, and it looks pretty serious now, but we're of course worried about what happens when the BRAC movement is full fruition. I was wondering if the people that are going to sign the EIS and the people say sitting at the table, and contractors like you, have actually come and driven up Wisconsin or Jones Bridge around say 6:00, 7:00 5:00 to 7:00 in the evening. And the third question is since Mr. Smythe didn't get to finish, I was wondering if I could yield the rest of my five minutes to him.	Thank you for your comment. The traffic study to be included in the EIS will be based on the post BRAC conditions and the data collected in 2011 will be used as the baseline for evaluation of the future impacts analysis in the EIS. The traffic study will analyze the traffic impacts of the proposed actions and will also identify potential mitigation measures, as appropriate.
36	Transcripts	General Public	All right. My question's about traffic, of course. I live in Bethesda, and the question I have is since we just presumably there was an EIS done for the current construction that's going on. There must have been a traffic study going on there where they predicted what the impact would be. My question is I would hope that when you do the EIS for this study that you take a look at how close their prediction was, you know, to see were they off or were they not, or were they on? And also request that when you do a traffic impact; I'm not sure how you do it, but if it's just the number of cars or things going by, I think someone ought to really look at time, how much time does it take to get from Wisconsin Avenue to turning left on Connecticut Avenue, for example, going across Jones Bridge there. And the same thing with going in on Wisconsin Avenue heading north or south coming by the facility, because it's really time is the issue and that's where we have seen the greatest impact on the previous construction and that's what the concerns are now.	Thank you for your comment. The traffic study to be included in the EIS will be based on the post BRAC conditions and the data collected in 2011 will be used as the baseline for evaluation of the future impacts analysis in the EIS. The traffic study will analyze the traffic impacts of the proposed actions using locally approved methodology, including pedestrian traffic and will also identify potential mitigation measures, as appropriate.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
37	Transcripts	General Public	Hi. These may apply partially to the traffic plan and the master plan. But from what is said, although I didn't see numbers, there's more square feet, there's somewhat more staff and there's more parking than if you didn't build this underground parking garage. What we have currently even before Walter Reed came over to the campus is a rush-hour, in the afternoon particularly, disaster and anything that doesn't move in the direction of mitigating that, compounds the problem. I'm a commissioned officer, Captain in the Public Health Service retired. I was planning officer at NIH. We dealt -- when we were a third the budget size of what we are now. We had to deal with this issue of congestion and a lot of buildings have gone up since then.	Thank you for your comment. The traffic study to be included in the EIS will be based on the post BRAC conditions and the data collected in 2011 will be used as the baseline for evaluation of the future impacts analysis in the EIS. The traffic study will analyze the traffic impacts of the proposed actions using locally approved methodology, including pedestrian traffic and will also identify potential mitigation measures, as appropriate.
38.1	Transcripts	General Public	I have used Bethesda Navy Hospital for 30 years. I have been a staff volunteer on a number of services. I have talked with staff. I have been there almost at every hour in the day, like MRIs at 3:00 in the morning. Anyway. How do they affect the functioning of the National Naval Medical Center? Staff tells me that some of them have to get up extremely early in the morning to get there at 5:30 to get a parking place. Then some of those staff tell me they then have to stay until 6:30 at night because of the traffic and so that's a long day. But yet they don't have a flexible work schedule so they aren't able to see patients. One of them was in behavioral health, saw mental health patients and he wasn't able to see patients past whatever it is, 5:00 or 4:30 when they officially stop, even though he was in his office because of this. Some staff, I'm told that it's typically like 10, 20, 30, up to an hour, minutes currently to leave the base. That is not helping it. I as a patient never schedule an appointment on a weekday after 12:00 because if there are various delays and other services I need, I am in this gridlock and I'm wasting an hour of my life in that gridlock and I don't care to do that. Anything that I can do and you have a few things are open on Saturdays, some of which only take 10 minutes: getting	Thank you for your comment. The traffic study to be included in the EIS will be based on the post BRAC conditions and the data collected in 2011 will be used as the baseline for evaluation of the future impacts analysis in the EIS. The traffic study will analyze the traffic impacts of the proposed actions using locally approved methodology and will also identify potential mitigation measures, as appropriate. Additionally, the Navy is also updating the Installation Transportation Management Plan (TMP) at the same time and the goal of the TMP is identify options to single occupancy vehicle commuting.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
			gas, using the PX, picking up a copy of my lab tests, getting lab tests done. Now, if you define, what is the problem, the problem is there are other problems, there are other ways to solve them. But the problem in one sense is that between Monday through Friday between 2:00 and 6:00 p.m. that there are a huge number of cars that are released on 355 from the Navy campus. So, let's take those elements.	
38.2	Transcripts	General Public	355. Not everybody has to exit on 355. One day because of construction, they exited most everybody to Jones Bridge Road and I was surprised that about half the people then took a left on Connecticut. They found it convenient and they hadn't even gone by that exit, which is the one in from the medical school. The second is there are bunches of people, some are even contractors because they come at set leaving times, 3:30, 4:00, 4:30, 5:00, whatever it is. NIH has staggered working hours. It's not only on the exits problem, NIH has exits on Old Georgetown Road that is less congested mostly. And they recently, partly due to the BRAC discussions that we had and I've been sitting in on that, opened a new exit right at Greentree Road where's there's a traffic light which will help. They have thought about closing, which I hope they will, closing Wilson Road, Lane, whatever it is. It's a light just north of the Metro. That, again, would lessen the 355 impact. But what Navy can do at a minimum is stagger the release hours so they aren't coming at precise times, so they're staggered. In a selected way, a few of internal medicine, gynecology, perhaps behavioral health can see patients on Saturdays. I'm not talking about everybody. It might be 10 percent of the staff. It may be medics do that instead of people coming to the emergency room at various hours. They can then get service. So, it's not an either/or thing.	Thank you for your comment. The traffic study to be included in the EIS will be based on the post BRAC conditions and the data collected in 2011 will be used as the baseline for evaluation of the future impacts analysis in the EIS. The traffic study will analyze the traffic impacts of the proposed actions and will also identify potential mitigation measures, as appropriate. Additionally, the Navy is also updating the Installation Transportation Management Plan (TMP) at the same time and the goal of the TMP is identify options to single occupancy vehicle commuting.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
38.3	Transcripts	General Public	Some things can be telecommuted. Now, there are security problems, but when I worked at the library, this is a very small example. Reference work, I did at home because I used publicly available databases like Medline and then I brought them in or I could email them and no security threat whatsoever. Some activities could be done off campus. Just to take a few that are space consuming. Health promotion involves -- you don't even have to see somebody's medical record if they're referred to stress reduction, health promotion. That could be done anywhere in the area. If they were referred to physical therapy for a specific thing, generally don't have to see their whole medical record for that. That could be done in a secure way.	Thank you for your comment. The traffic study to be included in the EIS will be based on the post BRAC conditions and the data collected in 2011 will be used as the baseline for evaluation of the future impacts analysis in the EIS. The traffic study will analyze the traffic impacts of the proposed actions using locally approved methodology and will also identify potential mitigation measures, as appropriate. Additionally, the Navy is also updating the Installation Transportation Management Plan (TMP) at the same time and the goal of the TMP is identify options to single occupancy vehicle commuting.
38.4	Transcripts	General Public	Suburban Hospital has pioneered or had to use, whatever you call it, many things off-site, physical therapy, outpatient clinics and so on so that they don't have a vast traffic jam right there and overuse their facilities. So, if we have for some and this may only be support staff and a few staff, for the working week, telecommute, that could cut quite a number of people that are exiting Monday through Friday. If they have Saturday hours for a few, that could cut down on that. If they stagger the release times and the hours, that could cut away from this bolus. So that is in some sense what we consider just permanent rush hour is a scheduling problem because most of the day -- if I drive down to Bethesda Navy at 8:00 or 9:00 in the morning, there's practically no traffic. If I leave at 11:00 or 12:00 there's very little traffic. But after 2:00 there's a problem. That is a scheduling problem. That hurts me as a patient but it hurts Navy because there are patients missing appointments, coming in late. Their staff are half asleep because of having to get up very early. They are not very happy and there are arrangements they can do for their staff and their patients. Some of their patients have emergencies. They may just be delivering a baby. If they have to fight through this traffic,	Thank you for your comment. The traffic study to be included in the EIS will be based on the post BRAC conditions and the data collected in 2011 will be used as the baseline for evaluation of the future impacts analysis in the EIS. The traffic study will analyze the traffic impacts of the proposed actions and will also identify potential mitigation measures, as appropriate. Additionally, the Navy is also updating the Installation Transportation Management Plan (TMP) at the same time and the goal of the TMP is identify options to single occupancy vehicle commuting.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
			that can cause real medical problems. But in a broader sense, 355 is a major route going to the Beltway and since 9/11 it's a major evacuation route. Since we're closing Walter Reed, the old Walter Reed, it's a major route to one of the major military hospitals in the whole area or the major one. So that Bethesda Navy personnel, staff, decision makers have an interest in keeping and reducing, not adding to. So, I would suggest that, as far as the Environmental Impact Statement, that none of this go forward until they have implemented plans such as these and they can figure out ways to do them better than I have suggested. As I suggested to them in a letter to the admiral in charge and I suggested this in April of 2008. It appeared in a Dr. Gridlock column that discussed my ideas at great length. And so NIH has made some progress on those. Navy, when I talked to them, they say that people don't come to Saturday hours. They need to publicize them more and they're given a choice. If I'm given a choice of having an MRI in three months or 3:00 in the morning this week, I go to the one this week. Now, it's not as extreme as that, but if they're given more choice instead of dragging themselves out of work and kids out of school, some people would prefer to come on a Saturday morning.	
39	EIS Email	General Public	Proposed parking garage between the tower and Rt. 355. would increase base internal congestion near North Gate 1 increase Rt. 355 congestion and increase air pollution near patients. Instead build it near Gate 4 or Gate 5 to provide direct access to and from Jones Bridge Road and better balance the impact of base garages. Have patients only typically short term use the three existing garages adjacent to hospital and staff use ones near bldg. 46, 66, and 17.	Thank you for your comment. As a part of the EIS, the Navy is conducting a traffic study and it will analyze the impacts of the proposed underground parking garage and will also identify potential mitigation measures, as appropriate. Additionally, the EIS will analyze three alternative sites to the underground parking garage that are in the northeast and south areas of the installation.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
40	Transcripts	General Public	So, I'm Kathy Sessions. I'm a resident of Hawkins Lane which is a historic district just off Jones Bridge Road adjacent to the university, Uniformed Services University Health Center. I and my neighbors are proud to be neighbors of the Naval Medical Center and support in general its renovation. However, we do have a number of neighborhood concerns about the impacts of both the ongoing construction and the proposed additional construction. There are four categories of concern that I'd like to just flag. The one of most concern to me is about air pollution and public health. Our neighborhood is home to a number of families with small children. We have a few older residents also with health issues and the neighborhood is situated close to multiple sources of air pollution including the Beltway and there's been a pretty dramatic increase in vehicular traffic along Jones Bridge Road related to the Walter Reed BRAC transitions, which has brought additional transportation pollution and the road and building construction equipment is bringing more in. We have trucks idling along Jones Bridge Road so we are concerned that additional construction and the proposal to make Jones Bridge an entrance for parking garages and trucks would add more pollutants to the airspace and create more of a kind of cumulative public health impact. So, that's one concern.	Thank you for your comment. As a part of the EIS, the Navy is conducting a traffic study and it will analyze the traffic impacts of the proposed actions, including construction traffic and will also identify potential mitigation measures, as appropriate. Additionally, the EIS will analyze the air quality impacts of the construction equipment and traffic and will also identify potential mitigation measures, as appropriate.
41	Transcripts	General Public	So, the second is about traffic impacts during rush hour. Traffic is already now so backed up on Jones Bridge that it can take a half hour to get home when it used to take five minutes, can get very difficult to get in and out of our lane which is Hawkins Lane onto Jones Bridge. So, again, we're concerned about the impacts of both the construction and renovation and additional vehicular traffic given that we don't seem to have successfully absorbed the Walter Reed-related transition, increases in traffic.	Thank you for your comment. The traffic study to be included in the EIS will be based on the post BRAC conditions and the data collected in 2011 will be used as the baseline for evaluation of the future impacts analysis in the EIS. The traffic study will analyze the traffic impacts of the proposed actions using locally approved methodology and will also identify potential mitigation measures, as appropriate. Additionally, the Navy is also updating the Installation Transportation Management Plan (TMP) at the same time and the goal of the TMP is identify options to single occupancy vehicle commuting.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
42	Transcripts	General Public	The third concern is about noise and noise pollution. Construction noise in the land adjacent to our lane has been constant and it often goes on all night long. So if you have your windows open, you hear, beep, beep. And it's been hard for neighbors to sleep at night. And the final concern is about impact on property values. The increased noise and the loss of green space bordering our neighborhood, the increased traffic and all of the related kind of impacts already on the neighborhood have decreased the pastoral, peaceful feel of our neighborhood. And we've had decreased interest in rental properties on the Lane this year and people trying to refinance their homes have been told that their homes are worth less than they had before the BRAC construction started. So, we fear additional impacts on the property values of the proposed renovations. So, I would hope that the impact assessment would consider the cumulative impact of all of the current and proposed changes in the federal facilities adjacent to our neighborhood in terms of the air pollution and the traffic and the noise. And also would hope it would identify options for mediating neighborhood impacts such as if there could be either a kind of no-idling practices for trucks coming in and out or other requirements for filters if they're diesel trucks so that they're not -- to reduce the diesel pollution. The possibility of noise barriers or other kind of tree plantings along the lane, curtailing construction activities to daylight hours so that they're not doing construction overnight would all potentially be helpful to the neighbors and make this lower impact.	Thank you for your comment. The EIS will analyze the impacts from the proposed actions, including traffic and noise impacts and will also identify potential mitigations measures, as appropriate. To the extent possible the Navy intends to adhere to the landscape design guidelines in the 2010 NSA Bethesda Installation Appearance Plan. The landscape design guidelines include maintaining a landscaped buffer at the southern, eastern, and northern perimeters in consideration of the residential and institutional neighbors.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
43	Email	Montgomery County Planning Department The Maryland National-Capital Park and Planning Commission	The Planning Department received the State Clearinghouse communication re this project. Thank you. We met with the Dept of the Navy, September 30, to find out more about their proposal and their traffic analysis. We look forward to continued coordination with them as they move forward. Since this submittal is a Notification of Intent to prepare an Environmental Impact Statement it concerns establishing the scope of the review. That being said, it will establish alternatives for evaluation. The Planning Department would like to remain involved as the EIS is prepared and receive the draft EIS for review as soon as it is available.	Thank you for your comment. The Navy will continue timely coordination with your agency throughout the EIS process.
44	Email	Montgomery County Planning Department The Maryland National-Capital Park and Planning Commission	We request that the scope of the EIS, which includes an evaluation of alternatives include the use of local regulations and their criteria, such as the Forest Conservation Law, the Montgomery County Historic Preservation ordinance and any applicable State regulations, as yardsticks to measure impacts on - The County-designated historic resource: the Bethesda Naval Hospital Tower Block We would also like to continue coordination on traffic and transportation issues and compatibility issues related to the existing neighborhood. Please also include us in all notifications of community meetings in advance. Thank you for contacting us early in the process. We look forward to working with you.	Thank you for your comment. The EIS will analyze the impacts on biological and cultural resources from the proposed actions and will include the analysis of compliance with the applicable regulations pertaining to the resources during construction and operation of the proposed actions. Additionally, the Navy has initiated Section 106 consultation with the Maryland Historical Trust because of the historic resources at NSA Bethesda.
45	Email	Montgomery County Planning Department The Maryland National-Capital Park and Planning Commission	We would also like to continue coordination on traffic and transportation issues and compatibility issues related to the existing neighborhood. Please also include us in all notifications of community meetings in advance. Thank you for contacting us early in the process. We look forward to working with you.	Thank you for your comment. The Navy continues to consult and collaborate with local and state transportation agencies to address critical transportation issues to the surrounding communities and to coordinate the implementation of improvement measures, if appropriate. To this end, the EIS traffic study intersections were selected based on the Maryland National Capital Park and Planning Commission's (MNCPPC) Local Area Transportation Review methodology and were identified in coordination with the M-NCPPC staff.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
46	Email	Montgomery County Planning Department The Maryland National-Capital Park and Planning Commission	Please also include us in all notifications of community meetings in advance. Thank you for contacting us early in the process. We look forward to working with you.	Thank you for your comment. The Navy will continue timely coordination with your agency throughout the EIS process, including notifications of community meetings.
47	Written Letter	Maryland Department of the Environment	Thank you for the opportunity to review the above referenced project. The document was circulated throughout the Maryland Department of the Environment (MDE) for review, and the following comments are offered for your consideration. I. Any above ground or underground petroleum storage tanks that may be utilized must be installed and maintained in accordance with applicable State and federal laws and regulations For demolition, any aboveground or underground petroleum storage tanks that may be on site must have the contents and tanks removed. Contact the Oil Control Program at (410) 537-3442 for additional information. 2. Any solid waste including construction, demolition and land clearing debris, generated from the subject project, must be properly disposed of at a permitted solid waste acceptance facility, or recycled if possible. Contact the Solid Waste Program at (410) 537-3318 for additional information. 3. The Hazardous Waste Program should be contacted directly at (410) 537-3343 by those facilities which generate or propose to generate or handle hazardous wastes to ensure these activities are being conducted in compliance with applicable State and federal laws and regulations. 4. The Hazardous Waste Program should be contacted at (410) 537-3343 prior to construction activities to ensure that the treatment, storage or disposal of hazardous wastes and low-level radioactive wastes at the facility will be conducted in compliance with applicable State and federal	Thank you for your comment. The EIS will analyze the impacts on Human Health and Safety from the proposed action and will include the analysis of compliance with the applicable regulations pertaining to hazardous material and hazardous waste during construction and operation of the proposed actions.

MEDICAL FACILITIES DEVELOPMENT AND UNIVERSITY EXPANSION
ENVIRONMENTAL IMPACT STATEMENT SCOPING COMMENTS/RESPONSES

CMT Number	Source	Organization	Comments	Response
			laws and regulations. 5. Any contract specifying "lead paint abatement" must comply with Code of Maryland Regulations (COMAR) 26.16.01Accreditation and Training for Lead Paint Abatement Services. If a property was built before 1950 and will be used as rental housing, then compliance with COMAR 26.16.02- Reduction of Lead Risk in Housing; and Environment Article Title 6, Subtitle 8, is required. Additional guidance regarding projects where lead paint may be encountered can be obtained by contacting the Environmental Lead Division at (410) 531-3825. 6. The proposed project may involve rehabilitation, redevelopment, revitalization, or property acquisition of commercial, industrial property. Accordingly, MDE's Brownfields Site Assessment and Voluntary Cleanup Programs (VCP) may provide valuable assistance to you in this project. These programs involve environmental site assessment in accordance with accepted industry and financial institution standards for property transfer. For specific information about these programs and eligibility, please contact James Carroll, Program Administrator, Land Restoration Program at (410) 531 3437.	

APPENDIX B: AIR QUALITY ANALYSIS

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TABLE OF CONTENTS

1.0 Project Description 3

2.0 Meteorology/Climate 5

3.0 Current Ambient Air Quality Conditions 5

4.0 Air Quality Regulatory Requirements 5

4.1 General Conformity Applicability Analysis 5

5.0 Conformity Applicability Analysis 7

5.1 Construction Phase Emissions 7

5.2 Operations Emissions 19

5.3 Summary of Construction and Operations Emissions 25

6.0 References 27

TABLES

Table 1: Ambient Air Quality Standards..... 6

Table 2: Emissions Factors for Construction Vehicles..... 9

Table 3: Equations for Construction Emissions Calculations..... 10

Table 4: Fugitive $PM_{2.5}$ Emission Factors for Construction Vehicles ... 11

Table 5: Total Equipment Emissions for Construction – Medical Facilities Development Underground Parking Alternative, Period 1.... 12

Table 6: Total Equipment Emissions for Construction – Medical Facilities Development 6-Story Above-Ground Parking, Period 1..... 12

Table 7: Total Equipment Emissions for Construction – Medical Facilities, Period 2..... 13

Table 9: Total Equipment Emissions for Construction – University Expansion Alternative 2, Period 2..... 15

Table 10: Total Emissions from Medical Facilities Development Construction – Underground Parking – Period 1..... 17

Table 12: Total Emissions from Medical Facilities Development Construction - Period 2..... 17

Table 13: Total Emissions from University Expansion Construction – Alternative 1 – Period 2 17

Table 14: Total Emissions from University Expansion Construction – Alternative 2 – Period 2 18

Table 15: Total Annual Emissions from Heating – Natural Gas 20

Table 16: Total Annual Emissions from Heating – #2 Fuel Oil 21

Table 17: Total Annual Emissions from Generators, Medical Facility .. 22

Table 18: Total Annual Emissions from Generators, University Expansion 22

Table 19: Emission Factors for Commuter Vehicles 23

Table 20: Equations for Operations Emissions Calculations 23

Table 21: Annual Emissions from Daily Vehicle Traffic 24

Table 22: Annual Emissions from Medical Facilities Development Operations (Above-ground Parking) 24

Table 23: Annual Emissions from Medical Facilities Development Operations (Underground Parking) 24

Table 24: Annual Emissions from University Expansion Operations (Alternatives 1 & 2) 25

Table 25: Total Annual Emissions: Medical Facilities Development–Underground Parking - All Periods 25

Table 26: Total Annual Emissions: Medical Facilities Development–Above-ground Parking - All Periods 25

Table 27: Total Annual Emissions: University Expansion (Alternatives 1 & 2) 25

APPENDIX B: AIR QUALITY ANALYSIS

This air quality applicability analysis was conducted to identify potential increases or decreases in criteria air pollutant emissions associated with the proposed construction at Naval Support Activity (NSA) Bethesda, Maryland. The project site is U.S. Environmental Protection Agency (USEPA) designated as in moderate nonattainment for ozone, nonattainment for particulate matter (2.5 microns), and maintenance for carbon monoxide (CO) and is subject to the Federal conformity requirements. It is also within an ozone transport region. The purpose of the analysis is to apply the Federal General Conformity Rule established in 40 CFR, Part 93 entitled: *Determining Conformity of Federal Actions to State or Federal Implementation Plans* to the Proposed Action Alternative in order to determine any effect on air quality.

The Federal conformity rules were established to ensure that Federal activities do not hamper local efforts to control air pollution. In particular, Section 176(c) of the Clean Air Act (CAA) prohibits federal agencies, departments, or instrumentalities from engaging in, supporting, licensing, or approving any action, in an area that is in nonattainment or maintenance of the National Ambient Air Quality Standards (NAAQS), which does not conform to an approved state or Federal implementation plan.

1.0 Project Description

The purpose of the Medical Facilities Development is to implement the Congressional Mandate from the 2010 National Defense Authorization Act to achieve the new statutory world-class standards for military medicine at the Walter Reed National Military Medical Center (WRNMMC) by providing enduring facilities commensurate in quality, capability, and condition with those provided by the Base Realignment and Closure (BRAC) investment. The development of the medical facilities is to accommodate the transfer of the Walter Reed Army Medical Center (WRAMC) to WRNMMC and because current space is insufficient to meet world-class medical care facility standards. To meet these standards, the project follows the recommendations listed in the WRNMMC Medical Facilities Master Plan that the medical facilities will provide required space in two-categories: (1) right-sizing existing departments in the existing hospital and (2) the replacement of current structures with new construction that would meet current space and health care operational standards. In addition, the Master Plan also proposes a parking structure to serve the medical facilities as well as the overall parking needs across NSA Bethesda.

The proposed action includes the construction of a 573,000-square foot (SF), 5-story medical facilities building (Building C) and 500-space, 225,000 SF underground parking garage to the west of existing Building

1. Building C is proposed to be constructed in the footprint of existing Buildings 2, 4, 6, 7, and 8, which are proposed to be demolished. Temporary medical facilities of approximately 100,000 SF would be constructed at the existing Lot G to provide uninterrupted patient services during construction of the new medical facility. In addition, internal renovations to Buildings 1, 3, 5, 9, and 10 and internal and external renovations to Building 13 as well as improvements to pedestrian pathways and landscaping would occur.

Utility upgrades associated with the Medical Facilities Development include the demolition and reconstruction of three existing cooling towers and construction of a fourth; replacement of deteriorating condensate return lines; restoration of damaged water lines; and upgrades to the capacity of the existing electrical distribution system increasing it from 31.5 mega volt-ampere (MVA) to 48 MVA.

Within the construction of the medical facilities parking structure, three alternative above-ground structure locations have been identified in addition to the proposed underground structure just west of Building 1. One alternative is the current H-Lot site, where the parking structure could be up to 6 stories, consistent with the Navy Lodge height. A second alternative is a warehouse area in the northeast corner of the installation where the structure could also be up to six stories requiring demolition of Buildings 80, 149, 152, 101, and 99. A third alternative is the Taylor Road site in the location of Buildings 28, 53, 59, 69, and 79, which would require the demolition of Buildings 28, 53, and 59 and the construction of an up to 5-story structure.

In addition, accessibility and appearance projects are proposed that follow recommendations in the Accessibility Capital Improvement Plan (ACIP) in the 2011 NSA Bethesda Accessibility Plan. This plan is focused on wounded warriors, their special needs, and the staff helping them to adjust to their new challenges. Projects include the construction of North Palmer Road, a courtyard, a Memorial Grove, a connector to Building 17, University entry, and a Stony Creek trail system.

The purpose of the University Expansion is to address the dispersed, aging, and inefficient infrastructure that create current space and operational limitations for educational and research activities. Currently the University is dispersed between 19 off-site leased spaces in Montgomery County, Maryland, and buildings dispersed at NSA Bethesda.

The proposed University Expansion would entail the construction of a new 341,151 SF education and research building (Building F) as well as a 400-space, 144,000 SF above-ground parking structure. The proposed action includes the renovation and modernization of approximately 39,000 SF of administrative and educational space and the ground floor in university buildings A, B, and C.

Two locations for the proposed University Expansion have been presented, Alternatives 1 and 2. Under either of the alternatives, the University Expansion would comprise an approximately 341,151 SF education and research building and an approximately 144,000 SF parking structure with 400 spaces.

Alternative 1 was identified in the 2008 NNMC master plan and would be located in the wooded lot east of Grier Road and south of the University campus. Under Alternative 1, Building F would be located adjacent to the parking structure. This alternative would require approximately 2.8 acres of the wooded area to be cleared.

Alternative 2 would be located west of the University campus in the developed area between the University and Armed Forces Radiobiology Research Center (AFRRI). Under Alternative 2, Building F would be located on top of the parking structure.

2.0 Meteorology/Climate

Temperature is a parameter used in calculations of emissions for air quality applicability. Climate at NSA Bethesda can be characterized as a humid, continental climate with a mean high temperature of 89°F in July and a mean low temperature of 25°F in January. Summers are warm with periods of high humidity and winters are cold, with periods of snow cover (City-data, nd).

3.0 Current Ambient Air Quality Conditions

USEPA has classified the area of the proposed action, Montgomery County, Maryland, as in moderate nonattainment for ozone and nonattainment $PM_{2.5}$. The county is also in maintenance for CO.

4.0 Air Quality Regulatory Requirements

4.1 General Conformity Applicability Analysis

USEPA defines ambient air in 40 CFR Part 50 as "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 Clean Air Act (CAA) and the 1977 and 1990 Clean Air Act Amendments (CAAA), USEPA has promulgated NAAQS. The NAAQS were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, USEPA has issued NAAQS for six criteria pollutants: CO, sulfur dioxide (SO_2), particulate matter (particles with a diameter less than or equal to a nominal 10 micrometers [PM_{10}] and particles with a diameter less than or equal to nominal 2.5 micrometers [$PM_{2.5}$]), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). Federal regulations designate Air-Quality Control Regions (AQCRs) in violation of the NAAQS as nonattainment areas. According to the severity of the pollution problem, nonattainment areas can be categorized as marginal, moderate, serious, severe, or extreme. USEPA has classified the Metropolitan Washington, DC, area (AQCR 47), which includes Montgomery County and NSA Bethesda,

as in moderate nonattainment for the 8-hour ozone NAAQS and in nonattainment for $PM_{2.5}$. It also has been designated as in maintenance for carbon monoxide. AQCR 47 is also in the ozone transport region, which is the northeastern section of the United States where ozone is transported by air currents into the regions from other sections of the United States.

The NAAQS for ozone, $PM_{2.5}$, and CO are in Table 1.

Table 1: Ambient Air Quality Standards

Pollutant	Federal Standard	Maryland Standard
Ozone (O_3)*		
8-Hour Average	0.075 ppm	0.075 ppm
Particulate Matter ($PM_{2.5}$)*		
24-Hour Average	35 µg/m^3	35 µg/m^3
Annual Geometric Mean	15 µg/m^3	15 µg/m^3
Carbon Monoxide (CO)*		
8-Hour	9 ppm	9 ppm
1-Hour	35 ppm	35 ppm

* Federal primary and secondary standards for this pollutant are identical.
(Sources: USEPA, 2011a; MDE, 2007)
Ug/m3 – micrograms per cubic meter
ppm – parts per million

To regulate the emission levels resulting from a project, Federal actions located in non-attainment or maintenance areas are required to demonstrate compliance with the General Conformity Rule established in 40 CFR Part 93 Determining Conformity of Federal Actions to State or Federal Implementation Plans (the Rule). The project area is located within a non-attainment area and maintenance area; therefore, a General Conformity Rule applicability analysis is warranted.

Section 93.153 of the Rule sets applicability requirements for projects subject to the Rule through establishment of *de minimis* levels for annual criteria pollutant emissions. These *de minimis* levels are set according to criteria pollutant non-attainment area designations. For projects below the *de minimis* levels, a conformity determination is not required. Those at or above the levels are required to perform a conformity analysis as established in the Rule. The *de minimis* levels apply to emissions that can occur during the construction and operation phases of the action.

On 11 July 2006, USEPA established *de minimis* levels for $PM_{2.5}$. The final rule established 100 tons per year (TPY) as the *de minimis* emission level under nonattainment for directly emitted $PM_{2.5}$ and each of the precursors that form it (SO_2, NO_x, volatile organic compounds [VOCs], and ammonia). This 100 TPY threshold applies separately to each precursor. This means that if an action's direct or indirect emissions of $PM_{2.5}$, SO2, NOx, VOC, or ammonia exceed 100 TPY, a General

Conformity determination would be required. Under the current USEPA policy for addressing $PM_{2.5}$ precursors, only $PM_{2.5}$ and SO_2 must be evaluated in all regions. States are not required to evaluate VOC, NO_x, or ammonia unless the State or USEPA make a technical demonstration that those particular emissions from sources within the State significantly contribute to $PM_{2.5}$ concentrations in a given nonattainment area (USEPA, 2007). Neither USEPA nor Maryland has found $PM_{2.5}$ problems in AQCR 47 to be caused by NO_x, VOC, or ammonia. Ammonia is not further addressed by the EIS (NO_x and VOC are addressed as ozone precursors).

NSA Bethesda has completed a General Conformity Rule applicability analysis in order to analyze any impact on air quality. Emissions have been estimated for the ozone precursor pollutants NO_x and VOC, and $PM_{2.5}$ with its precursor SO_2, and CO. Annual emissions for these compounds were estimated for each of the project actions (construction and operation) to determine if they would be below or above the *de minimis* levels established in the Rule. The *de minimis* for moderate ozone nonattainment and maintenance areas is 100 TPY for NO_x and 50 TPY for VOC in an ozone transport region. The maintenance *de minimis* level for CO is 100 TPY.

Sources of NO_x, VOC, $PM_{2.5}$, SO_2, and CO associated with the proposed projects would include emissions from construction and demolition equipment, fugitive dust ($PM_{2.5}$), painting of interior building surfaces, and parking spaces (VOC only), emissions from daily commuters, emissions from the expansion and additional load on the central utility plant, and additional emergency generators.

5.0 Conformity Applicability Analysis

This project construction- and operations-related General Conformity analysis was performed for the proposed action at NSA Bethesda. This conformity analysis and air emissions evaluation will follow the criteria regulated in *40 CFR Parts 93, Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule* (30 November 1993), as revised 5 April 2010. The emissions evaluation will also follow all NEPA-related criteria regulated in *40 CFR Part 6*.

5.1 Construction Phase Emissions

Construction emissions would result from the operation of heavy equipment, delivery trucks, and the painting of the building structures and parking spaces. The project would utilize a mix of heavy equipment for construction, mainly associated with preparing the site for the buildings and utility relocation.

5.1.1 Emissions from Heavy Equipment

Annual emissions were calculated for various types of diesel construction vehicles using model emission rate input for the year 2013 in USEPA's *Nonroad2008a Emission Inventory Model: Diesel*

Construction Equipment, Montgomery County, Maryland (USEPA, 2008). Truck emission levels were calculated using USEPA's *MOBILE6* model for conditions in summer 2012 (USEPA, 2009). The total annual emissions in TPY were determined for each vehicle based on the number of vehicles used and the number of operating hours per year. Construction of the Medical Facilities Development is estimated to begin in 2013 and be completed by 2018, and construction of the University Expansion is expected to begin in 2016 and be completed in 2017. However, a conservative approach was employed in the applicability analysis to assure that construction scheduling would not result in higher levels of emissions than predicted.

Period 1, beginning during calendar year 2013, includes all appearance and accessibility projects, installation of temporary medical facilities, electrical improvements, excavation for the Medical Facility parking garage for the underground alternative or demolition of buildings at the site of the above-ground parking alternative (the Taylor Road site with largest demolition requirement is assumed for the analysis), and demolition of Building 143 on the site of the proposed new utility plant. Although Period 1 is scheduled to occur over approximately 2 years, the analysis conservatively assumes all emissions occur over the same year.

Period 2, beginning during calendar year 2015, includes demolition of buildings on the site of proposed Building C and the construction of Building C, construction of the Medical Facility parking garage – either underground or above-ground, all Medical Facility renovation, renovation of Building 13, demolition of three existing cooling towers and replacement construction of these plus a new fourth tower, additional upgrades to utilities (replacement of condensate return lines, repair of damaged water lines, and installation of water tanks for emergency backup), and all University Expansion actions (construction of Building F, construction of a parking structure, and renovation of space in the existing university buildings). Although Period 2 is scheduled to occur over approximately 3 years, the analysis conservatively assumes all emissions occur over the same year.

Period 3 includes the full operation of all newly constructed buildings and represents the annual emissions from the proposed action.

For both alternatives, it was assumed that:

- Delivery trucks and dump trucks would travel 50 miles per day.
- One pick-up truck would be used at each site by the foreman. It is assumed this truck would drive only within NSA Bethesda, approximately 5 miles per vehicle, per day.

- There would be a concrete batch plant on-site, contributing a negligible addition of $PM_{2.5}$ emissions. Concrete mixer trucks would travel within NSA Bethesda, approximately 7 miles per day.

Calculations for Construction Emissions

Using the emissions factors in Table 2, construction emissions were calculated for the proposed construction at NSA Bethesda. Using the assumptions described above, the emissions in tons of NO_x, VOC, $PM_{2.5}$, SO_2, and CO for construction equipment emissions were calculated for each vehicle type using the appropriate equations displayed in Table 3.

Emissions factors used for construction vehicles, under all alternatives, are shown in Table 2.

Table 2: Emissions Factors for Construction Vehicles

Construction Vehicle Type	Emissions Factors lbs/hr-vehicle				
	NO_x	VOC	$PM_{2.5}$	SO_2	CO
Front End Loader	1.406	0.107	0.098	0.044	0.520
Excavator (includes trenching)	1.207	0.095	0.091	0.044	0.658
Dozer	1.498	0.117	0.108	0.052	0.581
Vibratory Roller	1.096	0.088	0.095	0.033	0.442
Grader	1.244	0.102	0.117	0.041	0.521
Concrete Pumper Truck	3.170	0.252	0.172	0.062	0.683
Concrete Truck Mix	5.380	0.375	0.256	0.105	1.162
Concrete Truck Travel*	3.867	0.340	0.110	0.013	1.851
Crane/Manlift	2.053	0.147	0.101	0.061	1.442
Backhoe (includes trenching)	1.338	0.302	0.244	0.033	1.681
Air Compressor	1.029	0.083	0.084	0.028	0.264
Dump Truck*	6.094	0.388	0.262	0.0307	2.163
Pick-Up Truck*	0.918	0.526	0.025	0.012	4.990
Delivery Truck *	5.872	0.378	0.211	0.275	1.948

* units are in grams/mile/vehicle

Table 3: Equations for Construction Emissions Calculations

Emission Source	Equation	Sample Calculation
Heavy Equipment Emissions, Hourly On-Site Activities	(# of vehicle type) (Emission factor) (Total # of days in operation) (hours/day) (1 ton/2,000 lbs) = tons of air emissions	(1 grader) (1.244 lbs/hr/vehicle) (6.6 days in operation) (8 hours/day) (1 ton/2,000 lbs) = **0.033 tons of NO_x of equipment emissions**
Construction Truck Emissions with Vehicle-miles	(# vehicle type) (Emission factor) (Total # of days in operation) (miles/day)(1 ton/2,000 lbs) = tons of air emissions	(1 dump truck) (6.094 grams/mile/vehicle) (1067 days)(50 miles/day)(1 lb/453.59 grams) (1 ton/2,000 lb) = **.0.358 tons NO_x of vehicle emissions**

Surface Disturbance (Fugitive $PM_{2.5}$)

The quantity of dust emissions of $PM_{2.5}$ from construction operations is assumed proportional to the days of construction activity on unpaved surfaces. The following sources for emission factors, with a capture fraction of 50 percent and silt and moisture contents of 20 percent, were used in $PM_{2.5}$ emission calculations for fugitive emissions (AP-42 Section 13.2; USEPA, 2006).

- The unpaved road equation 13.2.2.1 equation 1a (AP-42 Chapter 13.2.2) is used to estimate fugitive emissions for the concrete pumper truck, concrete truck mixing, crane, and pickup truck. Mileage on unpaved surface for each day of operation by vehicle type is estimated, and then multiplied by the number of construction days.
- The paved road equation 13.2.1.3 equation 2 (AP-42 Chapter 13.2.2) is used to estimate fugitive emissions for the concrete truck in travel, dump truck, and delivery truck. One mile per trip is assumed to be on dusty pavement equivalent to an industrial road or construction area.
- Front end loader and backhoe emissions combine unpaved road travel from equation 13.2.2.1 equation 1a and the dumping equation from AP-42 Chapter 11, Chapter 11.9-4.
- Dozer and vibratory roller emissions are based on the dozer equation from AP-42 Chapter 11, Table 11.9-1.
- Grader emissions are based on the grader equation from AP-42 Chapter 11, Table 11.9-1.

Resultant emission rates in lb/day are presented in Table 4, and resultant tons of $PM_{2.5}$ emissions are provided in Table 5.

Table 4: Fugitive $PM_{2.5}$ Emission Factors for Construction Vehicles

Equipment/Vehicle Type	Fugitive $PM_{2.5}$ (lb/day)	Equipment/Vehicle Type	Fugitive $PM_{2.5}$ (lb/day)
Front End Loader	2.26	Concrete Pumper Truck	0.16
Dozer	0.73	Concrete Truck	0.28
Vibratory Roller	0.73	Dump Truck	0.19
Grader	0.02	Pick-Up Truck	0.41
Excavator	0.20	Crane	0.21
Backhoe	0.47	Delivery Truck	0.12

Medical Facilities Development (Underground and Above-ground Parking)

Equipment requirements were estimated for the construction activities associated with site preparation for buildings, parking, and trenching for utilities for Periods 1 and 2. Tables 5 and 6 provide the equipment assumptions and resultant total equipment emissions for Period 1 of the Medical Facilities Development for the underground parking alternative and above-ground parking alternative. It is assumed that site preparation for both parking garage options would occur in Period 1 and the actual construction of the parking garage would be in Period 2. Therefore, there are two alternative options for Period 1 for the Medical Facilities Development, and then only one alternative option for Period 2, provided in Table 7. For a full description of these actions, see the Alternatives chapter of the EIS.

Construction emission calculations by Period are provided in Section 5.1 of this appendix. For utility enhancements, it was assumed that all utility lines that are tied into the existing network could be accessed with minimal disturbance. For utility lines in undisturbed or minimally disturbed areas, it was assumed that trenching and disturbance would occur.

Table 5: Total Equipment Emissions for Construction – Medical Facilities Development Underground Parking Alternative, Period 1

Construction Vehicle Type	Total Days of Operation	Total Emissions - Tons					
		NO_x	VOC	Exhaust $PM_{2.5}$	Fugitive $PM_{2.5}$	SO_2	CO
Front End Loader	521	2.929	0.224	0.204	0.590	0.092	1.083
Dozer	1	0.006	0.000	0.000	0.000	0.000	0.002
Concrete Truck Mixing	10	0.215	0.015	0.010	0.001	0.004	0.046
Crane/Manlift	1	0.008	0.001	0.000	0.000	0.000	0.006
Backhoe	22	0.118	0.027	0.021	0.005	0.003	0.148
Air Compressor	5	0.0206	0.0017	0.0017	0.000	0.001	0.005
Dump Truck	4237	1.423	0.091	0.0612	0.924	0.007	0.505
Pick-Up Truck	250	0.001	0.001	0.000	0.052	0.000	0.0069
Delivery Truck	250	0.081	0.005	0.003	0.015	0.004	0.0268
Total Emissions		**4.802**	**0.365**	**0.302**	**1.588**	**0.111**	**1.831**

Table 6: Total Equipment Emissions for Construction – Medical Facilities Development 6-Story Above-Ground Parking, Period 1

Construction Vehicle Type	Total Days of Operation	Total Emissions - Tons					
		NO_x	VOC	Exhaust $PM_{2.5}$	Fugitive $PM_{2.5}$	SO_2	CO
Front End Loader	17	0.096	0.007	0.007	0.019	0.003	0.035
Dozer	6	0.036	0.003	0.003	0.002	0.001	0.014
Concrete Truck Mixing	10	0.215	0.015	0.010	0.001	0.004	0.046
Crane/Manlift	16	0.131	0.009	0.006	0.002	0.004	0.092
Backhoe	22	0.118	0.027	0.021	0.005	0.003	0.148
Air Compressor	5	0.0206	0.0017	0.0017	0.000	0.001	0.005
Dump Truck	198	0.067	0.004	0.003	0.043	0.000	0.024
Pick-Up Truck	250	0.001	0.001	0.000	0.052	0.000	0.0069
Delivery Truck	250	0.081	0.005	0.003	0.015	0.004	0.0268
Total Emissions		**0.765**	**0.073**	**0.055**	**0.140**	**0.020**	**0.399**

Table 7: Total Equipment Emissions for Construction – Medical Facilities, Period 2

Construction Vehicle Type	Total Days of Operation	Total Emissions - Tons					
		NO_x	VOC	Exhaust $PM_{2.5}$	Fugitive $PM_{2.5}$	SO_2	CO
Front End Loader	204	1.148	0.088	0.080	0.231	0.036	0.425
Excavator	61	0.293	0.023	0.022	0.006	0.011	0.160
Dozer	9	0.055	0.004	0.004	0.003	0.002	0.021
Vibratory Roller	6	0.028	0.002	0.002	0.002	0.001	0.011
Grader	6.3	0.031	0.003	0.003	0.000	0.001	0.013
Concrete Pumper Truck	104	1.319	0.105	0.071	0.008	0.026	0.284
Concrete Truck Mixing	104	2.238	0.156	0.107	0.014	0.044	0.483
Concrete Truck Travel	104	0.003	0.000	0.000	0.014	0.000	0.001
Crane/Manlift	1210	10.997	0.790	0.543	0.128	0.326	7.725
Backhoe	79	0.422	0.095	0.077	0.019	0.010	0.531
Air Compressor	154	0.633	0.051	0.052	0.000	0.017	0.162
Dump Truck	1066	0.358	0.023	0.015	0.233	0.002	0.127
Pick-Up Truck	250	0.001	0.001	0.000	0.052	0.000	0.007
Delivery Truck	4429	1.433	0.092	0.051	0.265	0.067	0.476
Total Emissions		**18.960**	**1.433**	**1.029**	**0.976**	**0.542**	**10.426**

Alternative 1 and 2, University Expansion

Equipment requirements were estimated for the construction activities associated with site preparation for buildings, parking, and trenching for utilities. Tables 8 and 9 provide the equipment assumptions and resultant total equipment emissions for the University Expansion Alternatives 1 and 2. For a full description of these actions, please see the EIS, Section 2.

Construction emission calculations include the construction of the University Expansion, Building F, associated parking garage, and renovations. For the analysis of the parking garage, it was assumed that the parking garage would be three-stories, consistent with surrounding structures. All proposed projects within the University Expansion Alternatives are assumed to take place during Period 2; therefore, total emissions are provided for only one construction period, which would be expected to be from 2017 through 2018.

Table 8: Total Equipment Emissions for Construction – University Expansion Alternative 1, Period 2

Construction Vehicle Type	Total Days of Operation	Total Emissions - Tons					
		NO_x	VOC	Exhaust $PM_{2.5}$	Fugitive $PM_{2.5}$	SO_2	CO
Front End Loader	23	0.127	0.010	0.009	0.026	0.004	0.047
Excavator	8	0.037	0.003	0.003	0.001	0.001	0.020
Dozer	11	0.066	0.005	0.005	0.004	0.002	0.026
Vibratory Roller	9	0.039	0.003	0.003	0.000	0.001	0.016
Grader	4.7	0.024	0.002	0.002	0.000	0.001	0.010
Concrete Pumper Truck	54	0.685	0.055	0.037	0.004	0.013	0.148
Concrete Truck Mixing	54	1.162	0.081	0.055	0.007	0.023	0.251
Concrete Truck Travel	54	0.002	0.000	0.000	0.007	0.000	0.001
Crane/Manlift	590	4.845	0.348	0.239	0.063	0.144	3.404
Backhoe	2	0.011	0.002	0.002	0.000	0.000	0.013
Air Compressor	9	0.035	0.003	0.003	0.000	0.001	0.000
Dump Truck	67	0.023	0.001	0.001	0.015	0.000	0.008
Pick-Up Truck	250	0.001	0.001	0.000	0.052	0.000	0.007
Delivery Truck	2527	0.818	0.053	0.029	0.151	0.038	0.271
Total Emissions		**7.874**	**0.566**	**0.389**	**0.330**	**0.229**	**4.221**

Table 9: Total Equipment Emissions for Construction – University Expansion Alternative 2, Period 2

Construction Vehicle Type	Total Days of Operation	Total Emissions - Tons					
		NO_x	VOC	Exhaust $PM_{2.5}$	Fugitive $PM_{2.5}$	SO_2	CO
Front End Loader	13	0.071	0.005	0.005	0.014	0.002	0.026
Excavator	6	0.029	0.002	0.002	0.001	0.001	0.016
Dozer	11	0.067	0.005	0.005	0.004	0.002	0.026
Vibratory Roller	8	0.036	0.003	0.003	0.000	0.001	0.015
Grader	6.3	0.031	0.003	0.003	0.000	0.001	0.013
Concrete Pumper Truck	54	0.685	0.055	0.037	0.004	0.013	0.148
Concrete Truck Mixing	54	1.162	0.081	0.055	0.007	0.023	0.251
Concrete Truck Travel	54	0.002	0.000	0.000	0.007	0.000	0.001
Crane/Manlift	590	4.845	0.348	0.239	0.063	0.144	3.404
Backhoe	2	0.011	0.002	0.002	0.000	0.000	0.013
Air Compressor	9	0.035	0.003	0.003	0.000	0.001	0.009
Dump Truck	47	0.010	0.001	0.000	0.010	0.000	0.005
Pick-Up Truck	250	0.001	0.001	0.000	0.052	0.000	0.007
Delivery Truck	2527	0.818	0.053	0.029	0.151	0.038	0.271
Total Emissions		**7.804**	**0.562**	**0.385**	**0.315**	**0.227**	**4.205**

5.1.3 Emissions from Painting Activities

For painting building structures, it was assumed that water-based latex paint would be used with a VOC content of half a pound per gallon and one gallon of paint covers approximately 300 SF. Three coats of paint will be applied (one primer and two finish) to approximately 1,500,000 SF of interior surfaces in Building C on the Medical Facilities Development. Because exact room numbers are not known, a conservative estimate of three times the approximate square footage of the building was used to estimate surfaces requiring paint.

Three coats of paint will be applied (one primer and two finish) to approximately 200,000 SF of interior surfaces in Building F from the University Expansion Alternatives 1 and 2. This value assumes that 50 percent of Building F would consist of a research area and 50 percent for classrooms/educational space. Research areas would have limited paint based on lesser painting surfaces and larger rooms with an approximate painting area of 20,000 SF of painting surfaces, whereas the classroom/educational area would be broken down into 50 x 50 classrooms, with 12-foot drop ceilings and four walls leading to approximately 174,000 SF of painting surfaces. Additional painting for hallways and other areas was estimated at 6,000 SF.

Painting numbers for the Medical Facilities Development and University Expansion are assumed to occur in Period 2. Total interior painting for buildings constructed over the course of each construction period create approximate VOC emissions of:

- Medical Facilities Development interior painting = 3.750 tons VOC

- University Expansion interior painting = 0.500 tons VOC

Emissions from painting parking spaces were based on 4-inch wide stripes. It was assumed that the average parking space is 9 feet wide by 19 feet long, and every two parking spaces share a common line. Approximately 9.24 SF would be painted for every parking space. For parking spaces, it was assumed that alkyd paint would be used with a VOC content of 3 pounds per gallon and 1 gallon of paint covers approximately 200 SF. One coat of paint would be applied to the parking surfaces. Both alternatives for University Expansion would include the construction of 400 parking spaces. For the Medical Facilities Development, there would 500 spaces in the underground parking structure and 475 spaces for the above-ground parking structure alternative. For Period 2 of the Medical Facilities Development, an estimate of 500 parking spaces is used for a conservative analysis. Given these assumptions, approximate VOC emissions for painting parking spaces would be:

- Medical Facilities Development - 500 Parking Space Painting = 0.034 tons VOC

- University Expansion Alternatives, 400 Parking Space Painting = 0.028 tons VOC.

Similarly, it is expected that all painting activities for both the Medical Facilities Development and University Expansion would occur during Period 2.

5.1.5 Summary of Construction Emissions

After emissions analysis was performed for all aspects of construction, the totals were added to determine the combined annual construction emissions for Periods 1 and 2. Tables 10 through 14 summarize the results for the Proposed Action Alternatives for the Medical Facilities Development and University Expansion.

Table 10: Total Emissions from Medical Facilities Development Construction – Underground Parking – Period 1

Construction Activity	Total Emissions (Tons)				
	NO_x	VOC	$PM_{2.5}$	SO_2	CO
Use of Heavy Equipment	**4.802**	**0.365**	**0.302**	0.111	1.830
Fugitive Emissions			1.588		
Total Emissions from Construction	**4.8024**	**0.365**	**1.890**	**0.111**	**1.830**

Table 11: Total Emissions from Medical Facilities Development Construction – Above-ground Parking – Period 1

Construction Activity	Total Emissions (Tons)				
	NO_x	VOC	$PM_{2.5}$	SO_2	CO
Use of Heavy Equipment	0.765	0.073	0.055	0.020	0.399
Fugitive Emissions			0.140		
Total Emissions from Construction	**0.767**	**0.073**	**0.195**	**0.020**	**0.399**

Table 12: Total Emissions from Medical Facilities Development Construction - Period 2

Construction Activity	Total Emissions (Tons)				
	NO_x	VOC	$PM_{2.5}$	SO_2	CO
Use of Heavy Equipment	18.960	1.433	1.029	0.542	10.426
Fugitive Emissions			0.976		
Painting		3.784			
Total Emissions from Construction	**18.960**	**5.217**	**2.005**	**0.542**	**10.426**

Table 13: Total Emissions from University Expansion Construction – Alternative 1 – Period 2

Construction Activity	Total Emissions (Tons)				
	NO_x	VOC	$PM_{2.5}$	SO_2	CO
Use of Heavy Equipment	7.874	0.566	0.3891	0.229	4.221
Fugitive Emissions			0.330		
Painting		0.528			
Total Emissions from Construction	**7.874**	**1.094**	**0.720**	**0.229**	**4.221**

Table 14: Total Emissions from University Expansion Construction – Alternative 2 – Period 2

Construction Activity	Total Emissions (Tons)				
	NO_x	VOC	$PM_{2.5}$	SO_2	CO
Use of Heavy Equipment	7.804	0.562	0.385	0.227	4.205
Fugitive Emissions			0.315		
Painting		0.528			
Total Emissions from Construction	**7.804**	**1.089**	**0.699**	**0.227**	**4.205**

5.2 Operations Emissions

Greenhouse gas (GHG) emissions, while not included as part of the conformity applicability analysis, are also included as a part of the operations write up. This ensures the same assumptions for both sets of air quality analyses and provides the assumptions in one location. The GHG section of the EIS is available in Section 4.4.4.

5.2.1 Heating Source Emissions

Designs for the proposed facilities at NSA Bethesda have not yet been prepared; therefore, actual boiler or furnace types and sizes have not been determined. Operational heating requirements for the EIS analysis are based on the most recent *Commercial Buildings Energy Consumption Survey* (CBECS) in 2003 conducted by the Department of Energy, Energy Information Administration. Table C-30 from that document indicates that the average energy intensity for lodging buildings using natural gas is 26.4 cubic feet (CF) of gas annually per SF of floor space for educational spaces and 78.3 CF of gas annually for health care facilities (DOE, 2003). At 1,000 British Thermal Units (BTUs) per CF of gas, this equates annually to 26,400 BTU and 78,300 BTU annually per SF of university and medical facility space, respectively.

Space and water heating would be required for the Medical Facilities Development Building C (573,000 SF) and for the University Expansion Building F (approximately 341,000 SF). However, Building C will be replacing existing 325,340 SF of facilities slated for demolition, removing an existing demand from the Central Utility Plant. Therefore the net increase in medical facility space would be 247,660 SF. This increase in medical and university space would require annually:

- (247,660 SF)(78.3 CF/SF) = 19.39 million CF natural gas
- (341,000 SF)(26.4 CF/SF) = 9.00 million CF natural gas

Operational heating emissions for the natural gas plant are based on USEPA's *AP-42 Fifth Edition, Compilation of Air Pollution Emission Factors Volume I, Chapter 1: Stationary Sources, Supplement E* (USEPA, 1998). The Title V permit for the central heating plant boilers restricts four of the boilers NO_x emission rates to 36 lb/10^6 CF of natural gas and one to 25 lb/10^6 CF of natural gas. These natural gas emission rates are significantly less than the 100 lb/10^6 CF natural gas assumed by the AP-42 manual. All new construction would be expected to be heated by the central heating plant; the greater of the permit boiler emission rates has been used in calculations.

Therefore, the following natural gas emission rates are assumed:

- NO_x = 36 lb NO_x /10^6 CF
- VOC = 5.5 lb/10^6 CF
- $PM_{2.5}$ = 7.6 lb/10^6 CF

- SO_2 = 0.6 lb/10^6 CF
- CO = 84 lb/10^6 CF
- CO_2 = 120,000 lb/10^6 CF (GHG analysis only)
- Methane = 2.3 lb/10^6 CF (GHG analysis only)

The resultant annual emissions are provided in Table 15.

Table 15: Total Annual Emissions from Heating – Natural Gas

Heating	Total Emissions (TPY)					GHGs	
	NO_x	VOC	$PM_{2.5}$	SO_2	CO	CO_2	CH_4
Medical Facilities Development	0.349	0.053	0.074	0.006	0.814	1163.50	0.022
University Expansion (Alternatives 1 & 2)	0.162	0.025	0.034	0.003	0.025	540.14	0.010

Using the same assumptions, the total GHG emissions from natural gas heating would be 1163.50 TPY CO_2 and 0.022 TPY methane (Medical Facilities Development) and 540.14 TPY CO_2 and 0.010 TPY methane (University Expansion.

Under their Title V permit, NSA Bethesda is also allowed to use fuel oil to heat buildings. While this is not anticipated, a sensitivity analysis has been conducted to determine the total emissions that would result from burning fuel oil to heat newly constructed buildings.

For this analysis it is assumed that for full operation, NSA Bethesda would not use natural gas for the new buildings and instead would burn #2 fuel oil. Approximately 281,000 gal/year would be required; the permit allows 1.6 million gal/year to be burned at NSA Bethesda. The analysis uses the permitted emission rate for NO_x and rates found in USEPA's *AP-42 Fifth Edition, Compilation of Air Pollution Emission Factors Volume I, Chapter 1: Stationary Sources, Supplement E* (USEPA, 1998) for the other pollutants. For the sulfur totals, the analysis assumes #2 oil at less than 100 MMBTU/hr and a SO_2 percentage limit in the Title V permit (0.3%). The following fuel oil emission rates are thus assumed:

- NO_x = 14.2 lb/10^3 gal of oil
- VOC = 0.34 lb/10^3 gal of oil
- $PM_{2.5}$ = 2 lb/10^3 gal of oil
- SO_2 = 42.6 lb/10^3 gal of oil
- CO = 5 lb/10^3 gal of oil

Resultant heating emissions for 100-percent use of fuel oil in the proposed medical and university buildings for full operations are shown in Table 16. These emissions are provided to demonstrate that significant air quality emissions would not occur if NSA Bethesda used fuel oil. Given that all new construction would be expected to be heated by the natural gas plant, these numbers are not included in the final general conformity applicability analysis and have not been analyzed for GHG emissions.

Table 16: Total Annual Emissions from Heating – #2 Fuel Oil

Heating	Total Emissions (TPY)				
	NO_x	VOC	$PM_{2.5}$	SO_2	CO
Medical Facilities Development	1.625	0.038	0.228	4.880	0.572
University Expansion (Alternatives 1 & 2)	0.372	0.008	0.052	1.120	0.131

5.2.2 Generators

Emergency generators have been identified as a requirement for the Medical Facility and for the parking garages for both the Medical Facility and University Expansion. As the exact size and number has not been determined, the EIS does not assume that they would require a modification to the Title V permit such that they would be exempt from the conformity analysis. Thus their estimated emissions are included in this air conformity applicability analysis.

A final rule has been proposed by USEPA for Standards of Performance for Stationary Compression Ignition and Spark Ignition Internal Combustion Engines (USEPA, 2011b). It specifies that manufacturers must certify their 2013 model year and later emergency stationary internal combustion engines (includes generators) with a maximum engine power less than 3,700 kW to the Tier 3 standards contained in 40 CFR 1042.101 (CFR, 2012). The standards are for NOx+HC, PM, and CO. This analysis uses these standards and ratios of NOx to HC provided by the Nonroad Model (USEPA, 2008) and the assumption that generators will use diesel fuel containing 15 ppm sulfur and average 167 g/hp-hr of fuel. For GHG emissions, this analysis uses 42 U.S.C. 7401 -7671q (September 15, 2011)- Control of Emissions from New and In-Use Heavy Duty Highway Engines (40 CFR 1036) (EPA, 2011c).

- NOx = 3.878 g/bhp-hr
- VOC = 0.313 g/bhp-hr
- $PM_{2.5}$ = 0.080 g/bhp-hr
- SO_2 = 0.0025 g/bhp-hr
- CO = 3.730 g/bhp-hr
- CO_2 = 627 g/bhp-hr
- Methane (CH_4) = 0.10 g/bhp-hr

Two 1,005 hp (750 kW) generators are assumed to be the requirement for the Medical Facility Development, with an additional 402 hp (300 kW) generator for the parking garage elevators, any lighting, and security elements, regardless of whether the garage is above or below ground. For the underground parking garage, additional 402 hp backup generator capacity would also be required to operate the doors, additional lighting, ventilation, and a dewatering system.

One 402 hp generator is assumed required for the University Expansion.

Using an assumption of 300 annual hours for the emergency generators, the annual emissions of NO_x, VOC, $PM_{2.5}$, SO_2, and CO were calculated as shown in Tables 17 and 18. Generators are assumed to come online in Period 3, full operation. For the purposes of this analysis, all operational emissions are combined into one year, beginning after all construction has been completed.

Table 17: Total Annual Emissions from Generators, Medical Facility

Activity	Total Emissions (TPY)					GHGs	
	NO_x	VOC	$PM_{2.5}$	SO_2	CO	CO_2	CH_4
Two 1005 hp generators, 300 annual hours each	2.578	0.208	0.053	0.002	2.479	416.76	0.066
One 402 hp generator, 300 annual hours	0.516	0.042	0.011	0.000	0.496	83.35	0.013
Total – Aboveground	**3.093**	**0.250**	**0.064**	**0.002**	**2.974**	**500.18**	**0.080**
Additional 402 hp generator capacity underground, 300 annual hours	0.516	0.042	0.011	0.000	0.496	83.35	0.013
Total – Underground	**3.609**	**0.291**	**0.074**	**0.002**	**2.974**	**583.47**	**0.093**

Table 18: Total Annual Emissions from Generators, University Expansion

Activity	Total Emissions (TPY)					GHGs	
	NO_x	VOC	$PM_{2.5}$	SO_2	CO	CO_2	CH_4
One 402 hp generator, 300 annual hours	**0.516**	**0.042**	**0.011**	**0.000**	**0.496**	**83.35**	**0.013**

5.2.4 Vehicle Emissions from Daily Commuters

Vehicle emissions from commuter vehicles are based on the *MOBILE6* air modeling program, estimating the emissions per vehicle per mile traveled. The *MOBILE6* modeling program takes into account the vehicle age, average speed, and vehicle type to create average emission factors to be used in an overall analysis. The analysis assumed that the annual average temperature is 57°F. Based on this assumption, the emissions factors for $PM_{2.5}$, SO_2, NO_x, CO, and VOC from average vehicles are provided in Table 19 (CO2 is provided for GHG; commuter vehicles are not a main source of methane).

Table 19: Emission Factors for Commuter Vehicles

Pollutant	Emissions Factor - grams/mile/vehicle
NO_x	0.441
VOC	1.093
$PM_{2.5}$	0.011
SO_2	0.0068
CO	20.12
CO_2 (GHG only)	386.1

The annual emissions in tons per year of NO_x, VOC, $PM_{2.5}$, and SO_2 for commuter emissions during operations were calculated using the appropriate equations displayed in Table 20.

Table 20: Equations for Operations Emissions Calculations

Emission Source	Equation	Sample Calculation
Operations, Commuters	(# of vehicles) (# of trips/day) (#miles/trip) (#days/year)= #miles/year (#miles/year) (emissions factor grams/mile) (1 lb/453.59 grams) (1 ton/2,000 lb) = TPY of Vehicle Emissions	(50 vehicles) (2 trips/day) (20 miles/trip) (240 days/year) (0.441 g/mile/vehicle) (1 lb/453.59 grams) (1 ton/2000 lbs) = **0.233 TPY NO_x**

Under both Alternatives, the Medical Facilities Development would add an additional 50 personnel. While there would be 220 staff incoming to NSA Bethesda due to the University Expansion, these are current USU already commuting within the airshed. Therefore, these commuters are part of existing emissions and are not included in the analysis. It is expected that commuters would travel approximately 40 miles round trip, and considering annual vacations and holidays, work 240 days per year. Based on these assumptions, the commuter vehicle emissions for the Medical Facilities Development are shown in Table 21.

Table 21: Annual Emissions from Daily Vehicle Traffic

	Total Annual Emissions – TPY					GHGs
	NO_x	VOC	$PM_{2.5}$	SO_2	CO	CO_2
Medical Facilities Development	0.233	0.578	0.006	0.004	10.64	204.29

5.2.3 Summary of Annual Operations Emissions

Annual operations emissions include emissions from heating the building space, generator emissions, and emissions from daily employee traffic. Tables 22 through 24 provide the total annual operations emissions from the Medical Facilities Development and the University Expansion. Section 5.2.3 includes a summary for the general conformity applicability analysis only. For the GHG summary, please see Section 4.4.4 of the EIS.

Table 22: Annual Emissions from Medical Facilities Development Operations (Above-ground Parking)

Operations Activity	Total Annual Emissions –TPY				
	NOx	VOC	$PM_{2.5}$	SO_2	CO
Heating	0.349	0.053	0.074	0.006	0.814
Commuter Traffic	0.233	0.578	0.006	0.004	10.64
Generators	3.093	0.250	0.064	0.002	2.974
Total Emissions from Operations	**3.676**	**0.881**	**0.143**	**0.011**	**14.435**

Table 23: Annual Emissions from Medical Facilities Development Operations (Underground Parking)

Operations Activity	Total Annual Emissions –TPY				
	NOx	VOC	$PM_{2.5}$	SO_2	CO
Heating	0.349	0.053	0.074	0.006	0.814
Commuter Traffic	0.233	0.578	0.006	0.004	10.64
Generators	3.609	0.291	0.074	0.002	3.470
Total Emissions from Operations	**4.191**	**0.923**	**0.154**	**0.012**	**14.930**

Table 24: Annual Emissions from University Expansion Operations (Alternatives 1 & 2)

Operations Activity	Total Annual Emissions –TPY				
	NOx	VOC	$PM_{2.5}$	SO_2	CO
Heating	0.162	0.025	0.034	0.003	0.025
Generators	**0.516**	**0.042**	**0.011**	**0.000**	**0.496**
Total Emissions from Operations	**0.678**	**0.066**	**0.045**	**0.003**	**0.521**

5.3 Summary of Construction and Operations Emissions

Each year's emissions were summed by combining the total emissions for construction and operations to determine whether emissions in any year exceed the *de minimis* values presented in the following Tables 25 through 27.

Table 25: Total Annual Emissions: Medical Facilities Development– Underground Parking - All Periods

Construction and Operations	Total Emissions (TPY)				
	NO_x	VOC	$PM_{2.5}$	SO_2	CO
***de minimis* thresholds**	100	50	100	100	100
Period 1	**4.802**	**0.365**	**1.890**	**0.111**	**1.830**
Period 2	**18.960**	**5.217**	**2.005**	**0.542**	**10.426**
Period 3 (Full Operation)	**4.191**	**0.923**	**0.154**	**0.012**	**14.930**

Table 26: Total Annual Emissions: Medical Facilities Development– Above-ground Parking - All Periods

Construction and Operations	Total Emissions (TPY)				
	NO_x	VOC	$PM_{2.5}$	SO_2	CO
***de minimis* thresholds**	100	50	100	100	100
Period 1	**0.765**	**0.073**	**0.195**	**0.020**	**0.399**
Period 2	**18.960**	**5.217**	**2.005**	**0.542**	**10.426**
Period 3 (Full Operation)	**3.676**	**0.881**	**0.143**	**0.011**	**14.435**

Table 27: Total Annual Emissions: University Expansion (Alternatives 1 & 2)

Construction and Operations	Total Emissions (TPY)				
	NO_x	VOC	$PM_{2.5}$	SO_2	CO
***de minimis* thresholds**	100	50	100	100	100
Period 2 (Alternative 1)	**7.874**	**1.094**	**0.720**	**0.229**	**4.221**
Period 2 (Alternative 2)	**7.804**	**1.089**	**0.699**	**0.227**	**4.205**
Period 3 (Full Operation – both Alts)	**0.678**	**0.066**	**0.045**	**0.003**	**0.521**

For any combination of the alternatives, the combined construction and operation emissions would not exceed the *de minimis* threshold for any of the pollutants analyzed. Therefore, a conformity determination is

not required. A Record of Non-Applicability has been prepared and is attached to this appendix.

6.0 References

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1.0 ATTACHMENT ONE: RECORD OF NON-APPLICABILITY

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GENERAL CONFORMITY – RECORD OF NON-APPLICABILITY

Project/Action
Name: Medical Facilities Development and University Expansion – NSA Bethesda

Project/Action
Point of Contact: Brian Hillis

General Conformity under the Clean Air Act, Section 176 has been evaluated for the project described above according to the requirements of 40 CFR 93, Subpart B. The General Conformity Rule applies to Federal actions occurring in regions designated as being in nonattainment for the National Ambient Air Quality Standards (NAAQS) or attainment areas subject to maintenance plans (maintenance areas). Threshold (*de minimis*) rates of emissions have been established for Federal actions with the potential to have significant air quality impacts. If a project/action located in an area designated as nonattainment or maintenance exceeds these *de mimimis* levels, a general conformity analysis is required. Montgomery County is designated as a moderate ozone (8-hour) nonattainment area in an ozone transport region, and a nonattainment area for particulate matter (2.5 microns), and a maintenance area for carbon monoxide (CO) thus the NO_x, VOC, $PM_{2.5}$, SO_2, and CO thresholds apply.

A General Conformity Analysis of this project/action is not required because maximum annual direct and indirect emissions from this project/action have been estimated as:

Medical Facilities Development (Underground Parking) – Period 1

NO_X: 4.802 tons per year (TPY); VOC: 0.365 TPY; $PM_{2.5}$: 1.890 tons; SO_2: 0.111 TPY; CO: 1.830

Medical Facilities Development (Above-ground Parking) – Period 1

NO_X: 0.767 TPY; VOC: 0.073 TPY; $PM_{2.5}$: 0.195 tons; SO_2: 0.020 TPY; CO: 0.399

Medical Facilities Development – Period 2

NO_X: 18.960 TPY; VOC: 5.217 TPY; $PM_{2.5}$: 2.005 tons; SO_2: 0.542 TPY; CO: 10.426 TPY

Medical Facilities Development – Period 3 – Full Operation (Underground Parking)

NO_X: 4.191 TPY; VOC: 0.923 TPY; $PM_{2.5}$: 0.154 tons; SO_2: 0.012 TPY; CO: 14.930 TPY

Medical Facilities Development – Period 3 – Full Operation (Above-ground Parking)

NO_X: 3.676 TPY; VOC: 0.881 TPY; $PM_{2.5}$: 0.143 tons; SO_2: 0.011 TPY; CO: 14.435 TPY

University Expansion (Alternative 1) – Period 2

NO_X: 7.874 TPY; VOC: 1.094 TPY; $PM_{2.5}$: 0.720 tons; SO_2: 0.229 TPY; CO: 4.221

University Expansion (Alternative 2) – Period 2

NO_X: 7.804 TPY; VOC: 1.089 TPY; $PM_{2.5}$: 0.699 tons; SO_2: 0.227 TPY; CO: 4.205

University Expansion (Alternative 2) – Period 3 – Full Operation

NO_X: 0.678 TPY; VOC: 0.066 TPY; $PM_{2.5}$: 0.045 tons; SO_2: 0.003 TPY; CO: 0.521

Any combination of these alternatives is below the *de minimis* levels established in 40 CFR 93.153 (b) of:

NO_x: 100 tons; VOC: 50 tons; $PM_{2.5}$: 100 tons; SO_2: 100 tons; CO: 100 tons

Montgomery County is in attainment for criteria pollutants NO_2, SO_2, PM_{10}, and Pb and therefore these pollutants are not subject to conformity review.

Supporting documentation and emissions estimates can be found in Section 3.4 and 4.4 and Appendix B of the Environmental Impact Statement document.

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APPENDIX C: STATIONARY SOURCE CONSTRUCTION NOISE TECHNICAL REPORT

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TABLE OF CONTENTS

1.0 Introduction 1
2.0 Stationary Source Noise Evaluation: Medical Facilities Development 3
2.1 Building C – Site Preparation (Demolition) and Construction 3
2.2 Parking Alternatives 5
2.3 Accessibility and Appearance Improvements 10
2.4 Utilities 10
2.5 Temporary Medical Facilities 11
2.6 Internal Renovations 12
3.0 Stationary Source Noise Evaluation: University Expansion ... 12
3.1 University Expansion – Alternative 1: Construction 13
3.2 University Expansion – Alternative 2: Construction 13
4.0 References 15
Attachment - RCNM Data Output 1

TABLES

Table 1: Estimated Construction Noise Levels at Nearby Receptors -- Building C 4
Table 2: Estimated Construction Noise Levels at Nearby Receptors -- Underground Parking 6
Table 3: Estimated Construction Noise Levels at Nearby Receptors -- Warehouse Area 7
Table 4: Estimated Construction Noise Levels at Nearby Receptors -- H-Lot 8
Table 5: Estimated Construction Noise Levels at Nearby Receptors -- Taylor Road Facilities 10
Table 6: Estimated Construction Noise Levels at Nearby Receptors -- Utility Upgrades 11
Table 7: Estimated Construction Noise Levels at Nearby Receptors -- Temporary Medical Facilities 12
Table 8: Estimated Construction Noise Levels at Nearby Receptors -- University Expansion Alternative 1 13
Table 9: Estimated Construction Noise Levels at Nearby Receptors -- University Expansion Alternative 2 14

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APPENDIX C: STATIONARY SOURCE CONSTRUCTION NOISE TECHNICAL REPORT

1.0 Introduction

During construction of the proposed project, noise would be generated by (1) the movement of trucks required for the off-site disposal of construction debris and excavated materials and by the on-site delivery of construction materials (mobile sources), and (2) by construction activity and the operation of construction equipment (stationary sources). The methodology used to estimate stationary noise at receptors near construction sites is described in this appendix.

General Construction Stationary Source Assessment Methodology

Identification of stationary construction equipment to be used during the construction period is the product of a multistep process that analyzed the foreseeable construction process based on proposed design concepts and available project information. First, construction activities were derived from an overall construction schedule. The duration, scheduling, and location of potential construction activities and sub-activities that would be required to fulfill the construction schedule was then deduced. Other parameters such as working hours (7:00 AM and 5:00 PM) and five working days per week were defined for the analysis. From these assumptions, the types and number of pieces of construction equipment were identified and enumerated.

Although the Montgomery County Noise Ordinance is not applicable at Naval Support Activity (NSA) Bethesda, the EIS adopted its levels as a proxy to evaluate the effects of construction noise at receptors located on the installation. The intent of the ordinance is to control noise in order to protect public health and welfare and to allow the peaceful enjoyment of property. The ordinance contains maximum noise levels that differ depending on the day of the week, where lower maximum noise levels apply during weekends.

Construction tasks were assumed in order to establish the construction equipment that may be utilized for each task and the resultant estimated noise levels during the various phases of construction. In general terms these tasks included: site preparation activities such as demolition of existing structures or grading and leveling; site excavation for foundations and basements; construction of foundations and basements, including building of forms, installation of steel reinforcement, and pouring or pumping concrete; erection of steel superstructures; and installation of curtain walls. Building finishes and interior work (plumbing, electric, interior walls, etc.) is generally done after the exterior walls have been installed, and noise

levels from this construction activity are normally significantly lower than noise levels from the other tasks identified here. As such, building finishes and interior work is not considered in this analysis.

With the identification of the types and number of pieces of equipment likely to be utilized, as well as general location, duration, and time of usage, typical noise emission levels from construction tasks were estimated. Construction equipment expected to be used for each task is identified below. These noise emission levels were used as a basis to evaluate potential stationary source construction noise impacts at receptor locations in the study area.

Another essential input used to calculate construction noise levels at each noise-sensitive receptor was the Acoustical Usage Factor (AUF). This is the percentage of time that a certain piece of equipment is expected to be operated at full throttle setting while on-site during the construction. Because the construction equipment is not expected to be in operation at full power continuously, an AUF was assigned to each piece of equipment based on Federal Transit Administration (FTA) guidelines and data from similar construction projects, and included equipment expected to be utilized during construction. The "Peak Quantity" is the number of equipment pieces to be utilized during a peak construction period, such as the peak one-hour period. The "Usage Factor" is the percentage of time that the equipment is expected to be in operation.

To capture the reasonable worst case condition in the stationary source noise assessment, the Federal Highway Administration (FHWA), Roadway Construction Noise Model (RCNM) was used to estimate sound pressure levels at sensitive receptors in the vicinity of project construction sites. Receptor buildings were evaluated based on the activity inside the building for both existing buildings on the installation and expected uses in buildings that would be occupied during the construction process. The RCNM was populated with construction equipment according to a reasonable worst case scenario where multiple pieces of construction equipment were in use concurrently.

Additionally, the RCNM was set up as if all the construction equipment was located at the perimeter of the construction sites, i.e., as close to the noise-receiving property as possible. Although this condition is unlikely, it represents the reasonable worst case scenario. The RCNM was executed for construction tasks indicated below and the modeling results are included later in this appendix.

As illustrated in the sections below, some elements of the proposed actions may require noise reduction measures to achieve the adopted noise levels. Potential noise reduction measures have been identified to control airborne noise impacts. Typical measures that would be considered and implemented as appropriate include:

- Source Limits and Performance Standards to meet noise level thresholds for daytime, evening, and nighttime hours at sensitive land uses (Montgomery County Standards)
- Restricting truck travel in areas where sensitive populations are proximate to the roadway
- Establishment of noise monitoring stations for measuring noise near sensitive receptors or fence line prior to and during construction
- Design considerations and project layout approaches including measures such as construction of temporary noise barriers, placing construction equipment farther from noise-sensitive receptors, and constructing walled enclosures/sheds around especially noisy activities such as pavement breaking

2.0 Stationary Source Noise Evaluation: Medical Facilities Development

Medical Facilities Development includes the following elements for which construction noise was evaluated:

- the demolition of five hospital buildings and construction of a single 5-story facility and associated parking garage for visitors, patients, and others;
- utility capacity upgrades;
- accessibility and appearance improvement projects; and
- temporary medical facilities to provide uninterrupted patient care during construction.

2.1 Building C – Site Preparation (Demolition) and Construction

Demolition and construction activity associated with Medical Facilities Development could potentially affect noise levels within NSA Bethesda and adjacent areas. Sources of demolition and construction noise include noise emission from: vehicle movement and operation within and around the development area; the operation of equipment and machinery such as jackhammers and compressors, cranes, and front-end loaders; the loading of demolition debris onto trucks for shipment off-site; unloading and movement of construction materials and supplies; drilling or driving foundation piles; steel erection and curtain wall installation; and operation of other construction equipment on-site.

Sensitive receptors considered in the noise assessment for Building C include the inpatient population in Building 19, Building 9, and Building 9A. Due to the distances between the proposed Building C and other receptors on the campus (Buildings 50, 60, 61, 62, 65, 66, and 67), and the structures situated between the construction site and these receptors, the effects of noise generated during construction of Building C on these receptors are not expected to be significant and are not evaluated here.

For the demolition stage, buildings located on the Medical Facilities Development site (Buildings 2, 4, 6, 7, and 8) would be vacated and stripped of all internal furnishings. These activities would largely occur within the buildings with little effect on outside ambient noise levels. Once outside, these internal furnishings would be loaded onto trucks using (in a worst case scenario) front-end loaders.

Following internal contaminant removal, building shell demolition would proceed. These buildings range from between one and five stories and should not represent obvious demolition difficulties. In the case of high buildings, demolition would require the staged deconstruction of each floor. Rubble and debris would then be systematically removed and disposed off-site.

The buildings proposed for demolition have basement levels. These sub-grade structures will also be removed. Due to the proximity of other buildings, demolition activities would be performed using construction equipment with the lowest vibration levels available. Blasting techniques would not be used. Material would be removed via dump trucks and/or dumpsters that would likely stage on R.B. Brown Drive and exit the campus to Rockville Pike or Jones Bridge Road.

Removal of basement structures and excavation for the Building C foundations is expected to be one of the more noisy periods of construction in this area. Equipment expected for these activities may include excavators, backhoes, front-end loaders, backhoe-mounted grapples, compressors and jackhammers, and dump trucks.

Receptors adjacent to and outside the southern wall of Building 19, and the northern walls of Buildings 9 and 9A, which were estimated to be located approximately 50 feet off the perimeter of the construction site, would experience noise levels presented in Table 1.

Table 1: Estimated Construction Noise Levels at Nearby Receptors -- Building C

Receptor	Demolition	Excavation	Foundations & Basements	Superstructure
Buildings 19, 9, & 9A	88.1 dBA	87.1 dBA	86.0 dBA	85.7 dBA

Source: LBG, 2011.

As shown in Table 1, occupants of buildings adjacent to the construction site may experience levels of noise in excess of those adopted, which states that a "person must not cause or permit noise levels from construction activity that exceed the following levels:

(A) From 7 AM to 5 PM weekdays:
(i) 75 dBA if the Maryland Department of Environmental Protection has not approved a noise-suppression plan for the activity; or
(ii) 85 dBA if the Department has approved a noise-suppression plan for the activity.

The levels shown in Table 1 are estimated levels at the outside of the building wall. Depending on the noise-attenuating effects of the building walls and windows, the levels within the building would be lower. Furthermore, a noise wall situated between the construction activity and the building would further mitigate noise experienced outside the construction site.

With some combination of a construction noise wall (potential 3 dBA attenuation) and the attenuating effect of the building walls and windows, construction noise would not exceed the adopted levels. Additional attenuation could be gained by actions such as vacating those rooms adjacent to the construction site, or by increasing the attenuating effect of the windows by adding another window pane. In instances where buildings are historic resources, temporary soundproofing material can be installed to the interior of the windows to reduce interior noise levels.

2.2 Parking Alternatives

- *Underground Parking* – Construction techniques to be used in the Underground Parking Garage have not been developed at this time. In order to capture a worst-case condition it is assumed that:
  - excavation for the garage would remove soil and bedrock to approximately 30 feet below the existing ground level;
  - exterior walls of the facility would be poured concrete supplied by a batching plant located on-site; and
  - precast concrete elements would comprise the inner walls, floors, and floor supports.

The RCNM was used to estimate the noise levels generated by each of these tasks. For excavation it was assumed that construction would be concurrent in three locations at the site: the northern end, the southern end, and in the center. The model was run with identical equipment in each of these locations. Equipment included in the model included a dozer, a dump truck, an excavator, a front-end loader, and a hoe ram.

Because of the shape of the building footprint (approximately 750 feet along the north/south axis), there would be 200 or 300 feet between these machines. As such, the only receptors to experience additive effects of multiple machines would be those located directly east or west of the site. Additionally, during the later stages of excavation, when construction would occur below the surface level, receptors would be shielded from many of the noise-generating machines. The noisiest periods of construction are likely to be at the beginning of excavation and at the end of the construction, during installation or

construction of the upper level of the facility. As such, a noise-attenuating factor of 5 dBA[1] was assigned to operation of the hoe rams (used for dislodging bedrock at the bottom of the excavation). Because construction of the foundations would occur at the bottom of the excavation, with no line-of-sight to nearby receptors, noise generated during this activity was not evaluated.

The nearest receptors to the construction area are those populations in Building 9A and Building 19, both situated approximately 80 feet distant. Any receptors located west of the site are at least 350 feet distant and across Rockville Pike. The Stone Ridge School is located more than 700 feet north of the construction site across largely open landscape offering little noise-attenuating elements. Estimated noise levels at Building 19 and Building 9A and at the Stone Ridge School are presented in Table 2.

Table 2: Estimated Construction Noise Levels at Nearby Receptors -- Underground Parking

Receptor	Excavation	Construction
Buildings 19 & 9A	79.6 dBA	81.2 dBA
Stone Ridge School	62.9 dBA	64.4 dBA

Source: LBG, 2011.

Construction of the Underground Parking facility would not exceed the adopted construction noise levels at these receptors. No significant adverse impacts are anticipated.

- *Warehouse Area* - Development of an above-ground parking garage in the warehouse area would involve clearing the existing uses on the site, minor excavation for foundations, building forms, installing steel reinforcement, and pouring concrete for the foundations. Equipment expected to be used for excavation and foundation work includes: backhoe, rebar bender, compactor, concrete mixer truck, concrete pump truck, bulldozer, dump truck, generator, pneumatic tools, compressor, and welder.

It is assumed that preformed concrete elements would form the bulk of the remaining structure. These elements would be trucked to the site and secured into place using a crane. Equipment expected for construction of the facility includes: backhoe, compressor, two

[1] FHWA Highway Noise Barrier Design Handbook, typical 5 dB(A) attenuation expected for receivers whose line-of-sight is just blocked.

cranes, flatbed truck, generator, man lift, pneumatic tools, welder, and pickup trucks.

This construction site is located approximately 190 feet southeast of private residential units along E. Parkhill Drive, and approximately 390 feet from the Flag Housing along Van Reypen Road. No other sensitive receptors within the NSA Bethesda installation are in the vicinity of the site. The warehouse area is approximately 30 feet lower in elevation that the Flag Housing to the southwest and slightly higher in elevation than the off-campus residences. A thin line of deciduous trees lies between the off-campus residences to the northeast and the site, and a line of evergreen trees lie between the site and the Flag Housing. Although these features would attenuate noise to some degree, they were not considered in the RCNM runs. The warehouses that would remain in place under this alternative are not located between the receptors and the construction site and would not mitigate construction noise at the receptors.

The RCNM was run for two stages of construction: ground preparation and foundations and installation of prefabricated structural elements. The noise generated by the two stages was estimated for both the private residences and the Flag Housing (see Table 3).

Table 3: Estimated Construction Noise Levels at Nearby Receptors -- Warehouse Area

Receptor	Ground Preparation and Foundations	Installation of Pre-Fabricated Elements
Private Residences	75.2 dBA	73.8 dBA
Flag Housing	68.9 dBA	67.5 dBA

Source: LBG, 2011.

Construction of the parking facility in the warehouse area would not exceed the adopted construction noise levels at these receptors. No significant adverse impacts are anticipated.

- *H-Lot* – Development of an above-ground parking garage at H-Lot would involve clearing the existing parking lot and trees on the site, minor excavation for foundations, building forms, installing steel reinforcement, and pouring concrete for the foundations. Equipment expected to be used for excavation and foundation work includes: backhoe, rebar bender, compactor, concrete mixer truck, concrete pump truck, bulldozer, dump truck, generator, pneumatic tools, compressor, and welder.

It is assumed that preformed concrete elements would form the bulk of the remaining structure. These elements would be trucked to the site and secured into place using a crane. Equipment expected for construction of the facility includes: backhoe, compressor, two

cranes, flatbed truck, generator, man lift, pneumatic tools, welder, and pickup trucks.

This construction site is located approximately 20 feet west of the Navy Lodge residential facility and approximately 100 feet south of the Fisher Houses. The day-care center is located approximately 650 feet west. Additionally, off-campus residential uses are located approximately 160 feet south of the H-Lot construction site, across Jones Bridge Road. No other sensitive receptors within NSA Bethesda are in the vicinity of the site. A thin line of deciduous trees lies between the off-campus residences to the south and the site, and between H-Lot and the day care center. Although these features would attenuate noise to some degree, they were not considered in the RCNM runs.

The RCNM was run for two stages of construction: ground preparation and foundations and installation of prefabricated structural elements. The noise generated by the two stages was estimated for the off-campus residences, the Child Care Center, the Fisher Houses, and the Navy Lodge (see Table 4).

Table 4: Estimated Construction Noise Levels at Nearby Receptors -- H-Lot

Receptor	Ground Preparation and Foundations	Installation of Pre-Fabricated Elements
Navy Lodge	94.7 dBA	93.3 dBA
Fisher Houses	80.7 dBA	79.3 dBA
Off-Campus Residences	76.7 dBA	75.3 dBA
Child Care Center	64.5 dBA	63.1 dBA

Source: LBG, 2011.

Construction of the parking facility at H-Lot would only exceed the adopted construction noise levels at the Navy Lodge. Almost 10 dBA of reduction would be needed to achieve levels identified in the ordinance. With some combination of a construction noise wall and other mitigation measures, and the attenuating effect of the building walls and windows, construction noise could be reduced to the adopted levels. Additional attenuation would be gained by vacating those rooms adjacent to the construction site, or by increasing the attenuating effect of the windows by adding another window pane or adding sound-proofing material.

- *Taylor Road Facilities* – Development of an above-ground parking garage at the Taylor Road Facilities would involve removing the parking lot from the site, minor excavation for foundations, building forms, installing steel reinforcement, and pouring concrete for the foundations. (For this analysis it is assumed that the existing structures on the construction site for this

alternative would no longer be on the site and would not provide attenuation of adjacent construction noise. Sanctuary Hall (Wounded Warrior Transition Lodge [WWTL]) and the associated garage would be in the latter stages of construction and would provide noise attenuation between the Taylor Road Facilities and the sensitive receptors. Additionally, it is assumed that the garage would be a 5-story structure situated between Sanctuary Hall (WWTL) and the construction site). Equipment expected to be used for ground preparation and foundation work includes: backhoe, rebar bender, compactor, concrete mixer truck, concrete pump truck, bulldozer, dump truck, generator, pneumatic tools, compressor, and welder.

It is assumed that preformed concrete elements would form the bulk of the remaining structure. These elements would be trucked to the site and secured into place using a crane. Equipment expected for construction of the facility includes: backhoe, compressor, two cranes, flatbed truck, generator, man lift, pneumatic tools, welder, and pickup trucks.

This construction site is located approximately 120 feet from the proposed Sanctuary Hall, with the proposed garage situated between the construction and Sanctuary Hall. A 10 dBa reduction was applied to the RCNM to account for the noise-shielding effect of the parking garage. Additionally, the construction site is approximately 320 feet southeast of the residences along Van Reypen Road. No other sensitive receptors within the NSA Bethesda installation are in the vicinity of the site.

The RCNM was run for two stages of construction: ground preparation and foundations and installation of prefabricated structural elements. The noise generated by the two stages was estimated for Sanctuary Hall (WWTL) and the Flag Houses along Van Reypen Road (see Table 5).

Table 5: Estimated Construction Noise Levels at Nearby Receptors -- Taylor Road Facilities

Receptor	Ground Preparation and Foundations	Installation of Pre-Fabricated Elements
Sanctuary Hall	65.2 dBA	63.8 dBA
Admiral Houses	70.6 dBA	69.2 dBA

Source: LBG, 2011.

Construction of the parking garage at the Taylor Road Facilities is not expected to exceed the adopted construction noise levels. No significant adverse noise impacts due to construction of the facility at this site are anticipated.

2.3 Accessibility and Appearance Improvements

Construction of the proposed Accessibility and Appearance Improvements would involve delivery of construction and landscaping materials and the use of light-duty construction equipment, such as forklifts, backhoes, and small hydro-static front end loaders. This work would occur throughout the campus. Noise generated by this activity would be short-term and temporary. Due to the limited duration of these projects and because of the light-duty equipment to be used, no significant adverse impacts on ambient noise conditions are anticipated.

2.4 Utilities

Upgrades to utilities would require: demolition of the existing utility plant (Building 143) and construction of a new 12,900 square foot (SF) plant; demolition of three existing cooling towers and the construction of four cooling towers; and replacement of existing utility transmission lines and installation of new utility transmission line throughout the campus.

Demolition of the existing utility plant would involve techniques similar to those required for demolition of the medical facilities, described above. The new utility plant and new cooling towers would be located on or adjacent to the existing facilities, where nearby uses include campus administration and support, residential, and research. For this analysis it is assumed that demolition of the utility plant and the cooling towers would be concurrent.

Fisher Houses are located approximately 400 feet south of the construction site for the utility plant and more than 500 feet south of the new coolers. For this analysis it is assumed that both the cooling towers and the utility plant are 400 feet from the Fisher Houses. A parking garage is located between the cooling tower construction site and the Fisher Houses, and a 10 dBa reduction in noise experienced at Fisher Houses was applied to the RCNM to account for the noise-shielding effect of the parking garage. Because there is a line-of-sight connection between the utility plant construction site

and Fisher Houses, this 10 dB reduction is not applied in the model. The Armed Forces Radiobiology Research Center (AFRRI) is located approximately 150 feet east of both the utility plant and the cooling towers. A line of deciduous trees occupies land between the construction site and AFRRI, but no noise reduction was applied to the RCNM for this analysis. The expected construction noise during demolition of the utility plant and cooling towers is presented in Table 6.

Excavation for and construction of the foundations for the utility plant and cooling would involve techniques similar to those required for excavation and foundation construction of the medical facilities, described above.

Table 6: Estimated Construction Noise Levels at Nearby Receptors -- Utility Upgrades

Receptors	Demolition	Excavation & Foundations	Superstructure Construction
Fisher Houses	70.3 dBA	68.3 dBA	68.3 dBA
AFRRI	81.6 dBA	79.9	79.1 dBA

Source: LBG, 2011.

Provided that construction activity in the vicinity of AFRRI occurs between the hours of 7 AM and 5 PM on weekdays, and provided the construction contractor has a noise-suppression plan approved by Montgomery County Department of Environmental Protection, construction of the Utility Plant and new cooling towers is not expected to generate construction noise above the adopted levels. No significant adverse noise impacts due to construction of the facility at this site are anticipated. Construction occurring on weekends or after 5 PM on weekdays would require some combination of mitigation measures to reduce noise levels, as discussed earlier.

Upgrades to utility infrastructure throughout NSA Bethesda would also involve new trenching in some areas or exposing utility transmission lines in existing trenches in other areas. In areas where jackhammers or other loud equipment are used adjacent to sensitive receptors, it may be necessary to build a temporary noise wall between the construction site and the receptor, or otherwise attenuate excessive noise levels. No significant adverse noise impacts due to construction of the facility at this site are anticipated.

2.5 Temporary Medical Facilities

Temporary medical facilities would be constructed at the existing G-Lot parking area. These structures are intended to be temporary, and would be modular, prefabricated structures placed on the existing parking areas. The modular elements would be trucked in and set in place with a mobile crane. Utility connections would involve underground electric and communications lines and connections to water

and sanitary sewer lines. Trenching and installation for temporary utilities would require jackhammers, backhoes and dump trucks, etc.

For the analysis of potential noise impacts on receptors in the vicinity, it is assumed that trenching for temporary utilities, installation of utilities, and delivery and installation of the modular medical facilities would be concurrent, but the construction equipment would be spread across the construction site. It is also assumed that construction activity would not occur within approximately 30 feet from the edge of the asphalt surface.

Several facilities that comprise the Stone Ridge School are located approximately 20 feet north of G-Lot. Also, on-campus residential uses are located approximately 50 feet east of the lot. As such, the RCNM was run at different distances from the receptors with the following equipment: a backhoe, compressor, jackhammer, dump truck and flatbed truck, generator, welder, tractor-trailer rig, and a crane. The results of the model run are presented in Table 7.

Table 7: Estimated Construction Noise Levels at Nearby Receptors -- Temporary Medical Facilities

Receptor	Noise Level
Stone Ridge School	81.2 dBA
Housing East of G-Lot	79.2 dBA

Source: LBG, 2011.

Construction of the temporary medical facilities is not expected to exceed the adopted construction noise levels at these receptors. No significant adverse noise impacts due to construction of the facility at this site are anticipated.

2.6 Internal Renovations

Internal renovations would occur inside existing buildings and would not use heavy construction equipment. Power for hand tools would be supplied off existing electrical systems within the buildings and would not require generators. Temporary and intermittent noise from vehicles delivering construction materials and pickup trucks transporting workers are not expected to create significant noise impacts.

3.0 Stationary Source Noise Evaluation: University Expansion

The proposed University Expansion would entail the construction of a new, approximately 341,000 SF educational and research building, and an approximately 144,000 SF, 400-space parking structure. Two alternative locations for the building are considered here: Alternative 1 would place the University Expansion south of the

existing University and east of Grier Road; Alternative 2 would place the University Expansion between the University and AFRRI.

Construction for both alternatives would require similar construction equipment and techniques, and the equipment and techniques would be similar to those of the Medical Facilities Development. For either alternative, construction materials would likely be transported through Gate 5 and travel to the construction site via South Palmer Road.

3.1 University Expansion - Alternative 1: Construction

The Navy Lodge is located approximately 300 feet west of the construction site and the existing University Facilities are approximately 120 feet north of the construction site. Private residences south of Jones Bridge Road are located approximately 440 feet southwest of the construction site.

The RCNM was used to predict noise levels due to construction of the University Expansion at the location of Alternative 1 at the Navy Lodge, the existing University Facilities, and at the residences located south of Jones Bridge Road (Table 8). Although some portion of the wooded buffer between Alternative 1 and Jones Bridge Road would remain, the noise-mitigating effects of this buffer were not considered in this construction noise analysis.

Table 8: Estimated Construction Noise Levels at Nearby Receptors -- University Expansion Alternative 1

Receptor	Excavation and Ground Preparation	Foundations & Basements	Superstructure
Navy Lodge	72.5 dBA	70.8 dBA	70.5 dBA
University Facilities	80.5 dBA	78.8 dBA	78.4 dBA
Private Residences	69.2 dBA	67.5 dBA	67.1 dBA

Source: LBG, 2011.

Construction of Alternative 1 is not expected to exceed the adopted construction noise levels.

3.2 University Expansion - Alternative 2: Construction

The Fisher Houses are located approximately 320 feet southwest of the construction site, and the existing Uniformed Services University Facilities are approximately 25 feet east. AFRRI is located approximately 25 feet west of the construction site.

The RCNM was used to predict noise levels due to construction of the University Expansion at the location of Alternative 2 for receptors at

the Fisher Houses, the existing University Facilities, and AFRRI (Table 9).

Table 9: Estimated Construction Noise Levels at Nearby Receptors -- University Expansion Alternative 2

Receptor	Excavation and Ground Preparation	Foundations & Basements	Superstructure
Fisher Houses	71.9 dBA	70.2 dBA	69.9 dBA
University Facilities	94.1 dBA	92.4 dBA	92.1 dBA
AFRRI	94.1 dBA	92.4 dBA	92.1 dBA

Source: LBG, 2011.

Without noise-attenuating measures, construction of Alternative 2 of the University Expansion would exceed the adopted construction noise levels at the western wall of the University and at AFRRI. Noise attenuation across masonry walls is in the range of between 30 dB and 50 dB. However, if these walls include windows, the attenuating effect is reduced to a range of between 10 dB and 20 dB for single pane windows. Depending on the noise-attenuating capacity of the walls and windows of the University and AFRRI, noise inside the buildings may also exceed identified levels. Some combination of noise-attenuating measures would be needed during periods when construction is occurring adjacent to these facilities. Possible measures to reduce noise impacts inside the building include vacating rooms adjacent to the construction activity, or the temporary placement of sound proofing material over the interior of the windows.

4.0 References

(LBG, 2011). The Louis Berger Group, Inc. Noise Modeling at NSA Bethesda for the Construction Activities Associated with the Proposed Medical Facilities Development and University Expansion. December 2011.

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Attachment - RCNM Data Output

Raw data output files from the RCNM are provided in the attachment to this appendix. The files are presented in the same order as the discussion above.

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BUILDING C

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Build C Demo
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/07/2011
Case Description: Build C - Demo

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Adjacent Receptors	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	50.0	0.0
Crane	No	16		80.6	50.0	0.0
Jackhammer	Yes	20		88.9	50.0	0.0
Backhoe	No	40		77.6	50.0	0.0
Concrete Saw	No	20		89.6	50.0	0.0
Front End Loader	No	40		79.1	50.0	0.0
Grapple (on backhoe)	No	40		87.0	50.0	0.0
Dump Truck	No	40		76.5	50.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Compressor (air)	77.7	73.7
Crane	80.6	72.6
Jackhammer	88.9	81.9
Backhoe	77.6	73.6
Concrete Saw	89.6	82.6
Front End Loader	79.1	75.1
Grapple (on backhoe)	87.0	83.0
Dump Truck	76.5	72.5
Total	89.6	88.1

Build C Excavation

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/07/2011
Case Description: Excavation Building C

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Adj. Building C	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	50.0	0.0
Front End Loader	No	40		79.1	50.0	0.0
Excavator	No	40		80.7	50.0	0.0
Dump Truck	No	40		76.5	50.0	0.0
Compressor (air)	No	40		77.7	50.0	0.0
Jackhammer	Yes	20		88.9	50.0	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	50.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	77.6	73.6
Front End Loader	79.1	75.1
Excavator	80.7	76.7
Dump Truck	76.5	72.5
Compressor (air)	77.7	73.7
Jackhammer	88.9	81.9
Mounted Impact Hammer (hoe ram)	90.3	83.3
Total	90.3	87.1

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/07/2011
Case Description: Build C - Foundations & Basements

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Adjacent Receptors	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	50.0	0.0
Compressor (air)	No	40		77.7	50.0	0.0
Compactor (ground)	No	20		83.2	50.0	0.0
Concrete Batch Plant	No	15	83.0		50.0	0.0
Bar Bender	No	20	80.0		50.0	0.0
Concrete Pump Truck	No	20		81.4	50.0	0.0
Generator	No	50		80.6	50.0	0.0
Pickup Truck	No	40		75.0	50.0	0.0
Pneumatic Tools	No	50		85.2	50.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	77.6	73.6
Compressor (air)	77.7	73.7
Compactor (ground)	83.2	76.2
Concrete Batch Plant	83.0	74.8
Bar Bender	80.0	73.0
Concrete Pump Truck	81.4	74.4
Generator	80.6	77.6
Pickup Truck	75.0	71.0
Pneumatic Tools	85.2	82.2
Total	85.2	86.0

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/07/2011
Case Description: Building C - Superstructure

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Adjacent Receptors	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	50.0	0.0
Crane	No	16		80.6	50.0	0.0
Flat Bed Truck	No	40		74.3	50.0	0.0
Generator	No	50		80.6	50.0	0.0
Front End Loader	No	40		79.1	50.0	0.0
Man Lift	No	20		74.7	50.0	0.0
Welder / Torch	No	40		74.0	50.0	0.0
Concrete Batch Plant	No	15	83.0		50.0	0.0
Pneumatic Tools	No	50		85.2	50.0	0.0
Bar Bender	No	20	80.0		50.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Compressor (air)	77.7	73.7
Crane	80.6	72.6
Flat Bed Truck	74.3	70.3
Generator	80.6	77.6
Front End Loader	79.1	75.1
Man Lift	74.7	67.7
Welder / Torch	74.0	70.0
Concrete Batch Plant	83.0	74.8
Pneumatic Tools	85.2	82.2
Bar Bender	80.0	73.0
Total	85.2	85.7

PARKING GARAGE:

1. UNDERGROUND PARKING GARAGE
2. ABOVE-GROUND GARAGE AT WAREHOUSE AREA
3. ABOVE-GROUND GARAGE AT H LOT
4. ABOVE-GROUND GARAGE AT TAYLOR ROAD FACILITIES

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PARKING GARAGE:

UNDERGROUND PARKING GARAGE

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Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/08/2011
Case Description: Underground Parking Garage Excavation

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Buildings 19 and 9A	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	80.0	0.0
Dozer	No	40		81.7	400.0	0.0
Dozer	No	40		81.7	750.0	0.0
Dump Truck	No	40		76.5	80.0	0.0
Dump Truck	No	40		76.5	400.0	0.0
Dump Truck	No	40		76.5	750.0	0.0
Excavator	No	40		80.7	80.0	0.0
Excavator	No	40		80.7	400.0	0.0
Excavator	No	40		80.7	750.0	0.0
Front End Loader	No	40		79.1	80.0	0.0
Front End Loader	No	40		79.1	400.0	0.0
Front End Loader	No	40		79.1	750.0	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	80.0	5.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	400.0	5.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	750.0	5.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Dozer	77.6	73.6
Dozer	63.6	59.6
Dozer	58.1	54.2
Dump Truck	72.4	68.4
Dump Truck	58.4	54.4
Dump Truck	52.9	48.9
Excavator	76.6	72.6
Excavator	62.6	58.7
Excavator	57.2	53.2
Front End Loader	75.0	71.0
Front End Loader	61.0	57.1
Front End Loader	55.6	51.6
Mounted Impact Hammer (hoe ram)	81.2	74.2
Mounted Impact Hammer (hoe ram)	67.2	60.2
Mounted Impact Hammer (hoe ram)	61.8	54.8
Total	81.2	79.6

Parking garage Excavation

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Stone Ridge School	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	700.0	0.0
Dozer	No	40		81.7	1000.0	0.0
Dozer	No	40		81.7	1450.0	0.0
Dump Truck	No	40		76.5	700.0	0.0
Dump Truck	No	40		76.5	1000.0	0.0
Dump Truck	No	40		76.5	1450.0	0.0
Excavator	No	40		80.7	700.0	0.0
Excavator	No	40		80.7	1000.0	0.0
Excavator	No	40		80.7	1450.0	0.0
Front End Loader	No	40		79.1	700.0	0.0
Front End Loader	No	40		79.1	1000.0	0.0
Front End Loader	No	40		79.1	1450.0	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	700.0	5.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	1000.0	5.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	1450.0	5.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Dozer	58.7	54.8
Dozer	55.6	51.7
Dozer	52.4	48.4
Dump Truck	53.5	49.5
Dump Truck	50.4	46.5
Dump Truck	47.2	43.2
Excavator	57.8	53.8
Excavator	54.7	50.7
Excavator	51.5	47.5
Front End Loader	56.2	52.2
Front End Loader	53.1	49.1
Front End Loader	49.9	45.9
Mounted Impact Hammer (hoe ram)	62.4	55.4
Mounted Impact Hammer (hoe ram)	59.3	52.3
Mounted Impact Hammer (hoe ram)	56.0	49.0
Total	62.4	62.9

Parking garage Construction
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/08/2011
Case Description: Parking Garage Construction

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Buildings 19 & 9A	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Bar Bender	No	20	80.0		80.0	0.0
Bar Bender	No	20	80.0		400.0	0.0
Bar Bender	No	20	80.0		750.0	0.0
Concrete Batch Plant	No	15	83.0		400.0	0.0
Concrete Pump Truck	No	20		81.4	80.0	0.0
Crane	No	16		80.6	750.0	0.0
Crane	No	16		80.6	80.0	0.0
Generator	No	50		80.6	80.0	0.0
Generator	No	50		80.6	400.0	0.0
Generator	No	50		80.6	750.0	0.0
Backhoe	No	40		77.6	80.0	0.0
Backhoe	No	40		77.6	400.0	0.0
Backhoe	No	40		77.6	750.0	0.0
Pneumatic Tools	No	50		85.2	80.0	0.0
Pneumatic Tools	No	50		85.2	400.0	0.0
Pneumatic Tools	No	50		85.2	750.0	0.0
Welder / Torch	No	40		74.0	80.0	0.0
Welder / Torch	No	40		74.0	400.0	0.0
Welder / Torch	No	40		74.0	750.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Bar Bender	75.9	68.9
Bar Bender	61.9	54.9
Bar Bender	56.5	49.5
Concrete Batch Plant	64.9	56.7
Concrete Pump Truck	77.3	70.3
Crane	57.0	49.1
Crane	76.5	68.5
Generator	76.5	73.5
Generator	62.6	59.6
Generator	57.1	54.1
Backhoe	73.5	69.5
Backhoe	59.5	55.5
Backhoe	54.0	50.1
Pneumatic Tools	81.1	78.1
Pneumatic Tools	67.1	64.1
Pneumatic Tools	61.7	58.6
Welder / Torch	69.9	65.9
Welder / Torch	55.9	52.0
Welder / Torch	50.5	46.5
Total	81.1	81.2

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Stone Ridge School	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Bar Bender	No	20	80.0		700.0	0.0
Bar Bender	No	20	80.0		1000.0	0.0
Bar Bender	No	20	80.0		1450.0	0.0
Concrete Batch Plant	No	15	83.0		1000.0	0.0
Concrete Pump Truck	No	20		81.4	700.0	0.0
Crane	No	16		80.6	700.0	0.0
Crane	No	16		80.6	1450.0	0.0
Generator	No	50		80.6	700.0	0.0
Generator	No	50		80.6	1000.0	0.0
Generator	No	50		80.6	1450.0	0.0
Backhoe	No	40		77.6	700.0	0.0
Backhoe	No	40		77.6	1000.0	0.0
Backhoe	No	40		77.6	1450.0	0.0
Pneumatic Tools	No	50		85.2	700.0	0.0
Pneumatic Tools	No	50		85.2	1000.0	0.0
Pneumatic Tools	No	50		85.2	1450.0	0.0
Welder / Torch	No	40		74.0	700.0	0.0
Welder / Torch	No	40		74.0	1000.0	0.0
Welder / Torch	No	40		74.0	1450.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Bar Bender	57.1	50.1
Bar Bender	54.0	47.0
Bar Bender	50.8	43.8
Concrete Batch Plant	57.0	48.7
Concrete Pump Truck	58.5	51.5
Crane	57.6	49.7
Crane	51.3	43.3
Generator	57.7	54.7
Generator	54.6	51.6
Generator	51.4	48.4
Backhoe	54.6	50.7
Backhoe	51.5	47.6
Backhoe	48.3	44.3
Pneumatic Tools	62.3	59.2
Pneumatic Tools	59.2	56.1
Pneumatic Tools	55.9	52.9
Welder / Torch	51.1	47.1
Welder / Torch	48.0	44.0
Welder / Torch	44.8	40.8
Total	62.3	64.4

ABOVE-GROUND GARAGE AT WAREHOUSE AREA

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Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/08/2011
Case Description: Warehouse Excavation

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Private Residences	Residential	59.2	59.2	59.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	190.0	0.0
Bar Bender	No	20	80.0		190.0	0.0
Compactor (ground)	No	20		83.2	190.0	0.0
Concrete Mixer Truck	No	40		78.8	190.0	0.0
Concrete Pump Truck	No	20		81.4	190.0	0.0
Dozer	No	40		81.7	190.0	0.0
Dump Truck	No	40		76.5	190.0	0.0
Generator	No	50		80.6	190.0	0.0
Pneumatic Tools	No	50		85.2	190.0	0.0
Compressor (air)	No	40		77.7	190.0	0.0
Welder / Torch	No	40		74.0	190.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	66.0	62.0
Bar Bender	68.4	61.4
Compactor (ground)	71.6	64.6
Concrete Mixer Truck	67.2	63.2
Concrete Pump Truck	69.8	62.8
Dozer	70.1	66.1
Dump Truck	64.9	60.9
Generator	69.0	66.0
Pneumatic Tools	73.6	70.6
Compressor (air)	66.1	62.1
Welder / Torch	62.4	58.4
Total	73.6	75.2

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Admiral Housing	Residential	59.7	59.7	59.7

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	390.0	0.0
Bar Bender	No	20	80.0		390.0	0.0
Compactor (ground)	No	20		83.2	390.0	0.0
Concrete Mixer Truck	No	40		78.8	390.0	0.0
Concrete Pump Truck	No	20		81.4	390.0	0.0
Dozer	No	40		81.7	390.0	0.0
Dump Truck	No	40		76.5	390.0	0.0
Generator	No	50		80.6	390.0	0.0
Pneumatic Tools	No	50		85.2	390.0	0.0
Compressor (air)	No	40		77.7	390.0	0.0
Welder / Torch	No	40		74.0	390.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	59.7	55.7
Bar Bender	62.2	55.2
Compactor (ground)	65.4	58.4
Concrete Mixer Truck	61.0	57.0
Concrete Pump Truck	63.6	56.6
Dozer	63.8	59.8
Dump Truck	58.6	54.6
Generator	62.8	59.8
Pneumatic Tools	67.3	64.3
Compressor (air)	59.8	55.8
Welder / Torch	56.2	52.2
Total	67.3	68.9

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/08/2011
Case Description: Warehouse Area Construction

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Private Residences	Residential	59.2	59.2	59.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	190.0	0.0
Compressor (air)	No	40		77.7	190.0	0.0
Crane	No	16		80.6	190.0	0.0
Flat Bed Truck	No	40		74.3	190.0	0.0
Generator	No	50		80.6	190.0	0.0
Man Lift	No	20		74.7	190.0	0.0
Pneumatic Tools	No	50		85.2	190.0	0.0
Welder / Torch	No	40		74.0	190.0	0.0
Pickup Truck	No	40		75.0	190.0	0.0
Crane	No	16		80.6	190.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	66.0	62.0
Compressor (air)	66.1	62.1
Crane	69.0	61.0
Flat Bed Truck	62.7	58.7
Generator	69.0	66.0
Man Lift	63.1	56.1
Pneumatic Tools	73.6	70.6
Welder / Torch	62.4	58.4
Pickup Truck	63.4	59.4
Crane	69.0	61.0
Total	73.6	73.8

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Admiral Housing	Residential	59.7	59.7	59.7

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	390.0	0.0
Compressor (air)	No	40		77.7	390.0	0.0
Crane	No	16		80.6	390.0	0.0
Flat Bed Truck	No	40		74.3	390.0	0.0
Generator	No	50		80.6	390.0	0.0
Man Lift	No	20		74.7	390.0	0.0
Pneumatic Tools	No	50		85.2	390.0	0.0
Welder / Torch	No	40		74.0	390.0	0.0
Pickup Truck	No	40		75.0	390.0	0.0
Crane	No	16		80.6	390.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	59.7	55.7
Compressor (air)	59.8	55.8
Crane	62.7	54.7
Flat Bed Truck	56.4	52.4
Generator	62.8	59.8
Man Lift	56.9	49.9
Pneumatic Tools	67.3	64.3
Welder / Torch	56.2	52.2
Pickup Truck	57.2	53.2
Crane	62.7	54.7
Total	67.3	67.5

ABOVE-GROUND GARAGE AT H LOT

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Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/12/2011
Case Description: Lot H Excavation

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Navy Lodge	Residential	59.2	59.2	59.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	20.0	0.0
Bar Bender	No	20	80.0		20.0	0.0
Compactor (ground)	No	20		83.2	20.0	0.0
Concrete Mixer Truck	No	40		78.8	20.0	0.0
Concrete Pump Truck	No	20		81.4	20.0	0.0
Dozer	No	40		81.7	20.0	0.0
Dump Truck	No	40		76.5	20.0	0.0
Generator	No	50		80.6	20.0	0.0
Pneumatic Tools	No	50		85.2	20.0	0.0
Compressor (air)	No	40		77.7	20.0	0.0
Welder / Torch	No	40		74.0	20.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	85.5	81.5
Bar Bender	88.0	81.0
Compactor (ground)	91.2	84.2
Concrete Mixer Truck	86.8	82.8
Concrete Pump Truck	89.4	82.4
Dozer	89.6	85.6
Dump Truck	84.4	80.4
Generator	88.6	85.6
Pneumatic Tools	93.1	90.1
Compressor (air)	85.6	81.6
Welder / Torch	82.0	78.0
Total	93.1	94.7

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Fisher Houses	Residential	59.7	59.7	59.7

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	100.0	0.0
Bar Bender	No	20	80.0		100.0	0.0
Compactor (ground)	No	20		83.2	100.0	0.0
Concrete Mixer Truck	No	40		78.8	100.0	0.0
Concrete Pump Truck	No	20		81.4	100.0	0.0
Dozer	No	40		81.7	100.0	0.0
Dump Truck	No	40		76.5	100.0	0.0
Generator	No	50		80.6	100.0	0.0
Pneumatic Tools	No	50		85.2	100.0	0.0
Compressor (air)	No	40		77.7	100.0	0.0
Welder / Torch	No	40		74.0	100.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	71.5	67.6
Bar Bender	74.0	67.0
Compactor (ground)	77.2	70.2
Concrete Mixer Truck	72.8	68.8
Concrete Pump Truck	75.4	68.4
Dozer	75.6	71.7
Dump Truck	70.4	66.5
Generator	74.6	71.6
Pneumatic Tools	79.2	76.1
Compressor (air)	71.6	67.7
Welder / Torch	68.0	64.0
Total	79.2	80.7

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Off-Campus Residences	Residential	64.6	64.6	64.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	160.0	0.0
Bar Bender	No	20	80.0		160.0	0.0
Compactor (ground)	No	20		83.2	160.0	0.0
Concrete Mixer Truck	No	40		78.8	160.0	0.0
Concrete Pump Truck	No	20		81.4	160.0	0.0
Dozer	No	40		81.7	160.0	0.0
Dump Truck	No	40		76.5	160.0	0.0
Generator	No	50		80.6	160.0	0.0
Pneumatic Tools	No	50		85.2	160.0	0.0
Compressor (air)	No	40		77.7	160.0	0.0
Welder / Torch	No	40		74.0	160.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	67.5	63.5
Bar Bender	69.9	62.9
Compactor (ground)	73.1	66.1
Concrete Mixer Truck	68.7	64.7
Concrete Pump Truck	71.3	64.3
Dozer	71.6	67.6
Dump Truck	66.3	62.4
Generator	70.5	67.5
Pneumatic Tools	75.1	72.1
Compressor (air)	67.6	63.6
Welder / Torch	63.9	59.9
Total	75.1	76.7

**** Receptor #4 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Child Care Center	Residential	64.6	64.6	64.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	650.0	0.0
Bar Bender	No	20	80.0		650.0	0.0
Compactor (ground)	No	20		83.2	650.0	0.0
Concrete Mixer Truck	No	40		78.8	650.0	0.0
Concrete Pump Truck	No	20		81.4	650.0	0.0
Dozer	No	40		81.7	650.0	0.0
Dump Truck	No	40		76.5	650.0	0.0
Generator	No	50		80.6	650.0	0.0
Pneumatic Tools	No	50		85.2	650.0	0.0
Compressor (air)	No	40		77.7	650.0	0.0
Welder / Torch	No	40		74.0	650.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	55.3	51.3
Bar Bender	57.7	50.7
Compactor (ground)	61.0	54.0
Concrete Mixer Truck	56.5	52.5
Concrete Pump Truck	59.1	52.1
Dozer	59.4	55.4
Dump Truck	54.2	50.2
Generator	58.4	55.3
Pneumatic Tools	62.9	59.9
Compressor (air)	55.4	51.4
Welder / Torch	51.7	47.7
Total	62.9	64.5

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/12/2011
Case Description: Lot H Construction

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Navy Lodge	Residential	59.2	59.2	59.2

Description	Impact Device	Usage (%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	20.0	0.0
Compressor (air)	No	40		77.7	20.0	0.0
Crane	No	16		80.6	20.0	0.0
Flat Bed Truck	No	40		74.3	20.0	0.0
Generator	No	50		80.6	20.0	0.0
Man Lift	No	20		74.7	20.0	0.0
Pneumatic Tools	No	50		85.2	20.0	0.0
Welder / Torch	No	40		74.0	20.0	0.0
Pickup Truck	No	40		75.0	20.0	0.0
Crane	No	16		80.6	20.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	85.5	81.5
Compressor (air)	85.6	81.6
Crane	88.5	80.6
Flat Bed Truck	82.2	78.2
Generator	88.6	85.6
Man Lift	82.7	75.7
Pneumatic Tools	93.1	90.1
Welder / Torch	82.0	78.0
Pickup Truck	83.0	79.0
Crane	88.5	80.6
Total	93.1	93.3

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Fisher Houses	Residential	59.7	59.7	59.7

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	100.0	0.0
Compressor (air)	No	40		77.7	100.0	0.0
Crane	No	16		80.6	100.0	0.0
Flat Bed Truck	No	40		74.3	100.0	0.0
Generator	No	50		80.6	100.0	0.0
Man Lift	No	20		74.7	100.0	0.0
Pneumatic Tools	No	50		85.2	100.0	0.0
Welder / Torch	No	40		74.0	100.0	0.0
Pickup Truck	No	40		75.0	100.0	0.0
Crane	No	16		80.6	100.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	71.5	67.6
Compressor (air)	71.6	67.7
Crane	74.5	66.6
Flat Bed Truck	68.2	64.3
Generator	74.6	71.6
Man Lift	68.7	61.7
Pneumatic Tools	79.2	76.1
Welder / Torch	68.0	64.0
Pickup Truck	69.0	65.0
Crane	74.5	66.6
Total	79.2	79.3

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Off-Campus Residences	Residential	64.6	64.6	64.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	160.0	0.0
Compressor (air)	No	40		77.7	160.0	0.0
Crane	No	16		80.6	160.0	0.0
Flat Bed Truck	No	40		74.3	160.0	0.0
Generator	No	50		80.6	160.0	0.0
Man Lift	No	20		74.7	160.0	0.0
Pneumatic Tools	No	50		85.2	160.0	0.0
Welder / Torch	No	40		74.0	160.0	0.0
Pickup Truck	No	40		75.0	160.0	0.0
Crane	No	16		80.6	160.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	67.5	63.5
Compressor (air)	67.6	63.6
Crane	70.4	62.5
Flat Bed Truck	64.1	60.2
Generator	70.5	67.5
Man Lift	64.6	57.6
Pneumatic Tools	75.1	72.1
Welder / Torch	63.9	59.9
Pickup Truck	64.9	60.9
Crane	70.4	62.5
Total	75.1	75.3

**** Receptor #4 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Child Care Center	Residential	64.6	64.6	64.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	650.0	0.0
Compressor (air)	No	40		77.7	650.0	0.0
Crane	No	16		80.6	650.0	0.0
Flat Bed Truck	No	40		74.3	650.0	0.0
Generator	No	50		80.6	650.0	0.0
Man Lift	No	20		74.7	650.0	0.0
Pneumatic Tools	No	50		85.2	650.0	0.0
Welder / Torch	No	40		74.0	650.0	0.0
Pickup Truck	No	40		75.0	650.0	0.0
Crane	No	16		80.6	650.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	55.3	51.3
Compressor (air)	55.4	51.4
Crane	58.3	50.3
Flat Bed Truck	52.0	48.0
Generator	58.4	55.3
Man Lift	52.4	45.4
Pneumatic Tools	62.9	59.9
Welder / Torch	51.7	47.7
Pickup Truck	52.7	48.7
Crane	58.3	50.3
Total	62.9	63.1

ABOVE-GROUND GARAGE AT TAYLOR ROAD FACILITIES

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Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/13/2011
Case Description: Taylor Road Facilities Excavation

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Sanctuary Hall	Residential	59.2	59.2	59.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	190.0	10.0
Bar Bender	No	20	80.0		190.0	10.0
Compactor (ground)	No	20		83.2	190.0	10.0
Concrete Mixer Truck	No	40		78.8	190.0	10.0
Concrete Pump Truck	No	20		81.4	190.0	10.0
Dozer	No	40		81.7	190.0	10.0
Dump Truck	No	40		76.5	190.0	10.0
Generator	No	50		80.6	190.0	10.0
Pneumatic Tools	No	50		85.2	190.0	10.0
Compressor (air)	No	40		77.7	190.0	10.0
Welder / Torch	No	40		74.0	190.0	10.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	56.0	52.0
Bar Bender	58.4	51.4
Compactor (ground)	61.6	54.6
Concrete Mixer Truck	57.2	53.2
Concrete Pump Truck	59.8	52.8
Dozer	60.1	56.1
Dump Truck	54.9	50.9
Generator	59.0	56.0
Pneumatic Tools	63.6	60.6
Compressor (air)	56.1	52.1
Welder / Torch	52.4	48.4
Total	63.6	65.2

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Admiral Housing	Residential	59.7	59.7	59.7

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	320.0	0.0
Bar Bender	No	20	80.0		320.0	0.0
Compactor (ground)	No	20		83.2	320.0	0.0
Concrete Mixer Truck	No	40		78.8	320.0	0.0
Concrete Pump Truck	No	20		81.4	320.0	0.0
Dozer	No	40		81.7	320.0	0.0
Dump Truck	No	40		76.5	320.0	0.0
Generator	No	50		80.6	320.0	0.0
Pneumatic Tools	No	50		85.2	320.0	0.0
Compressor (air)	No	40		77.7	320.0	0.0
Welder / Torch	No	40		74.0	320.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	61.4	57.5
Bar Bender	63.9	56.9
Compactor (ground)	67.1	60.1
Concrete Mixer Truck	62.7	58.7
Concrete Pump Truck	65.3	58.3
Dozer	65.5	61.6
Dump Truck	60.3	56.3
Generator	64.5	61.5
Pneumatic Tools	69.1	66.0
Compressor (air)	61.5	57.6
Welder / Torch	57.9	53.9
Total	69.1	70.6

Report date: 12/12/2011
Case Description: Taylor Road Facilities Construction

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Sanctuary Hall	Residential	59.2	59.2	59.2

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	190.0	10.0
Compressor (air)	No	40		77.7	190.0	10.0
Crane	No	16		80.6	190.0	10.0
Flat Bed Truck	No	40		74.3	190.0	10.0
Generator	No	50		80.6	190.0	10.0
Man Lift	No	20		74.7	190.0	10.0
Pneumatic Tools	No	50		85.2	190.0	10.0
Welder / Torch	No	40		74.0	190.0	10.0
Pickup Truck	No	40		75.0	190.0	10.0
Crane	No	16		80.6	190.0	10.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	56.0	52.0
Compressor (air)	56.1	52.1
Crane	59.0	51.0
Flat Bed Truck	52.7	48.7
Generator	59.0	56.0
Man Lift	53.1	46.1
Pneumatic Tools	63.6	60.6
Welder / Torch	52.4	48.4
Pickup Truck	53.4	49.4
Crane	59.0	51.0
Total	63.6	63.8

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Admiral Housing	Residential	59.7	59.7	59.7

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	320.0	0.0
Compressor (air)	No	40		77.7	320.0	0.0
Crane	No	16		80.6	320.0	0.0
Flat Bed Truck	No	40		74.3	320.0	0.0
Generator	No	50		80.6	320.0	0.0
Man Lift	No	20		74.7	320.0	0.0
Pneumatic Tools	No	50		85.2	320.0	0.0
Welder / Torch	No	40		74.0	320.0	0.0
Pickup Truck	No	40		75.0	320.0	0.0
Crane	No	16		80.6	320.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	61.4	57.5
Compressor (air)	61.5	57.6
Crane	64.4	56.5
Flat Bed Truck	58.1	54.1
Generator	64.5	61.5
Man Lift	58.6	51.6
Pneumatic Tools	69.1	66.0
Welder / Torch	57.9	53.9
Pickup Truck	58.9	54.9
Crane	64.4	56.5
Total	69.1	69.2

UTILITY PLANT

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Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/13/2011
Case Description: Utility Plant, Cooling Towers - Demo

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Fisher House	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	500.0	10.0
Crane	No	16		80.6	500.0	10.0
Jackhammer	Yes	20		88.9	500.0	10.0
Backhoe	No	40		77.6	500.0	10.0
Concrete Saw	No	20		89.6	500.0	10.0
Front End Loader	No	40		79.1	500.0	10.0
Grapple (on backhoe)	No	40		87.0	500.0	10.0
Dump Truck	No	40		76.5	500.0	10.0
Compressor (air)	No	40		77.7	400.0	0.0
Crane	No	16		80.6	400.0	0.0
Jackhammer	Yes	20		88.9	400.0	0.0
Backhoe	No	40		77.6	400.0	0.0
Concrete Saw	No	20		89.6	400.0	0.0
Front End Loader	No	40		79.1	400.0	0.0
Grapple (on backhoe)	No	40		87.0	400.0	0.0
Dump Truck	No	40		76.5	400.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Compressor (air)	47.7	43.7
Crane	50.6	42.6
Jackhammer	58.9	51.9
Backhoe	47.6	43.6
Concrete Saw	59.6	52.6
Front End Loader	49.1	45.1
Grapple (on backhoe)	57.0	53.0
Dump Truck	46.5	42.5
Compressor (air)	59.6	55.6
Crane	62.5	54.5
Jackhammer	70.8	63.8
Backhoe	59.5	55.5
Concrete Saw	71.5	64.5
Front End Loader	61.0	57.1
Grapple (on backhoe)	68.9	65.0
Dump Truck	58.4	54.4
Total	71.5	70.3

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
AFRRI	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	150.0	0.0
Crane	No	16		80.6	150.0	0.0
Jackhammer	Yes	20		88.9	150.0	0.0
Backhoe	No	40		77.6	150.0	0.0
Concrete Saw	No	20		89.6	150.0	0.0
Front End Loader	No	40		79.1	150.0	0.0
Grapple (on backhoe)	No	40		87.0	150.0	0.0
Dump Truck	No	40		76.5	150.0	0.0
Compressor (air)	No	40		77.7	150.0	0.0
Crane	No	16		80.6	150.0	0.0
Jackhammer	Yes	20		88.9	150.0	0.0
Backhoe	No	40		77.6	150.0	0.0
Concrete Saw	No	20		89.6	150.0	0.0
Front End Loader	No	40		79.1	150.0	0.0
Grapple (on backhoe)	No	40		87.0	150.0	0.0
Dump Truck	No	40		76.5	150.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Compressor (air)	68.1	64.1
Crane	71.0	63.0
Jackhammer	79.3	72.4
Backhoe	68.0	64.0
Concrete Saw	80.0	73.0
Front End Loader	69.6	65.6
Grapple (on backhoe)	77.5	73.5
Dump Truck	66.9	62.9
Compressor (air)	68.1	64.1
Crane	71.0	63.0
Jackhammer	79.3	72.4
Backhoe	68.0	64.0
Concrete Saw	80.0	73.0
Front End Loader	69.6	65.6
Grapple (on backhoe)	77.5	73.5
Dump Truck	66.9	62.9
Total	80.0	81.6

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/13/2011
Case Description: Utility Plant, Cooling Towers - Exc & Foundations

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Fisher House	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	500.0	10.0
Bar Bender	No	20	80.0		500.0	10.0
Compactor (ground)	No	20		83.2	500.0	10.0
Concrete Mixer Truck	No	40		78.8	500.0	10.0
Concrete Pump Truck	No	20		81.4	500.0	10.0
Dozer	No	40		81.7	500.0	10.0
Dump Truck	No	40		76.5	500.0	10.0
Generator	No	50		80.6	500.0	10.0
Pneumatic Tools	No	50		85.2	500.0	10.0
Compressor (air)	No	40		77.7	500.0	10.0
Welder / Torch	No	40		74.0	500.0	10.0
Backhoe	No	40		77.6	400.0	0.0
Bar Bender	No	20	80.0		400.0	0.0
Compactor (ground)	No	20		83.2	400.0	0.0
Concrete Mixer Truck	No	40		78.8	400.0	0.0
Concrete Pump Truck	No	20		81.4	400.0	0.0
Dump Truck	No	40		76.5	400.0	0.0
Generator	No	50		80.6	400.0	0.0
Pneumatic Tools	No	50		85.2	400.0	0.0
Compressor (air)	No	40		77.7	400.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	47.6	43.6
Bar Bender	50.0	43.0
Compactor (ground)	53.2	46.2
Concrete Mixer Truck	48.8	44.8
Concrete Pump Truck	51.4	44.4
Dozer	51.7	47.7
Dump Truck	46.5	42.5
Generator	50.6	47.6
Pneumatic Tools	55.2	52.2
Compressor (air)	47.7	43.7
Welder / Torch	44.0	40.0
Backhoe	59.5	55.5
Bar Bender	61.9	54.9
Compactor (ground)	65.2	58.2
Concrete Mixer Truck	60.7	56.8
Concrete Pump Truck	63.3	56.3
Dump Truck	58.4	54.4
Generator	62.6	59.6
Pneumatic Tools	67.1	64.1
Compressor (air)	59.6	55.6
Total	67.1	68.3

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
AFRRI	Residential	56.6	56.6	56.6

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	150.0	0.0
Bar Bender	No	20	80.0		150.0	0.0
Compactor (ground)	No	20		83.2	150.0	0.0
Concrete Mixer Truck	No	40		78.8	150.0	0.0
Concrete Pump Truck	No	20		81.4	150.0	0.0
Dozer	No	40		81.7	150.0	0.0
Dump Truck	No	40		76.5	150.0	0.0
Generator	No	50		80.6	150.0	0.0
Pneumatic Tools	No	50		85.2	150.0	0.0
Compressor (air)	No	40		77.7	150.0	0.0
Welder / Torch	No	40		74.0	150.0	0.0
Backhoe	No	40		77.6	150.0	0.0
Bar Bender	No	20	80.0		150.0	0.0
Compactor (ground)	No	20		83.2	150.0	0.0
Concrete Mixer Truck	No	40		78.8	150.0	0.0
Concrete Pump Truck	No	20		81.4	150.0	0.0
Dump Truck	No	40		76.5	150.0	0.0
Generator	No	50		80.6	150.0	0.0
Pneumatic Tools	No	50		85.2	150.0	0.0
Compressor (air)	No	40		77.7	150.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	68.0	64.0
Bar Bender	70.5	63.5
Compactor (ground)	73.7	66.7
Concrete Mixer Truck	69.3	65.3
Concrete Pump Truck	71.9	64.9
Dozer	72.1	68.1
Dump Truck	66.9	62.9
Generator	71.1	68.1
Pneumatic Tools	75.6	72.6
Compressor (air)	68.1	64.1
Welder / Torch	64.5	60.5
Backhoe	68.0	64.0
Bar Bender	70.5	63.5
Compactor (ground)	73.7	66.7
Concrete Mixer Truck	69.3	65.3
Concrete Pump Truck	71.9	64.9
Dump Truck	66.9	62.9
Generator	71.1	68.1
Pneumatic Tools	75.6	72.6
Compressor (air)	68.1	64.1
Total	75.6	79.9

TEMPORARY MEDICAL FACILITIES

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Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/13/2011
Case Description: Temporary Medical

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Stone Ridge School	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	50.0	0.0
Compressor (air)	No	40		77.7	60.0	0.0
Dump Truck	No	40		76.5	70.0	0.0
Flat Bed Truck	No	40		74.3	80.0	0.0
Generator	No	50		80.6	90.0	0.0
Jackhammer	Yes	20		88.9	100.0	0.0
Welder / Torch	No	40		74.0	110.0	0.0
Tractor	No	40	84.0		120.0	0.0
Crane	No	16		80.6	130.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	77.6	73.6
Compressor (air)	76.1	72.1
Dump Truck	73.5	69.5
Flat Bed Truck	70.2	66.2
Generator	75.5	72.5
Jackhammer	82.9	75.9
Welder / Torch	67.2	63.2
Tractor	76.4	72.4
Crane	72.3	64.3
Total	82.9	81.2

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Housing E. of Lot G	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	75.0	0.0
Compressor (air)	No	40		77.7	80.0	0.0
Dump Truck	No	40		76.5	90.0	0.0
Flat Bed Truck	No	40		74.3	100.0	0.0
Generator	No	50		80.6	110.0	0.0
Jackhammer	Yes	20		88.9	120.0	0.0
Welder / Torch	No	40		74.0	130.0	0.0
Tractor	No	40	84.0		140.0	0.0
Crane	No	16		80.6	150.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	74.0	70.1
Compressor (air)	73.6	69.6
Dump Truck	71.3	67.4
Flat Bed Truck	68.2	64.3
Generator	73.8	70.8
Jackhammer	81.3	74.3
Welder / Torch	65.7	61.7
Tractor	75.1	71.1
Crane	71.0	63.0
Total	81.3	79.2

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UNIVERSITY EXPANSION – ALTERNATIVE 1

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UniExp Alt 1 Excavation & Ground Prep
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/14/2011
Case Description: Univ Expand - Alternative 1 Excavation & Ground Prep

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Navy Lodge	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	300.0	0.0
Front End Loader	No	40		79.1	300.0	0.0
Excavator	No	40		80.7	300.0	0.0
Dump Truck	No	40		76.5	300.0	0.0
Compressor (air)	No	40		77.7	300.0	0.0
Jackhammer	Yes	20		88.9	300.0	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	300.0	0.0
Dozer	No	40		81.7	300.0	0.0
Generator	No	50		80.6	300.0	0.0
Pickup Truck	No	40		75.0	300.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	62.0	58.0
Front End Loader	63.5	59.6
Excavator	65.1	61.2
Dump Truck	60.9	56.9
Compressor (air)	62.1	58.1
Jackhammer	73.3	66.3
Mounted Impact Hammer (hoe ram)	74.7	67.7
Dozer	66.1	62.1
Generator	65.1	62.1
Pickup Truck	59.4	55.5
Total	74.7	72.5

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
University Facilities	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	120.0	0.0
Front End Loader	No	40		79.1	120.0	0.0
Excavator	No	40		80.7	120.0	0.0
Dump Truck	No	40		76.5	120.0	0.0
Compressor (air)	No	40		77.7	120.0	0.0
Jackhammer	Yes	20		88.9	120.0	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	120.0	0.0
Dozer	No	40		81.7	120.0	0.0
Generator	No	50		80.6	120.0	0.0
Pickup Truck	No	40		75.0	120.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	70.0	66.0
Front End Loader	71.5	67.5
Excavator	73.1	69.1
Dump Truck	68.8	64.9
Compressor (air)	70.1	66.1
Jackhammer	81.3	74.3
Mounted Impact Hammer (hoe ram)	82.7	75.7
Dozer	74.1	70.1
Generator	73.0	70.0
Pickup Truck	67.4	63.4
Total	82.7	80.5

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Private Residences	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	440.0	0.0
Front End Loader	No	40		79.1	440.0	0.0
Excavator	No	40		80.7	440.0	0.0
Dump Truck	No	40		76.5	440.0	0.0
Compressor (air)	No	40		77.7	440.0	0.0
Jackhammer	Yes	20		88.9	440.0	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	440.0	0.0
Dozer	No	40		81.7	440.0	0.0
Generator	No	50		80.6	440.0	0.0
Pickup Truck	No	40		75.0	440.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	58.7	54.7
Front End Loader	60.2	56.2
Excavator	61.8	57.8
Dump Truck	57.6	53.6
Compressor (air)	58.8	54.8
Jackhammer	70.0	63.0
Mounted Impact Hammer (hoe ram)	71.4	64.4
Dozer	62.8	58.8
Generator	61.7	58.7
Pickup Truck	56.1	52.1
Total	71.4	69.2

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/14/2011
Case Description: UniExp Alt 1 Foundations & Basements

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Navy Lodge	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	300.0	0.0
Compressor (air)	No	40		77.7	300.0	0.0
Compactor (ground)	No	20		83.2	300.0	0.0
Concrete Mixer Truck	No	40		78.8	300.0	0.0
Bar Bender	No	20	80.0		300.0	0.0
Concrete Pump Truck	No	20		81.4	300.0	0.0
Generator	No	50		80.6	300.0	0.0
Pickup Truck	No	40		75.0	300.0	0.0
Pneumatic Tools	No	50		85.2	300.0	0.0
Crane	No	16		80.6	300.0	0.0
Pickup Truck	No	40		75.0	300.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	62.0	58.0
Compressor (air)	62.1	58.1
Compactor (ground)	67.7	60.7
Concrete Mixer Truck	63.2	59.3
Bar Bender	64.4	57.4
Concrete Pump Truck	65.8	58.8
Generator	65.1	62.1
Pickup Truck	59.4	55.5
Pneumatic Tools	69.6	66.6
Crane	65.0	57.0
Pickup Truck	59.4	55.5
Total	69.6	70.8

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
University Facilities	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	120.0	0.0
Compressor (air)	No	40		77.7	120.0	0.0
Compactor (ground)	No	20		83.2	120.0	0.0
Concrete Mixer Truck	No	40		78.8	120.0	0.0
Bar Bender	No	20	80.0		120.0	0.0
Concrete Pump Truck	No	20		81.4	120.0	0.0
Generator	No	50		80.6	120.0	0.0
Pickup Truck	No	40		75.0	120.0	0.0
Pneumatic Tools	No	50		85.2	120.0	0.0
Crane	No	16		80.6	120.0	0.0
Pickup Truck	No	40		75.0	120.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	70.0	66.0
Compressor (air)	70.1	66.1
Compactor (ground)	75.6	68.6
Concrete Mixer Truck	71.2	67.2
Bar Bender	72.4	65.4
Concrete Pump Truck	73.8	66.8
Generator	73.0	70.0
Pickup Truck	67.4	63.4
Pneumatic Tools	77.6	74.6
Crane	72.9	65.0
Pickup Truck	67.4	63.4
Total	77.6	78.8

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Private Residences	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	440.0	0.0
Compressor (air)	No	40		77.7	440.0	0.0
Compactor (ground)	No	20		83.2	440.0	0.0
Concrete Mixer Truck	No	40		78.8	440.0	0.0
Bar Bender	No	20	80.0		440.0	0.0
Concrete Pump Truck	No	20		81.4	440.0	0.0
Generator	No	50		80.6	440.0	0.0
Pickup Truck	No	40		75.0	440.0	0.0
Pneumatic Tools	No	50		85.2	440.0	0.0
Crane	No	16		80.6	440.0	0.0
Pickup Truck	No	40		75.0	440.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	58.7	54.7
Compressor (air)	58.8	54.8
Compactor (ground)	64.3	57.4
Concrete Mixer Truck	59.9	55.9
Bar Bender	61.1	54.1
Concrete Pump Truck	62.5	55.5
Generator	61.7	58.7
Pickup Truck	56.1	52.1
Pneumatic Tools	66.3	63.3
Crane	61.7	53.7
Pickup Truck	56.1	52.1
Total	66.3	67.5

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/14/2011
Case Description: UniExp Alt 1 - Superstructure

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Navy Lodge	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	300.0	0.0
Crane	No	16		80.6	300.0	0.0
Flat Bed Truck	No	40		74.3	300.0	0.0
Generator	No	50		80.6	300.0	0.0
Front End Loader	No	40		79.1	300.0	0.0
Man Lift	No	20		74.7	300.0	0.0
Welder / Torch	No	40		74.0	300.0	0.0
Concrete Mixer Truck	No	40		78.8	300.0	0.0
Pneumatic Tools	No	50		85.2	300.0	0.0
Bar Bender	No	20	80.0		300.0	0.0
Concrete Pump Truck	No	20		81.4	300.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Compressor (air)	62.1	58.1
Crane	65.0	57.0
Flat Bed Truck	58.7	54.7
Generator	65.1	62.1
Front End Loader	63.5	59.6
Man Lift	59.1	52.1
Welder / Torch	58.4	54.5
Concrete Mixer Truck	63.2	59.3
Pneumatic Tools	69.6	66.6
Bar Bender	64.4	57.4
Concrete Pump Truck	65.8	58.8
Total	69.6	70.5

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
University Facilities	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	120.0	0.0
Crane	No	16		80.6	120.0	0.0
Flat Bed Truck	No	40		74.3	120.0	0.0
Generator	No	50		80.6	120.0	0.0
Front End Loader	No	40		79.1	120.0	0.0
Man Lift	No	20		74.7	120.0	0.0
Welder / Torch	No	40		74.0	120.0	0.0
Concrete Mixer Truck	No	40		78.8	120.0	0.0
Pneumatic Tools	No	50		85.2	120.0	0.0
Bar Bender	No	20	80.0		120.0	0.0
Concrete Pump Truck	No	20		81.4	120.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Compressor (air)	70.1	66.1
Crane	72.9	65.0
Flat Bed Truck	66.6	62.7
Generator	73.0	70.0
Front End Loader	71.5	67.5
Man Lift	67.1	60.1
Welder / Torch	66.4	62.4
Concrete Mixer Truck	71.2	67.2
Pneumatic Tools	77.6	74.6
Bar Bender	72.4	65.4
Concrete Pump Truck	73.8	66.8
Total	77.6	78.4

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Private Residences	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	440.0	0.0
Crane	No	16		80.6	440.0	0.0
Flat Bed Truck	No	40		74.3	440.0	0.0
Generator	No	50		80.6	440.0	0.0
Front End Loader	No	40		79.1	440.0	0.0
Man Lift	No	20		74.7	440.0	0.0
Welder / Torch	No	40		74.0	440.0	0.0
Concrete Mixer Truck	No	40		78.8	440.0	0.0
Pneumatic Tools	No	50		85.2	440.0	0.0
Bar Bender	No	20	80.0		440.0	0.0
Concrete Pump Truck	No	20		81.4	440.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Compressor (air)	58.8	54.8
Crane	61.7	53.7
Flat Bed Truck	55.4	51.4
Generator	61.7	58.7
Front End Loader	60.2	56.2
Man Lift	55.8	48.8
Welder / Torch	55.1	51.1
Concrete Mixer Truck	59.9	55.9
Pneumatic Tools	66.3	63.3
Bar Bender	61.1	54.1
Concrete Pump Truck	62.5	55.5
Total	66.3	67.1

UNIVERSITY EXPANSION – ALTERNATIVE 2

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UniExp Alt 2 Excavation & Ground Prep
Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/14/2011
Case Description: Univ Expand - Alternative 2 Excavation & Ground Prep

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Fisher House	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	320.0	0.0
Front End Loader	No	40		79.1	320.0	0.0
Excavator	No	40		80.7	320.0	0.0
Dump Truck	No	40		76.5	320.0	0.0
Compressor (air)	No	40		77.7	320.0	0.0
Jackhammer	Yes	20		88.9	320.0	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	320.0	0.0
Dozer	No	40		81.7	320.0	0.0
Generator	No	50		80.6	320.0	0.0
Pickup Truck	No	40		75.0	320.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	61.4	57.5
Front End Loader	63.0	59.0
Excavator	64.6	60.6
Dump Truck	60.3	56.3
Compressor (air)	61.5	57.6
Jackhammer	72.8	65.8
Mounted Impact Hammer (hoe ram)	74.2	67.2
Dozer	65.5	61.6
Generator	64.5	61.5
Pickup Truck	58.9	54.9
Total	74.2	71.9

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
University Facilities	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	25.0	0.0
Front End Loader	No	40		79.1	25.0	0.0
Excavator	No	40		80.7	25.0	0.0
Dump Truck	No	40		76.5	25.0	0.0
Compressor (air)	No	40		77.7	25.0	0.0
Jackhammer	Yes	20		88.9	25.0	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	25.0	0.0
Dozer	No	40		81.7	25.0	0.0
Generator	No	50		80.6	25.0	0.0
Pickup Truck	No	40		75.0	25.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	83.6	79.6
Front End Loader	85.1	81.2
Excavator	86.7	82.8
Dump Truck	82.5	78.5
Compressor (air)	83.7	79.7
Jackhammer	94.9	87.9
Mounted Impact Hammer (hoe ram)	96.3	89.3
Dozer	87.7	83.7
Generator	86.7	83.6
Pickup Truck	81.0	77.0
Total	96.3	94.1

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
AFRRI	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	25.0	0.0
Front End Loader	No	40		79.1	25.0	0.0
Excavator	No	40		80.7	25.0	0.0
Dump Truck	No	40		76.5	25.0	0.0
Compressor (air)	No	40		77.7	25.0	0.0
Jackhammer	Yes	20		88.9	25.0	0.0
Mounted Impact Hammer (hoe ram)	Yes	20		90.3	25.0	0.0
Dozer	No	40		81.7	25.0	0.0
Generator	No	50		80.6	25.0	0.0
Pickup Truck	No	40		75.0	25.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	83.6	79.6
Front End Loader	85.1	81.2
Excavator	86.7	82.8
Dump Truck	82.5	78.5
Compressor (air)	83.7	79.7
Jackhammer	94.9	87.9
Mounted Impact Hammer (hoe ram)	96.3	89.3
Dozer	87.7	83.7
Generator	86.7	83.6
Pickup Truck	81.0	77.0
Total	96.3	94.1

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/14/2011
Case Description: UniExp Alt 2 Foundations & Basements

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Fisher House	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	320.0	0.0
Compressor (air)	No	40		77.7	320.0	0.0
Compactor (ground)	No	20		83.2	320.0	0.0
Concrete Mixer Truck	No	40		78.8	320.0	0.0
Bar Bender	No	20	80.0		320.0	0.0
Concrete Pump Truck	No	20		81.4	320.0	0.0
Generator	No	50		80.6	320.0	0.0
Pickup Truck	No	40		75.0	320.0	0.0
Pneumatic Tools	No	50		85.2	320.0	0.0
Crane	No	16		80.6	320.0	0.0
Pickup Truck	No	40		75.0	320.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	61.4	57.5
Compressor (air)	61.5	57.6
Compactor (ground)	67.1	60.1
Concrete Mixer Truck	62.7	58.7
Bar Bender	63.9	56.9
Concrete Pump Truck	65.3	58.3
Generator	64.5	61.5
Pickup Truck	58.9	54.9
Pneumatic Tools	69.1	66.0
Crane	64.4	56.5
Pickup Truck	58.9	54.9
Total	69.1	70.2

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
University Facilities	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	25.0	0.0
Compressor (air)	No	40		77.7	25.0	0.0
Compactor (ground)	No	20		83.2	25.0	0.0
Concrete Mixer Truck	No	40		78.8	25.0	0.0
Bar Bender	No	20	80.0		25.0	0.0
Concrete Pump Truck	No	20		81.4	25.0	0.0
Generator	No	50		80.6	25.0	0.0
Pickup Truck	No	40		75.0	25.0	0.0
Pneumatic Tools	No	50		85.2	25.0	0.0
Crane	No	16		80.6	25.0	0.0
Pickup Truck	No	40		75.0	25.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	83.6	79.6
Compressor (air)	83.7	79.7
Compactor (ground)	89.3	82.3
Concrete Mixer Truck	84.8	80.8
Bar Bender	86.0	79.0
Concrete Pump Truck	87.4	80.4
Generator	86.7	83.6
Pickup Truck	81.0	77.0
Pneumatic Tools	91.2	88.2
Crane	86.6	78.6
Pickup Truck	81.0	77.0
Total	91.2	92.4

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Private Residences	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Backhoe	No	40		77.6	25.0	0.0
Compressor (air)	No	40		77.7	25.0	0.0
Compactor (ground)	No	20		83.2	25.0	0.0
Concrete Mixer Truck	No	40		78.8	25.0	0.0
Bar Bender	No	20	80.0		25.0	0.0
Concrete Pump Truck	No	20		81.4	25.0	0.0
Generator	No	50		80.6	25.0	0.0
Pickup Truck	No	40		75.0	25.0	0.0
Pneumatic Tools	No	50		85.2	25.0	0.0
Crane	No	16		80.6	25.0	0.0
Pickup Truck	No	40		75.0	25.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Backhoe	83.6	79.6
Compressor (air)	83.7	79.7
Compactor (ground)	89.3	82.3
Concrete Mixer Truck	84.8	80.8
Bar Bender	86.0	79.0
Concrete Pump Truck	87.4	80.4
Generator	86.7	83.6
Pickup Truck	81.0	77.0
Pneumatic Tools	91.2	88.2
Crane	86.6	78.6
Pickup Truck	81.0	77.0
Total	91.2	92.4

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/14/2011
Case Description: UniExp Alt 2 - Superstructure

**** Receptor #1 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Fisher House	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	320.0	0.0
Crane	No	16		80.6	320.0	0.0
Flat Bed Truck	No	40		74.3	320.0	0.0
Generator	No	50		80.6	320.0	0.0
Front End Loader	No	40		79.1	320.0	0.0
Man Lift	No	20		74.7	320.0	0.0
Welder / Torch	No	40		74.0	320.0	0.0
Concrete Mixer Truck	No	40		78.8	320.0	0.0
Pneumatic Tools	No	50		85.2	320.0	0.0
BarEnder	No	20	80.0		320.0	0.0
Concrete Pump Truck	No	20		81.4	320.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Compressor (air)	61.5	57.6
Crane	64.4	56.5
Flat Bed Truck	58.1	54.1
Generator	64.5	61.5
Front End Loader	63.0	59.0
Man Lift	58.6	51.6
Welder / Torch	57.9	53.9
Concrete Mixer Truck	62.7	58.7
Pneumatic Tools	69.1	66.0
Bar Bender	63.9	56.9
Concrete Pump Truck	65.3	58.3
Total	69.1	69.9

**** Receptor #2 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
University Facilities	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	25.0	0.0
Crane	No	16		80.6	25.0	0.0
Flat Bed Truck	No	40		74.3	25.0	0.0
Generator	No	50		80.6	25.0	0.0
Front End Loader	No	40		79.1	25.0	0.0
Man Lift	No	20		74.7	25.0	0.0
Welder / Torch	No	40		74.0	25.0	0.0
Concrete Mixer Truck	No	40		78.8	25.0	0.0
Pneumatic Tools	No	50		85.2	25.0	0.0
Bar Bender	No	20	80.0		25.0	0.0
Concrete Pump Truck	No	20		81.4	25.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Compressor (air)	83.7	79.7
Crane	86.6	78.6
Flat Bed Truck	80.3	76.3
Generator	86.7	83.6
Front End Loader	85.1	81.2
Man Lift	80.7	73.7
Welder / Torch	80.0	76.0
Concrete Mixer Truck	84.8	80.8
Pneumatic Tools	91.2	88.2
Bar Bender	86.0	79.0
Concrete Pump Truck	87.4	80.4
Total	91.2	92.1

**** Receptor #3 ****

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
AFRRI	Residential	56.0	56.0	56.0

Equipment

Description	Impact Device	Usage (%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	25.0	0.0
Crane	No	16		80.6	25.0	0.0
Flat Bed Truck	No	40		74.3	25.0	0.0
Generator	No	50		80.6	25.0	0.0
Front End Loader	No	40		79.1	25.0	0.0
Man Lift	No	20		74.7	25.0	0.0
Welder / Torch	No	40		74.0	25.0	0.0
Concrete Mixer Truck	No	40		78.8	25.0	0.0
Pneumatic Tools	No	50		85.2	25.0	0.0
Bar Bender	No	20	80.0		25.0	0.0
Concrete Pump Truck	No	20		81.4	25.0	0.0

Results

Equipment	Calculated (dBA) Lmax	Leq
Compressor (air)	83.7	79.7
Crane	86.6	78.6
Flat Bed Truck	80.3	76.3
Generator	86.7	83.6
Front End Loader	85.1	81.2
Man Lift	80.7	73.7
Welder / Torch	80.0	76.0
Concrete Mixer Truck	84.8	80.8
Pneumatic Tools	91.2	88.2
Bar Bender	86.0	79.0
Concrete Pump Truck	87.4	80.4
Total	91.2	92.1

APPENDIX D: DRAFT TRAFFIC STUDY

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DRAFT TRAFFIC STUDY

Medical Facilities Development and University Expansion

NSA Bethesda

Department of the Navy

September 2012

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Abstract

This Naval Support Activity (NSA) Bethesda Traffic Study analyzes the traffic capacity and level of service for both existing and 2018 future conditions. The analysis of future conditions consists of determining the impacts of a 2018 No Action (No Build condition) Alternative with short-term planned projects in place and the 2018 short-term planned projects plus the proposed actions (i.e., multiple Build Alternatives) for the Medical Facilities Development and University Expansion. This report provides individual analysis for each Build Alternative compared to the No Build condition as well as a summary of all Build Alternatives in a discussion section. This report concludes with a set of recommendations based upon the analysis.

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TABLE OF CONTENTS

List of Figures v

List of Tables xi

1.0 Introduction 1-1

2.0 Description of the Project Tasking 2-1

3.0 Operation Analysis of Existing and Future Conditions 3-1

3.1 Existing Conditions 3-1

3.1.1 *External Roadway Conditions..... 3-2*

3.1.1.1 External Roadway Network 3-2

3.1.1.2 External Study Intersections 3-5

3.1.1.3 External Existing Lane Geometry and Traffic Control 3-6

3.1.1.4 External Existing Peak Hour Traffic Volumes 3-10

3.1.1.5 External Existing Capacity Analysis 3-14

3.1.1.6 External Roadway Operational Conditions 3-19

3.1.1.7 Commuter Traffic Growth 3-21

3.1.2 *NSA Bethesda Traffic using Rockville Pike and Jones Bridge Road 3-22*

3.1.3 *Vehicular Gate Access and Operations..... 3-24*

3.1.3.1 Security Gate Configurations 3-24

3.1.3.2 Gate Traffic Volumes 3-26

3.1.3.3 Gate Vehicle Occupancy and Classification 3-28

3.1.3.4 Observed Gate Operations 3-31

3.1.3.5 Internal Roadway Conditions 3-32

3.1.3.6 Internal Existing Lane Utilization 3-32

3.1.3.7 Internal Existing Peak Hour Traffic Volumes 3-32

3.1.3.8 Truck Access and Circulation Patterns 3-37

3.1.3.9 NSA Bethesda Internal Capacity Analysis 3-37

3.1.3.10 Internal Observation Findings 3-40

3.1.4 *Pedestrian and Bicycle Facilities..... 3-40*

3.1.4.1 Installation Access for Pedestrians and Cyclists 3-40

3.1.4.2 Pedestrian Infrastructure and Use 3-43

3.1.5 *Availability of Transit..... 3-51*

3.1.5.1 WMATA Transit Services 3-51

3.1.5.2 MTA Services 3-54

3.1.5.3 Montgomery County Ride On Bus Services 3-54

3.1.5.4 NSA Bethesda Shuttle Services 3-55

3.1.6 *Travel Time and Delay Survey..... 3-57*

3.2 Future Conditions 3-61

3.2.1 *The 2018 No Build Condition Development..... 3-61*

3.2.1.1 External Roadway Improvements 3-62

3.2.1.2 External Transit Improvements 3-64

3.2.1.3 Background Developments 3-65

3.2.1.4 Gate Improvements 3-71

3.2.1.5 Internal Roadway Improvements 3-71

3.2.1.6 Short-Term Planned Projects 3-74

3.2.1.7 Internal Installation Parking 3-76

3.2.1.8 2018 No Build Condition Trip Distribution 3-87

3.2.2 *The 2018 No Build Condition Alternative Operational Analysis. 3-87*

3.2.2.1 External Intersection Analysis 3-87

3.2.2.2 Internal Intersection Analysis 3-100

3.2.3 *2018 Build Alternative Introduction* *3-104*
3.2.4 *Build Alternative 1* *3-107*
3.2.4.1 Trip Generation *3-107*
3.2.4.2 Trip Distribution *3-107*
3.2.4.3 External Intersection Analysis *3-114*
3.2.4.4 Arterial Analysis *3-117*
3.2.4.5 Internal Intersection Analysis *3-122*
3.2.4.6 Bicycle and Pedestrian Impacts *3-128*
3.2.5 *Build Alternative 2* *3-128*
3.2.5.1 Trip Generation *3-128*
3.2.5.2 Trip Distribution *3-130*
3.2.5.3 External Intersection Analysis *3-135*
3.2.5.4 Arterial Analysis *3-139*
3.2.5.5 Internal Intersection Analysis *3-144*
3.2.5.6 Bicycle and Pedestrian Impacts *3-149*
3.2.6 *Build Alternative 3* *3-149*
3.2.6.1 Trip Generation *3-149*
3.2.6.2 Trip Distribution *3-150*
3.2.6.3 External Intersection Analysis *3-157*
3.2.6.4 Arterial Analysis *3-164*
3.2.6.5 Internal Intersection Analysis *3-165*
3.2.6.6 Bicycle and Pedestrian Impacts *3-170*
3.2.7 *Build Alternative 4* *3-170*
3.2.7.1 Trip Generation *3-172*
3.2.7.2 Trip Distribution *3-172*
3.2.7.3 External Intersection Analysis *3-179*
3.2.7.4 Arterial Analysis *3-183*
3.2.7.5 Internal Intersection Analysis *3-188*
3.2.7.6 Bicycle and Pedestrian Impacts *3-193*
3.2.8 *Build Alternative 5* *3-193*
3.2.8.1 Trip Generation *3-195*
3.2.8.2 Trip Distribution *3-195*
3.2.8.3 External Intersection Analysis *3-200*
3.2.8.4 Arterial Analysis *3-208*
3.2.8.5 Internal Intersection Analysis *3-209*
3.2.8.6 Bicycle and Pedestrian Impacts *3-214*
3.2.9 *Build Alternative 6* *3-216*
3.2.9.1 Trip Generation *3-216*
3.2.9.2 Trip Distribution *3-216*
3.2.9.3 External Intersection Analysis *3-221*
3.2.9.4 Arterial Analysis *3-228*
3.2.9.5 Internal Intersection Analysis *3-229*
3.2.9.6 Bicycle and Pedestrian Impacts *3-234*
3.2.10 *Build Alternative 7* *3-234*
3.2.10.1 Trip Generation *3-234*
3.2.10.2 Trip Distribution *3-235*
3.2.10.3 External Intersection Analysis *3-240*
3.2.10.4 Arterial Analysis *3-247*
3.2.10.5 Internal Intersection Analysis *3-248*
3.2.10.6 Bicycle and Pedestrian Impacts *3-253*
3.2.11 *Build Alternative 8* *3-253*
3.2.11.1 Trip Generation *3-253*
3.2.11.2 Trip Distribution *3-254*
3.2.11.3 External Intersection Analysis *3-259*
3.2.11.4 Arterial Analysis *3-266*
3.2.11.5 Internal Intersection Analysis *3-267*
3.2.11.6 Bicycle and Pedestrian Impacts *3-272*

3.2.12 *Build Alternative 9* *3-272*
3.2.12.1 Trip Generation *3-273*
3.2.12.2 Trip Distribution *3-273*
3.2.12.3 External Intersection Analysis *3-278*
3.2.12.4 Arterial Analysis *3-286*
3.2.12.5 Internal Intersection Analysis *3-287*
3.2.12.6 Bicycle and Pedestrian Impacts *3-292*
3.2.13 *Build Alternative 10* *3-292*
3.2.13.1 Trip Generation *3-293*
3.2.13.2 Trip Distribution *3-293*
3.2.13.3 External Intersection Analysis *3-298*
3.2.13.4 Arterial Analysis *3-305*
3.2.13.5 Internal Intersection Analysis *3-306*
3.2.13.6 Bicycle and Pedestrian Impacts *3-311*

4.0 Discussion of 2018 Condition Findings 4-1

4.1 External Intersection Summary 4-1
4.1.1 *Critical Lane Volume Analysis* *4-1*
4.1.2 *Highway Capacity Manual (HCM) Analysis* *4-3*
4.2 Arterial Analysis Summary 4-5
4.3 Internal Intersection Summary 4-9
4.4 Gate Count Summary 4-13
4.5 Internal Parking 4-15
4.6 Bicycle and Pedestrian Impacts 4-16

5.0 Construction Impacts 5-1

5.1 Parking 5-1
5.2 Sidewalk Impacts 5-1
5.3 Gate #5 Construction Truck Impacts 5-2
5.3.1 *Existing Condition* *5-2*
5.3.2 *Future Condition* *5-3*
5.3.2.1 Estimated Trucks *5-5*
5.3.2.2 Queue Analysis *5-5*

6.0 Proposed Action Recommendations 6-1

7.0 Construction Recommendations 7-1

8.0 Bibliography 8-1

9.0 Appendices 9-1

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LIST OF FIGURES

Figure 1: NSA Bethesda Location and Gates..... 1-3
Figure 2: External Study Intersections..... 3-7
Figure 3A: External Lane Geometry and Traffic Control..... 3-8
Figure 3B: External Lane Geometry and Traffic Control..... 3-9
Figure 4A: External Traffic Volumes - Existing (2011) Conditions.. 3-12
Figure 4B: External Traffic Volumes – Existing (2011) Conditions.. 3-13
Figure 5: Internal Study Intersections..... 3-34
Figure 6: Internal Lane Geometry and Traffic Control..... 3-35
Figure 7: Internal Traffic Volumes - Existing (2011) Conditions... 3-36
Figure 8: Truck Access and Service/Loading Facilities..... 3-38
Figure 9: Connectivity to Local Pedestrian and Bike Facilities.... 3-42
Figure 10: Installation Pedestrian Facilities – Sidewalk and Buffer Widths 3-45
Figure 11: Installation Pedestrian Facilities – Curb Ramps and Sidewalk Locations 3-46
Figure 12A: External Pedestrian Volumes..... 3-47
Figure 12B: External Pedestrian Volumes..... 3-48
Figure 13: Internal Pedestrian Volumes..... 3-49
Figure 14: Bicycle Parking Inventory..... 3-52
Figure 15: Local Public Transit Availability..... 3-53
Figure 16: NSA Bethesda Shuttle Routes and Stops..... 3-56
Figure 17: Travel Time and Delay Survey Study Area and Measurement Locations 3-58
Figure 18A: Travel Time/Delay Survey Results – Rockville Pike, Southbound AM 3-59
Figure 18B: Travel Time/Delay Survey Results – Rockville Pike, Northbound PM 3-59
Figure 18C: Travel Time/Delay Survey Results – Jones Bridge Road, Westbound AM 3-60
Figure 18D: Travel Time/Delay Survey Results – Jones Bridge Road, Eastbound PM 3-60
Figure 19: External Project Locations..... 3-63
Figure 20: Pedestrian Crossing at Rockville Pike and Gate #2..... 3-65
Figure 21: Location of Background Developments..... 3-69
Figure 22A: Background Development Trip Distribution..... 3-72
Figure 22B: Background Development Trip Distribution..... 3-73

Figure 23: Planned Project Locations..... 3-75

Figure 24: Existing Parking Facility Locations..... 3-79

Figure 25: 2018 No Build Condition Parking Facility Locations..... 3-81

Figure 26: Updated NSA Bethesda Distribution Percentages Based upon 2008 NNMC Transportation Study 3-83

Figure 27A: Planned Project Trip Distribution..... 3-84

Figure 27B: Planned Project Trip Distribution..... 3-85

Figure 27C: Planned Project Trip Distribution..... 3-86

Figure 28A: 2018 No Build Condition Projected Turning Movement Counts 3-88

Figure 28B: 2018 No Build Condition Projected Turning Movement Counts 3-89

Figure 28C: 2018 No Build Condition Projected Turning Movement Counts 3-90

Figure 29A: 2018 No Build Condition Lane Geometry and Traffic Control 3-91

Figure 29B: 2018 No Build Condition Lane Geometry and Traffic Control 3-92

Figure 29C: 2018 No Build Condition Lane Geometry and Traffic Control 3-93

Figure 30A: 2018 AM Peak Hour No Build Condition CLV Intersection LOS 3-95

Figure 30B: 2018 PM Peak Hour No Build Condition CLV Intersection LOS 3-96

Figure 31A: 2018 AM Peak Hour No Build Condition HCM Intersection LOS 3-102

Figure 31B: 2018 PM Peak Hour No Build Condition HCM Intersection LOS 3-103

Figure 32: Proposed Parking Facility Locations..... 3-106

Figure 33: 2009 Patient Temporal Distribution..... 3-108

Figure 34A: 2018 Alternative 1 Trip Distribution..... 3-111

Figure 34B: 2018 Alternative 1 Trip Distribution..... 3-112

Figure 34C: 2018 Alternative 1 Trip Distribution..... 3-113

Figure 35A: 2018 AM Peak Hour Build Alternative 1 CLV Intersection LOS 3-115

Figure 35B: 2018 PM Peak Hour Build Alternative 1 CLV Intersection LOS 3-116

Figure 36: Alternative 1 Lane Geometry and Traffic Control..... 3-123

Figure 37A: 2018 AM Peak Hour Build Alternative 1 Internal Intersection LOS 3-126

Figure 37B: 2018 PM Peak Hour Build Alternative 1 Internal Intersection LOS 3-127

Figure 38: 2018 Build Alternative 1 Sidewalk Connections..... 3-129

Figure 39A: 2018 Alternative 2 Trip Distribution..... 3-133

Figure 39B: 2018 Alternative 2 Trip Distribution..... 3-134

Figure 39C: 2018 Alternative 2 Trip Distribution..... 3-135

Figure 40A: 2018 AM Peak Hour Build Alternative 2 CLV Intersection LOS 3-137

Figure 40B: 2018 PM Peak Hour Build Alternative 2 CLV Intersection LOS 3-138

Figure 41A: 2018 AM Peak Hour Build Alternative 2 Internal Intersection LOS 3-147

Figure 41B: 2018 PM Peak Hour Build Alternative 2 Internal Intersection LOS 3-148

Figure 42A: 2018 Alternative 3 Trip Distribution..... 3-154

Figure 42B: 2018 Alternative 3 Trip Distribution..... 3-155

Figure 42C: 2018 Alternative 3 Trip Distribution..... 3-156

Figure 43A: 2018 AM Peak Hour Build Alternative 3 CLV Intersection LOS 3-159

Figure 43B: 2018 PM Peak Hour Build Alternative 3 CLV Intersection LOS 3-160

Figure 44A: 2018 AM Peak Hour Build Alternative 3 Internal Intersection LOS 3-168

Figure 44B: 2018 PM Peak Hour Build Alternative 3 Internal Intersection LOS 3-169

Figure 45: 2018 Build Alternative 3 Sidewalk Connections..... 3-171

Figure 46A: 2018 Alternative 4 Trip Distribution..... 3-176

Figure 46B: 2018 Alternative 4 Trip Distribution..... 3-177

Figure 46C: 2018 Alternative 4 Trip Distribution..... 3-178

Figure 47A: 2018 AM Peak Hour Build Alternative 4 CLV Intersection LOS 3-181

Figure 47B: 2018 PM Peak Hour Build Alternative 4 CLV Intersection LOS 3-182

Figure 48A: 2018 AM Peak Hour Build Alternative 4 Internal Intersection LOS 3-191

Figure 48B: 2018 PM Peak Hour Build Alternative 4 Internal Intersection LOS 3-192

Figure 49: 2018 Build Alternative 4 Sidewalk Connections..... 3-194

Figure 50A: Alternative 5 Trip Distribution..... 3-198

Figure 50B: Alternative 5 Trip Distribution..... 3-199

Figure 50C: Alternative 5 Trip Distribution..... 3-200

Figure 51A: 2018 AM Peak Hour Build Alternative 5 CLV intersection LOS 3-203

Figure 51B: 2018 PM Peak Hour Build Alternative 5 CLV intersection LOS 3-204

Figure 52A: 2018 AM Peak Hour Build Alternative 5 Internal Intersection LOS 3-212

Figure 52B: 2018 PM Peak Hour Build Alternative 5 Internal Intersection LOS 3-213

Figure 53: 2018 Build Alternative 5 Sidewalk Connections..... 3-215

Figure 54A: 2018 Alternative 6 Trip Distribution..... 3-218

Figure 54B: 2018 Alternative 6 Trip Distribution..... 3-219

Figure 54C: 2018 Alternative 6 Trip Distribution..... 3-220

Figure 55A: 2018 AM Peak Hour Build Alternative 6 CLV Intersection LOS 3-222

Figure 55B: 2018 PM Peak Hour Build Alternative 6 CLV Intersection LOS 3-223

Figure 56A: 2018 AM Peak Hour Build Alternative 6 Internal Intersection LOS 3-232

Figure 56B: 2018 PM Peak Hour Build Alternative 6 Internal Intersection LOS 3-233

Figure 57A: 2018 Alternative 7 Trip Distribution..... 3-237

Figure 57B: 2018 Alternative 7 Trip Distribution..... 3-238

Figure 57C: 2018 Alternative 7 Trip Distribution..... 3-239

Figure 58A: 2018 AM Peak Hour Build Alternative 7 CLV Intersection LOS 3-241

Figure 58B: 2018 PM Peak Hour Build Alternative 7 CLV Intersection LOS 3-242

Figure 59A: 2018 AM Peak Hour Build Alternative 7 Internal Intersection LOS 3-251

Figure 59B: 2018 PM Peak Hour Build Alternative 7 Internal Intersection LOS 3-252

Figure 60A: 2018 Alternative 8 Trip Distribution..... 3-256

Figure 60B: 2018 Alternative 8 Trip Distribution..... 3-257

Figure 60C: 2018 Alternative 8 Trip Distribution..... 3-258

Figure 61A: 2018 AM Peak Hour Build Alternative 8 CLV Intersection LOS 3-260

Figure 61B: 2018 PM Peak Hour Build Alternative 8 CLV Intersection LOS 3-261

Figure 62A: 2018 AM Peak Hour Build Alternative 8 Internal Intersection LOS 3-270

Figure 62B: 2018 PM Peak Hour Build Alternative 8 Internal Intersection LOS 3-271

Figure 63A: 2018 Alternative 9 Trip Distribution..... 3-276

Figure 63B: 2018 Alternative 9 Trip Distribution..... 3-277

Figure 63C: 2018 Alternative 9 Trip Distribution..... 3-278

Figure 64A: 2018 AM Peak Hour Build Alternative 9 CLV Intersection LOS 3-280

Figure 64B: 2018 PM Peak Hour Build Alternative 9 CLV Intersection LOS 3-281

Figure 65A: 2018 AM Peak Hour Build Alternative 9 Internal Intersection LOS 3-290

Figure 65B: 2018 PM Peak Hour Build Alternative 9 Internal Intersection LOS 3-291

Figure 66A: 2018 Alternative 10 Trip Distribution..... 3-295

Figure 66B: 2018 Alternative 10 Trip Distribution..... 3-296

Figure 66C: 2018 Alternative 10 Trip Distribution..... 3-297

Figure 67A:2018 AM Peak Hour Build Alternative 10 CLV Intersection LOS 3-300

Figure 67B:2018 PM Peak Hour Build Alternative 10 CLV Intersection LOS 3-301

Figure 68A: 2018 AM Peak Hour Build Alternative 10 Internal Intersection LOS 3-309

Figure 68B: 2018 PM Peak Hour Build Alternative 10 Internal Intersection LOS 3-310

Figure 69: Gate #5..... 5-4

Figure 70: Existing Tractor Trailer Truck Storage..... 5-8

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LIST OF TABLES

Table 1: NSA Bethesda External LOS Results (CLV Method)..... 3-15
Table 2A: NSA Bethesda External LOS Results (Synchro Method)..... 3-18
Table 2B: NSA Bethesda External LOS Results (Synchro Method)..... 3-19
Table 3: Traffic Volume Growth Comparison..... 3-22
Table 6: NSA Bethesda Gate and System Peak Hour Traffic Volumes... 3-27
Table 7: NSA Bethesda Peak Period Traffic Volumes..... 3-28
Table 8: NSA Bethesda Vehicle Occupancy Summary..... 3-29
Table 9: NSA Bethesda Vehicle Classification Summary..... 3-30
Table 10: NSA Bethesda Internal Level of Service Results..... 3-39
Table 11: Bicycle Traffic Volumes at Security Gates..... 3-51
Table 12: Travel Time and Delay Survey Summary..... 3-57
Table 13: Background Developments..... 3-67
Table 14: Proposed Background Development Trip Generation Rates... 3-68
Table 15: Planned Projects..... 3-74
Table 16: Proposed Background Development Trip Generation Rates... 3-76
Table 17: Existing Parking facilities with Space Distribution..... 3-78
Table 18: 2018 No Build Condition Parking facilities with Space Distribution 3-80
Table 19: Final No Build Condition Trip Generation..... 3-82
Table 20: 2018 No Build Condition CLV Analysis for the External Intersections 3-94
Table 21: 2018 No Build Condition HCM Analysis for the External Intersections 3-98
Table 22: 2018 No Build Condition AM Peak Hour Arterial Analysis. 3-100
Table 23: 2018 No Build Condition PM Peak Hour Arterial Analysis. 3-100
Table 24: 2018 No Build Condition Internal Intersection Analysis. 3-101
Table 25: Proposed Parking Facilities..... 3-104
Table 26: List of 2018 Traffic Study Build Alternatives..... 3-105
Table 27: 2018 Build Alternatives 1, 3, 5, 6, 7, 8, 9 and 10 Trip Generation 3-107
Table 28: 2018 Build Alternative 1 CLV External Intersection Analysis 3-114
Table 29A: 2018 AM Peak Hour Build Alternative 1 HCM External Analysis 3-118
Table 29B: 2018 PM Peak Hour Build Alternative 1 HCM External Analysis 3-120

Table 30: 2018 AM Peak Hour Build Alternative 1 Arterial Analysis 3-122

Table 31: 2018 PM Peak Hour Build Alternative 1 Arterial Analysis 3-122

Table 32A: 2018 Build Alternative 1 Internal Intersection Analysis.... 3-124

Table 32B: 2018 Build Alternative 1 Internal Intersection Analysis.... 3-125

Table 33: 2018 Build Alternative 2 Trip Generation..... 3-130

Table 34: 2018 Build Alternative 2 CLV External Intersection Analysis 3-136

Table 35A: 2018 AM Peak Hour Build Alternative 2 HCM External Analysis 3-140

Table 35B: 2018 PM Peak Hour Build Alternative 2 HCM External Analysis 3-142

Table 36: 2018 AM Peak Hour Build Alternative 2 Arterial Analysis 3-144

Table 37: 2018 PM Peak Hour Build Alternative 2 Arterial Analysis 3-144

Table 38A: 2018 Build Alternative 2 Internal Intersection Analysis.... 3-145

Table 38B: 2018 Build Alternative 2 Internal Intersection Analysis.... 3-146

Table 39: Trip Distribution shift between Buildings 54 and 55 to the Proposed Warehouse Parking Structure 3-151

Table 40: Trip Distribution from both Building 54 and 55 to the Proposed Parking Structures in the Warehouse Area and USU Alterntive 2 3-151

Table 41: 2018 Build Alternative 3 CLV External Analysis..... 3-158

Table 42A: 2018 AM Peak Hour Build Alternative 3 HCM External Analysis 3-161

Table 42B: 2018 PM Peak Hour Build Alternative 3 HCM External Analysis 3-163

Table 43: 2018 AM Peak Hour Build Alternative 3 Arterial Analysis 3-165

Table 44: 2018 PM Peak Hour Build Alternative 3 Arterial Analysis 3-165

Table 45A: 2018 Build Alternative 3 Internal Intersection Analysis.... 3-166

Table 45B: 2018 Build Alternative 3 Internal Intersection Analysis.... 3-167

Table 46: 2018 Build Alternative 4 Trip Generation..... 3-172

Table 47: Trip Distribution from both Building 54 and 55 to the Proposed Parking Structures in H- and N-Lots 3-173

Table 48: 2018 Build Alternative 4 CLV External Intersection Analysis 3-180

Table 49A: 2018 AM Peak Hour Build Alternative 4 HCM External Analysis 3-184

Table 49B: 2018 PM Peak Hour Build Alternative 4 HCM External Analysis 3-186

Table 50: 2018 AM Peak Hour Build Alternative 4 Arterial Analysis 3-188

Table 51: 2018 PM Peak Hour Build Alternative 4 Arterial Analysis 3-188

Table 52A: 2018 Build Alternative 4 Internal Intersection Analysis.... 3-189

Table 52B: 2018 Build Alternative 4 Internal Intersection Analysis.... 3-190

Table 53: Trip Distribution shift between Buildings 54 and 55 to the Proposed Taylor Road Facilities Parking Structure 3-196

Table 54: Build Alternative 5 CLV External Analysis..... 3-201

Table 55A: 2018 AM Peak Hour Build Alternative 5 HCM External Analysis 3-205

Table 55B: 2018 PM Peak Hour Build Alternative 5 HCM External Analysis 3-207

Table 56: 2018 AM Peak Hour Build Alternative 5 Arterial Analysis 3-209

Table 57: 2018 PM Peak Hour Build Alternative 5 Arterial Analysis 3-209

Table 58A: 2018 Build Alternative 5 Internal Intersection Analysis.... 3-210

Table 58B: 2018 Build Alternative 5 Internal Intersection Analysis.... 3-211

Table 59: 2018 Build Alternative 6 CLV External Analysis..... 3-221

Table 60A: 2018 Build Alternative 6 HCM External Analysis..... 3-225

Table 60B: 2018 Build Alternative 6 HCM External Analysis..... 3-227

Table 61: 2018 AM Peak Hour Build Alternative 6 Arterial Analysis 3-229

Table 62: 2018 PM Peak Hour Build Alternative 6 Arterial Analysis 3-229

Table 63A: 2018 Build Alternative 6 Internal Intersection Analysis.... 3-230

Table 63B: 2018 Build Alternative 6 Internal Intersection Analysis.... 3-231

Table 64: 2018 Build Alternative 7 CLV External Analysis..... 3-240

Table 65A: 2018 Build Alternative 7 HCM External Analysis..... 3-244

Table 65B: 2018 Build Alternative 7 HCM External Analysis..... 3-246

Table 66: 2018 AM Peak Hour Build Alternative 7 Arterial Analysis 3-248

Table 67: 2018 PM Peak Hour Build Alternative 7 Arterial Analysis 3-248

Table 68A: 2018 Build Alternative 7 Internal Intersection Analysis.... 3-249

Table 68B: 2018 Build Alternative 7 Internal Intersection Analysis.... 3-250

Table 69: 2018 Build Alternative 8 CLV External Analysis..... 3-259

Table 70A: 2018 AM Peak Hour Build Alternative 8 HCM External Analysis 3-263

Table 70B: 2018 PM Peak Hour Build Alternative 8 HCM External Analysis 3-265

Table 71: 2018 AM Peak Hour Build Alternative 8 Arterial Analysis 3-267

Table 72: 2018 PM Peak Hour Build Alternative 8 Arterial Analysis 3-267

Table 73A: 2018 Build Alternative 8 Internal Intersection Analysis.... 3-268

Table 73B: 2018 Build Alternative 8 Internal Intersection Analysis.... 3-269

Table 74: 2018 Build Alternative 9 CLV External Analysis..... 3-279

Table 75A: 2018 AM Peak Hour Build Alternative 9 HCM External Analysis 3-283

Table 75B: 2018 PM Peak Hour Build Alternative 9 HCM External Analysis 3-285

Table 76: 2018 AM Peak Hour Build Alternative 9 Arterial Analysis 3-287

Table 77: 2018 PM Peak Hour Build Alternative 9 Arterial Analysis 3-287

Table 78A: 2018 Build Alternative 9 Internal HCM Intersection Analysis 3-288

Table 78B: 2018 Build Alternative 9 Internal HCM Intersection Analysis 3-289

Table 79: 2018 Build Alternative 10 CLV External Analysis..... 3-298

Table 80A:2018 AM Peak Hour Build Alternative 10 HCM External Analysis 3-302

Table 80B:2018 PM Peak Hour Build Alternative 10 HCM External Analysis 3-304

Table 81: 2018 AM Peak Hour Build Alternative 10 Arterial Analysis.... 3-306

Table 82: 2018 PM Peak Hour Build Alternative 10 Arterial Analysis.... 3-306

Table 83A:2018 Build Alternative 10 Internal HCM Intersection Analysis 3-307

Table 83B:2018 Build Alternative 10 Internal HCM Intersection Analysis 3-308

Table 84: AM Peak Hour CLV Summary..... 4-2

Table 85: PM Peak Hour CLV Summary..... 4-3

Table 86: AM Peak Hour HCM Summary..... 4-4

Table 87: PM Peak Hour HCM Summary..... 4-5
Table 88: AM Peak Hour Arterial Summary..... 4-6
Table 89: PM Peak Hour Arterial Summary..... 4-7
Table 90: 2018 AM Peak Hour Arterial Travel Speeds..... 4-7
Table 91: 2018 PM Peak Hour Arterial Travel Speeds..... 4-8
Table 92: 2018 AM Peak Hour Arterial Travel Times..... 4-8
Table 93: 2018 PM Peak Hour Arterial Travel Times..... 4-8
Table 94: 2018 AM Peak Hour Arterial Level of Service..... 4-9
Table 95: 2018 PM Peak Hour Arterial Level of Service..... 4-9
Table 96: AM Peak Hour Internal Summary..... 4-11
Table 97: PM Peak Hour HCM Internal Summary..... 4-13
Table 98: AM Peak Hour 2018 Volumes by Gate..... 4-14
Table 99: AM Peak Hour 2018 Percent Change by Gate..... 4-14
Table 100: PM Peak Hour 2018 Volume Change by Gate..... 4-15
Table 101: AM Peak Hour 2018 Percent Change by Gate..... 4-15
Table 102: Parking Summary..... 4-17
Table 103: AM Peak Hour 2018 Build Alternative New Pedestrian Trips... 4-18
Table 104: PM Peak Hour 2018 Build Alternative New Pedestrian Trips... 4-18
Table 105: Existing Truck Arrival and Inspection Summary..... 5-3

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1.0 Introduction

This report presents the findings of a transportation study prepared as part of the Environmental Impact Statement (EIS) for the proposed Medical Facilities Development, and University Expansion at the Naval Support Activity Bethesda (NSA Bethesda). The Medical Facilities Development includes: the demolition of five hospital buildings and construction of a single 5-story facility and associated 500-space parking garage for visitors, patients, and very important persons; internal renovation of five hospital buildings; temporary medical facilities to provide uninterrupted patient care during construction; utility capacity upgrades; accessibility and appearance improvement projects; and internal and external renovations of a workshop/warehouse to office space. The University Expansion includes the construction of a new education/research facility and associated 400-space parking garage at the Uniformed Services University of the Health Sciences (USU) and the internal renovation of existing USU buildings.

NSA Bethesda is located on Rockville Pike (MD 355) north of downtown Bethesda Maryland, and is home to the Walter Reed National Military Medical Center (WRNMMC), the USU, and several other health care support facilities for the armed services.

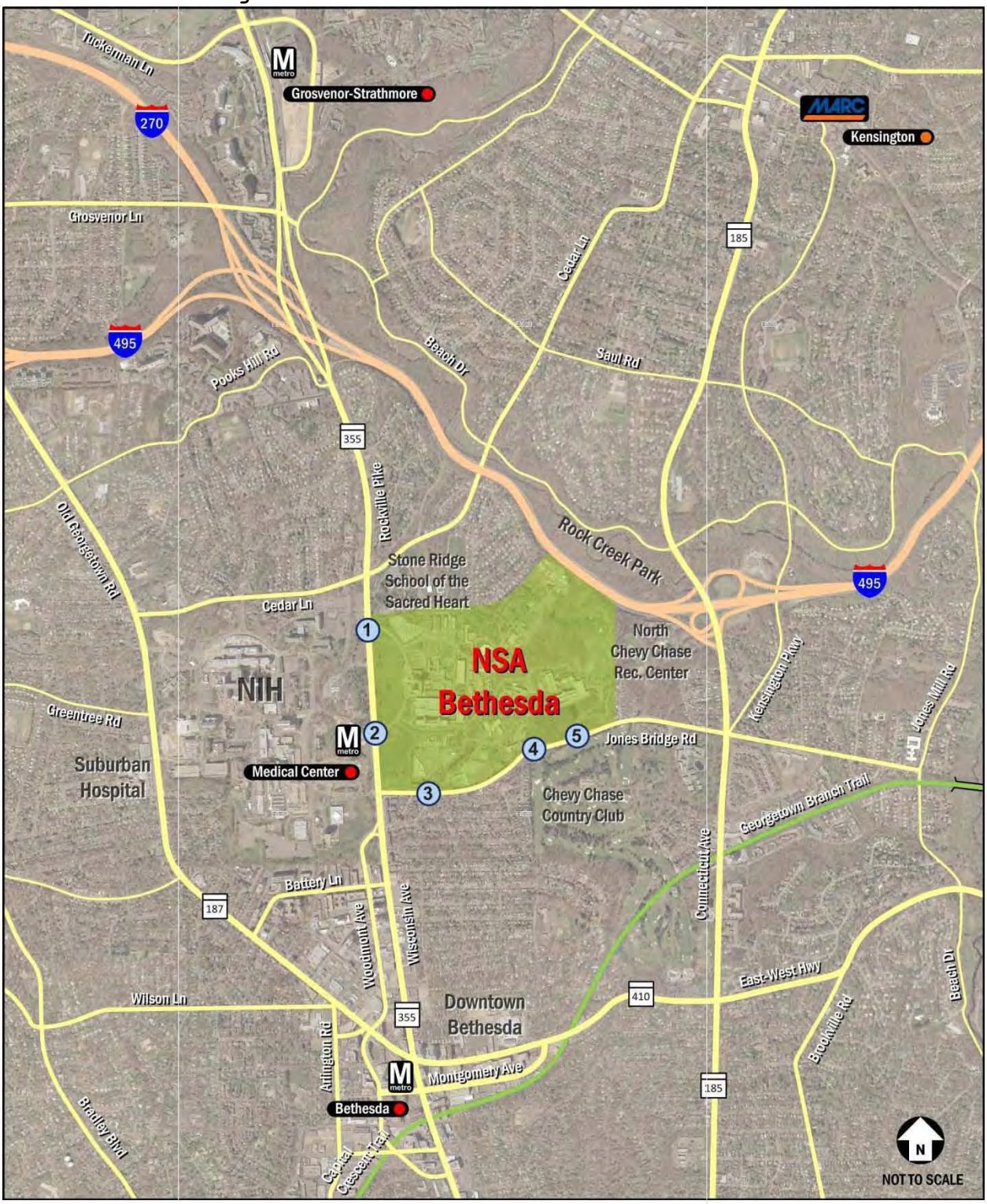
Founded in 1940, NSA Bethesda operated as the National Naval Medical Center (NNMC) until the Defense Base Closure and Realignment (BRAC) Committee recommended that the nearby Walter Reed Army Medical Center be closed and that some of its operations be merged with the NNMC to create the WRNMMC. The realignment process was formally concluded on September 15, 2011, and the WRNMMC will receive approximately 1.2 million patient visits plus other visitors annually. Of the 11,686 total personnel at NSA Bethesda, WRNMMC comprises approximately 6,800 staff members.

NSA Bethesda is surrounded by the National Institutes of Health (NIH) main campus to the west; Stone Ridge School of the Sacred Heart (a pre-K to 12 girls school) and residential uses to the north; North Chevy Chase Recreation Center, residential uses, and Rock Creek Park to the east; and Columbia Country Club, residential housing, parks, and a golf course to the south. Interstate 495 (I-495) is adjacent to the northeastern corner of the installation. Jones Bridge Road is the southern boundary and Rockville Pike forms the western boundary. The Medical Center Metro station is situated to the west directly across Rockville Pike from the South Wood Road Entrance to NSA Bethesda. Figure 1 shows the location of NSA Bethesda. NSA Bethesda is a secure site that can only be accessed via five security gates. These gates are shown in Figure 1 and are:

- Gate #1 or North Wood Road Gate (North Gate): Accessed from Rockville Pike.
- Gate #2 or South Wood Road Gate (South Gate): Accessed from Rockville Pike.
- Gate #3 or Gunnell Road Gate: Accessed from Jones Bridge Road.
- Gate #4 or Grier Road Gate: Accessed from Jones Bridge Road.
- Gate #3 or University Road Gate: Accessed from Jones Bridge Road.

The five gates will be referred to as Gates #1, #2, #3, #4, and #5 in this Traffic Study.

Figure 1: NSA Bethesda Location and Gates



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2.0 Description of the Project Tasking

The scope of work for this traffic study includes the following tasks:

- Provide engineering services necessary for the preparation of a condition assessment report of the traffic capacity and level of service (LOS) analysis as well as parking adequacy for both existing conditions and for future requirements based on the Medical Facilities Development and University Expansion.

- Provide recommendations for improvements to the installation roads system based on the results of the capacity and LOS analysis of future requirements.

- Provide a list of findings, recommendations, and alternatives for each alternative.

This traffic study has seven sections to document the analysis, findings, and recommendations for NSA Bethesda.

Section 1.0 presents the introduction, study area, and the proposed actions.

Section 2.0 describes the project tasking.

Section 3.0 presents an operational analysis of existing and future conditions. Section 3.1 presents the operational analysis of the study area surrounding NSA Bethesda under existing conditions for both the internal and external roadway networks as well as non-automotive transportation modes. Section 3.2 details future background developments, NSA Bethesda's proposed actions, and presents the operational analysis under these conditions.

Section 4.0 summarizes the findings of the existing and future operational analyses.

Section 5.0 presents transportation impacts from construction activities associated with the proposed actions, including construction vehicle queuing analysis at Gate #5.

Section 6.0 presents the recommendations for minimizing transportation impacts once the operation of the proposed actions are underway.

Section 7.0 presents recommendations for minimizing transportation impacts during construction activities.

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3.0 Operation Analysis of Existing and Future Conditions

The existing and projected future conditions at and around NSA Bethesda were assessed in order to determine the impacts of the proposed actions. This chapter describes the process by which the current state of transportation operations along the surrounding roadway network and within NSA Bethesda was evaluated.

This chapter discusses the existing study area roadways and installation gates, data gathering technics, traffic operational analysis methods and results, and comparisons to 2008 traffic forecasts. To ensure the analysis complies with all state and county requirements, agreement was sought from the Maryland-National Capital Park and Planning Commission (M-NCPPC), Maryland State Highway Administration (MSHA), and Montgomery County Department of Transportation (MCDOT) on the study area, analysis methods, and future external roadway distribution of new NSA Bethesda trips. The analysis methods agreed upon for the external roadway intersections followed the Montgomery County and the MSHA requirements. A separate more commonly accepted traffic analysis method was used for the internal roadway network as these roadways are not under the County or State jurisdiction, but will be reviewed by the National Capital Planning Commission (NCPC). To provide additional traffic operation measurements beyond the MSHA and Montgomery County requirements, this same commonly accepted traffic analysis method was also used to evaluate the external roadways.

The chapter also discusses installation trucking access, pedestrian and bicycle facilities and volumes, and transit availability. Trucking access provides an overview of which route trucks would be required to use when accessing the installation and where they might be destined once inside. In addition to motor vehicle conditions, pedestrian and bicycle facilities and volumes provides a description of the existing pedestrian and bicycle network and the current volume. Transit availability discusses the different transit options connecting the installation facilities to the local neighborhood and regional transit centers. As the installation is in an urban area (less than one mile north of downtown Bethesda), these alternative transportation modes are an important part of the transportation system serving the installation.

3.1 Existing Conditions

Various data sources were used to determine the existing state of transportation operations in the vicinity of NSA Bethesda. Installation observations, the lane configuration of the internal and external roadway networks, and vehicular traffic count data were used to conduct existing conditions capacity analyses. Other collected data

used to determine the existing conditions were developed from a travel time study and observations regarding the operations of the installation's access gates.

3.1.1 ***External Roadway Conditions***

NSA Bethesda is situated just south of the Capital Beltway (I-495) in Bethesda, Maryland. The western and southern boundaries of the installation are formed by Rockville Pike and Jones Bridge Road, respectively. The remaining borders of the installation include various residential, educational, and community uses. The roadway network and external study intersections are illustrated in Figure 2.

3.1.1.1 External Roadway Network

The principal roadways in the vicinity of NSA Bethesda include the following:

Rockville Pike (MD 355)

This six-lane divided roadway is classified as a principal arterial by the MSHA. An arterial is defined as a roadway serving regional traffic movements and regional land uses (i.e., medical center, shopping center, research park, etc.), traveling between cities, and connecting Interstates or other arterials to local roadways serving local land uses (i.e., residential homes, small businesses, etc.). Rockville Pike provides direct access to NSA Bethesda through Gates #1 and #2. It is oriented north-south along the western edge of the installation, connecting the installation with Washington, DC to the south (it is called Wisconsin Avenue south of the installation) and the city of Frederick, Maryland to the north. This roadway also provides connections to other locations throughout Montgomery County and the surrounding metropolitan area via an interchange with the Capital Beltway (I-495) and the Washington National Pike (I-270) to the north. It also provides connections to major east-west arterial roadways along other segments to the north and south of the installation. Rockville Pike is therefore a major regional and commuter route. It is also the main artery for several bus routes operated by the Washington Metropolitan Area Transit Authority (WMATA) and the Montgomery County Ride On transit systems.

Rockville Pike is heavily traveled in the vicinity of NSA Bethesda. Traffic congestion and delays occur in the southbound direction during the morning peak period, with similar conditions occurring in the northbound direction during the evening peak period. Alternating bands of stopped and slowly moving traffic were observed stretching for several intersections in both directions from the installation along the peak direction of travel. These congested conditions are a result of high volumes of commuter traffic heading between suburban residential areas to the north of the installation and the employment centers of Bethesda-Chevy Chase and the District of Columbia to the south.

In response to increased traffic volumes along Rockville Pike, the MSHA has proposed a series of improvements throughout this corridor to improve traffic flow. The most noteworthy of these is to widen Rockville Pike in the northbound direction to four lanes between the North Wood Road installation entrance and Locust Hill Road, just north of Cedar Lane. These improvements are intended to improve traffic capacity at the Cedar Lane intersection, which serves as a primary location for delays.

Improvements are also planned at the intersection of Jones Bridge Road with Rockville Pike, which would widen each leg of the intersection in order to incorporate additional turning and through lanes at each approach. These improvements are intended to improve capacity in this heavily congested area. Fully actuated signals will also be implemented at this location through modifications to the traffic signal's operational scheme. Fully actuated signals allow the signal to respond to varying traffic patterns in real time by reacting to the shifting ebb and flow of traffic along all intersection approaches, allocating green time based upon traffic demand up to a maximum limit. In this way, the signal will be able to accommodate fluctuations in traffic volume on a cycle-by-cycle (the time for a traffic signal to service each approach) basis.

Capital Beltway (I-495)

The Capital Beltway exists as a circumferential regional interstate facility around Washington, DC. In the vicinity of NSA Bethesda, I-495 runs east-west to the north of the installation with an eight-lane cross section, connecting to I-270 to the northwest and other radial arterials including Rockville Pike, Old Georgetown Road, and Connecticut Avenue in the immediate vicinity of the installation.

Jones Bridge Road

Jones Bridge Road is a four-lane divided arterial roadway, oriented east-west along the southern edge of NSA Bethesda. Jones Bridge Road provides direct access to NSA Bethesda via Gates #3, #4, and #5. The road begins at the NIH campus to the west and continues east to intersect with Connecticut Avenue and has a posted speed limit of 40 miles per hour (mph).

Cedar Lane

Cedar Lane is an undivided arterial roadway that ranges between two and four lanes in width, and is oriented east-west north of NSA Bethesda. Cedar Lane is separated from NSA Bethesda by the Stone Ridge School of the Sacred Heart and therefore does not connect directly to the installation. The posted speed limit is 30 mph.

Future improvements proposed by the MSHA include the addition of several turn lanes at the intersection of Cedar Lane and Rockville Pike in order to increase the saturation flow rate at this

intersection. By increasing the rate at which vehicles will be able to traverse this intersection from the east and west, more green time could be allocated to the approaches along Rockville Pike. As mentioned previously, the additional through lanes along Rockville Pike will also improve these operations.

Connecticut Avenue (MD 185)

Connecticut Avenue is a six-lane divided roadway and is classified as a major highway (same as an arterial) by Montgomery County. It is oriented north-south just east of NSA Bethesda, and extends from Washington, DC to Aspen Hill, east of Rockville in Montgomery County. Connecticut Avenue has an interchange with I-495 to the northeast of NSA Bethesda. This roadway serves regional and commuter traffic and is traversed by several WMATA and Ride On bus routes. The posted speed limit is 35 mph and in sections is enforced by speed cameras.

Future improvements proposed by the MSHA at the intersection of Connecticut Avenue and Jones Bridge Road include widening of both roadways near the intersection in an effort to improve traffic flow and congestion.

Old Georgetown Road (MD 187)

Old Georgetown Road is a four-lane roadway that is classified as a major highway (same as an arterial) by Montgomery County and is oriented north-south to the west of Rockville Pike. Old Georgetown Road extends south from White Flint to downtown Bethesda. This roadway has interchanges with I-270 and I-495 and is traversed by several WMATA and Ride On bus routes. The posted speed limit is 40 mph.

Future improvements proposed by the MSHA at the intersection of Old Georgetown Road and West Cedar Lane include the addition or lengthening of turning lanes and the widening of travel lanes, which will improve flow through existing intersections near the NIH campus.

Jones Mill Road

This is a two-lane roadway located east of Connecticut Avenue and is classified as a primary residential street by Montgomery County. Jones Mill Road is oriented primarily north-south between I-495 and the East-West Highway and serves to connect the northern and southern sections of Beach Drive as it travels through Rock Creek Park. The posted speed is 25 mph.

Woodmont Avenue

This roadway has a four-lane cross-section and is classified as an arterial street with a posted speed of 25 mph. Woodmont Avenue is parallel to Rockville Pike northward from downtown Bethesda, remaining one block west of Rockville Pike before finally curving east and intersecting with that roadway one block south of Jones Bridge Road. Woodmont Avenue assists in circulating traffic between NSA Bethesda, the NIH campus, and the downtown Bethesda.

3.1.1.2 External Study Intersections

The Montgomery County Local Area Transportation Review (LATR) Guidelines are set forth to establish a more precise and documented approach for evaluating the potential transportation-related impact for growth throughout Montgomery County, Maryland. Throughout the county, various areas are categorized based on their level of congestion and ability to accept a respective amount of additional development. The LATR assists in determining what additional development can be supported in the area and outlines the steps an applicant must take for determining the associated impact on the transportation network. Since NSA Bethesda is within Montgomery County, it will adhere to the LATR standards.

As part of the LATR evaluation, elements such as development size, trip generation, study area, adequacy of traffic flows, and other criteria are analyzed. One specific step of this evaluation is selecting a study area. As outlined in the LATR, the study area associated with a new or redeveloped parcel is directly related to the total number of new trips the development will add to the transportation network. Based on a scale provided by M-NCPPC, a total number of signalized intersections must be studied for a specific range of generated trips.

For this traffic study, the Navy initiated early coordination with the M-NCPPC, MSHA, and MCDOT to ensure that the agencies were in agreement with the methodology used in the traffic study. The intersections external to NSA Bethesda that were included in the traffic study were identified based on a preliminary site trip assignment through 17 intersections adjacent to the installation, in accordance with the M-NCPPC’s LATR methodology. This list was expanded to include additional intersections identified by the public during the scoping period. Based on the site trip assignment and coordination with M-NCPPC, the

original 17 intersections were determined to capture the majority of the traffic that would be generated by proposed actions; therefore, the additional intersections were not included. The external roadway study intersections, shown in detail in Figure 2, are:

1. Rockville Pike and Grosvenor Lane
2. Rockville Pike and Pooks Hill Road
3. Old Georgetown Road and Oakmont Ave/Cedar Lane
4. Locust Ave/West Drive and Cedar Lane
5. Rockville Pike and Cedar Lane
6. Rockville Pike and North Drive/School Driveway
7. Rockville Pike and NIH Delivery Entrance/North Wood Road (Gate #1)
8. Rockville Pike and Wilson Drive
9. Rockville Pike and South Drive/South Wood Road (Gate #2)
10. Rockville Pike and Center Drive/Jones Bridge Road
11. Gunnell Road (Gate #3)/Glenbrook Parkway and Jones Bridge Road
12. Grier Road (Gate #4) and Jones Bridge Road
13. University Road (Gate #5) and Jones Bridge Road
14. Connecticut Avenue and Jones Bridge Road and Kensington Parkway
15. Manor Road and Jones Bridge Road
16. Jones Bridge Road and Jones Mill Road
17. Rockville Pike/Wisconsin Avenue and Woodmont Avenue/Glenbrook Parkway

Within the study area, intersections 7, 9, 11, 12, and 13 are the locations of security gates for NSA Bethesda.

3.1.1.3 External Existing Lane Geometry and Traffic Control

As part of the field data collected in the vicinity of NSA Bethesda, a detailed reconnaissance of the lane geometry and traffic signal timings was conducted. Several visits were made to NSA Bethesda to ensure that accurate information was collected and available for this report. Based on those field visits, the lane geometry and traffic control indicated on Figures 3A and 3B were utilized in this study.

Figure 2: External Study Intersections

Figure 3A: External Lane Geometry and Traffic Control

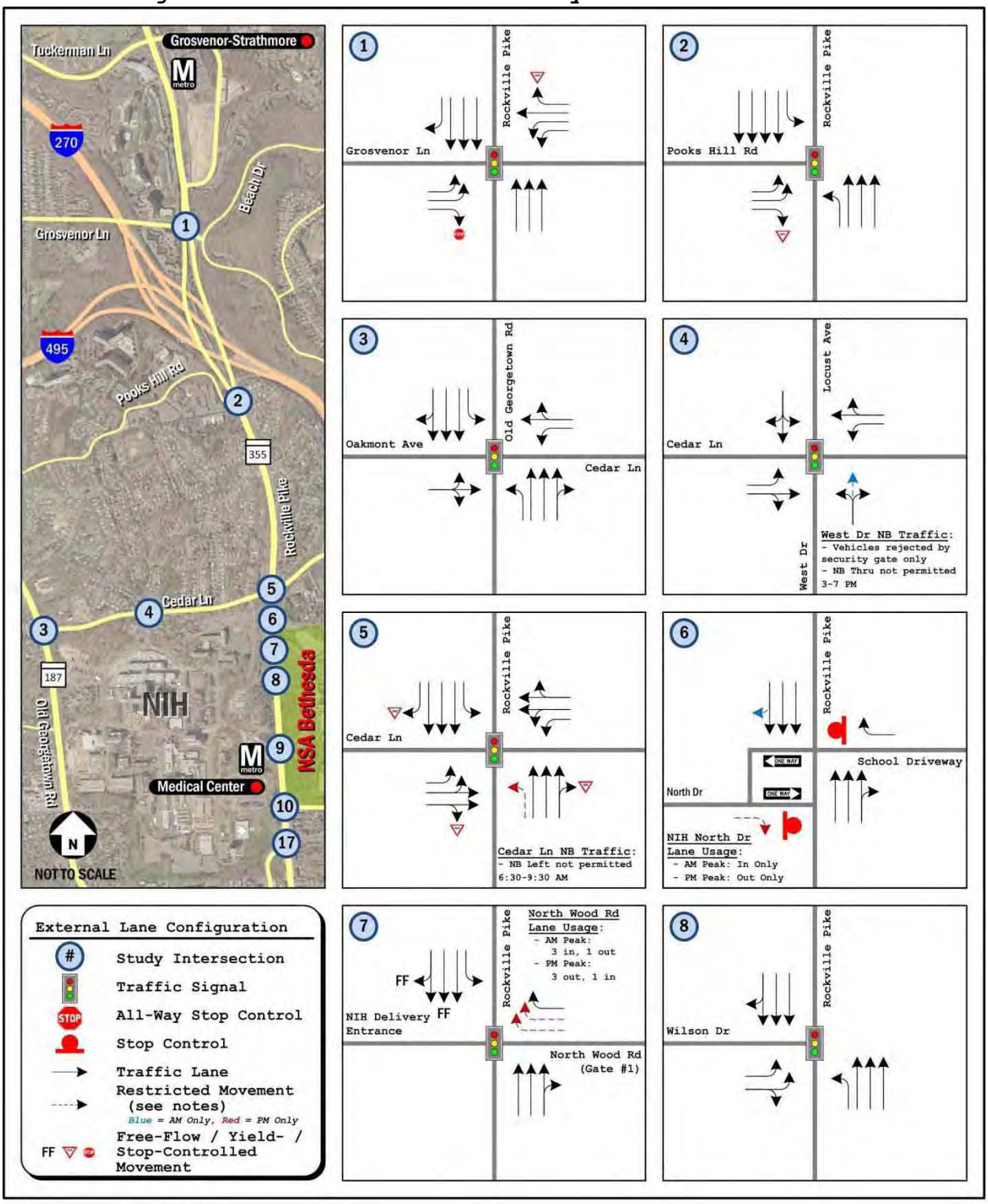
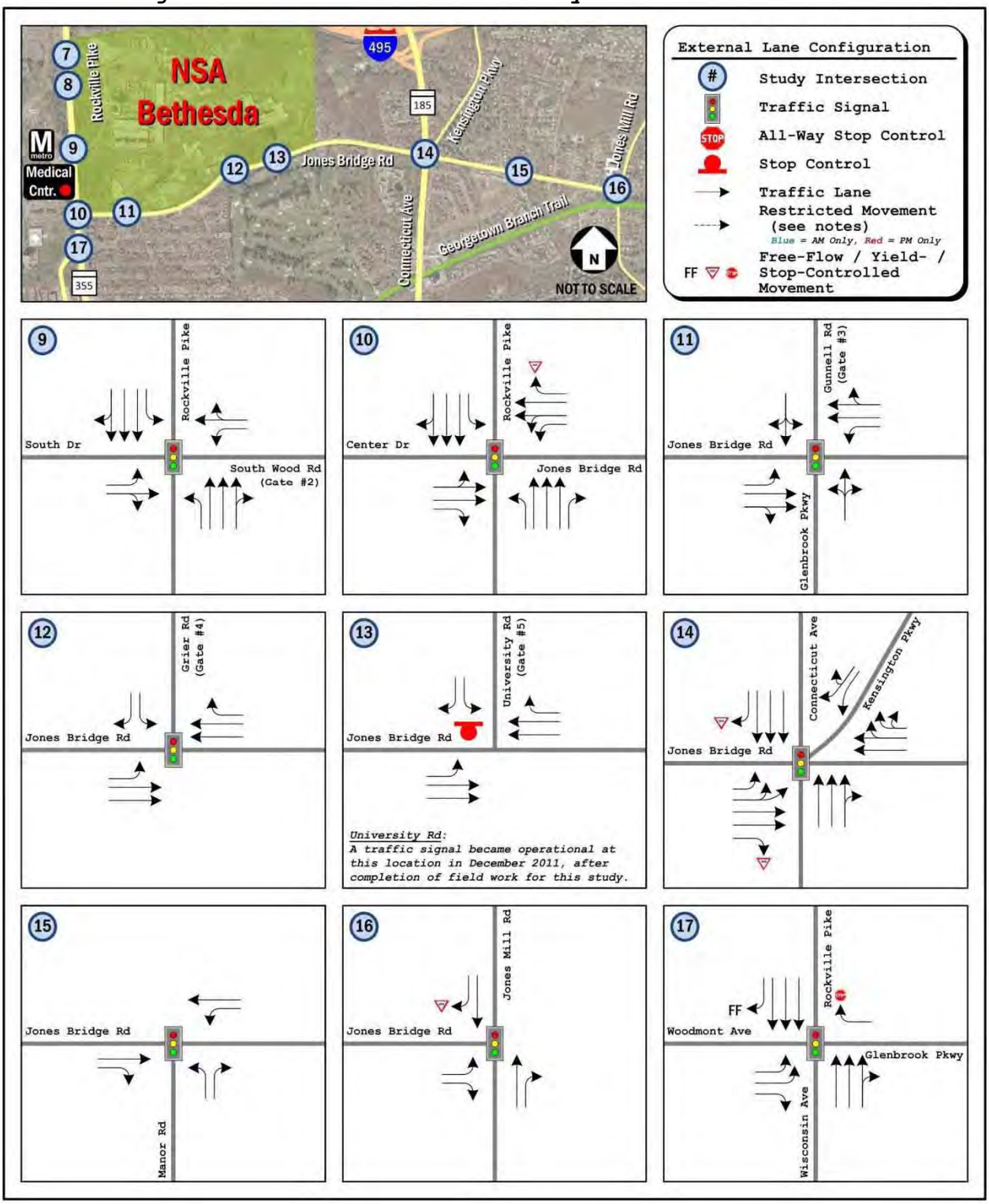


Figure 3B: External Lane Geometry and Traffic Control



While the information collected is expected to be the most accurate available, the MSHA continues to monitor the corridor and adjust signal timings to optimize the traffic flow. These modifications are not expected to have a significant impact on the phasing or lane use at the external intersections.

3.1.1.4 External Existing Peak Hour Traffic Volumes

Manual turning movement counts were collected at the 17 external intersections shown in Section 3.1.1.2 over the course of October 18, 19, 20, and 26, 2011. These days were selected so that average mid-week (Tuesday through Thursday) data could be collected. Traffic volumes were collected at the 17 external study intersections from 5:30 – 9:00 AM and from 3:00 - 6:30 PM in order to provide a large range of data to properly identify the morning and afternoon peak hours of traffic.

In addition to manual turning movement counts, automatic traffic records (ATR) were placed at eight locations throughout the study area to obtain 24-hour counts. These counters were placed between October 25th and November 2nd to provide a multiple day count history in 15-minute intervals.

Traffic count data at the 17 external study intersections were tabulated during 15-minute intervals within the AM and PM observational periods. The 1 hour periods associated with the highest volume of traffic during the AM and PM peaks are generally referred to as the peak hours. Based upon the manual turning movement and ATR counts, the following conclusions can be drawn from the calculated peak hour data for NSA Bethesda:

- The traffic counts at the external intersections indicate a system peak hour of 7:45 – 8:45 AM in the morning and 4:45 – 5:45 PM in the evening.

- Along Rockville Pike/Wisconsin Avenue, the AM peak hour becomes gradually later as traffic progresses southbound through the study area. This finding shows the peak flow of commuter vehicles traveling southbound, peaking at the northernmost study area intersection between 7:30 – 8:30 AM, adjacent to NSA Bethesda between 7:45 – 8:45 AM, and finally to the south of the installation between 8:00 – 9:00 AM.

- The AM peak hour of traffic outside NSA Bethesda Gates #1, #2, #3, and #4 occurs between 7:30 – 8:30 AM and 8:00 – 9:00 AM at all intersections. Gate #5 experienced its peak hour between 6:30 – 7:30 AM.

- The PM peak hour occurs in a wider range of times across the study area, varying from 3:30 – 4:30 PM to 5:30 – 6:30 PM. However, the PM peak hour generally occurs later in the day on the major north-south commuter route of Rockville Pike/Wisconsin

Avenue when compared to the side streets. This is consistent with the tendency for traffic from local area driveways to peak earlier than commuter traffic that must travel some distance to arrive in the study area.

These AM and PM system peak traffic volumes are shown on Figures 4A and 4B and will be utilized for purposes of analyzing capacity across the study area.

Figure 4A: External Traffic Volumes - Existing (2011) Conditions

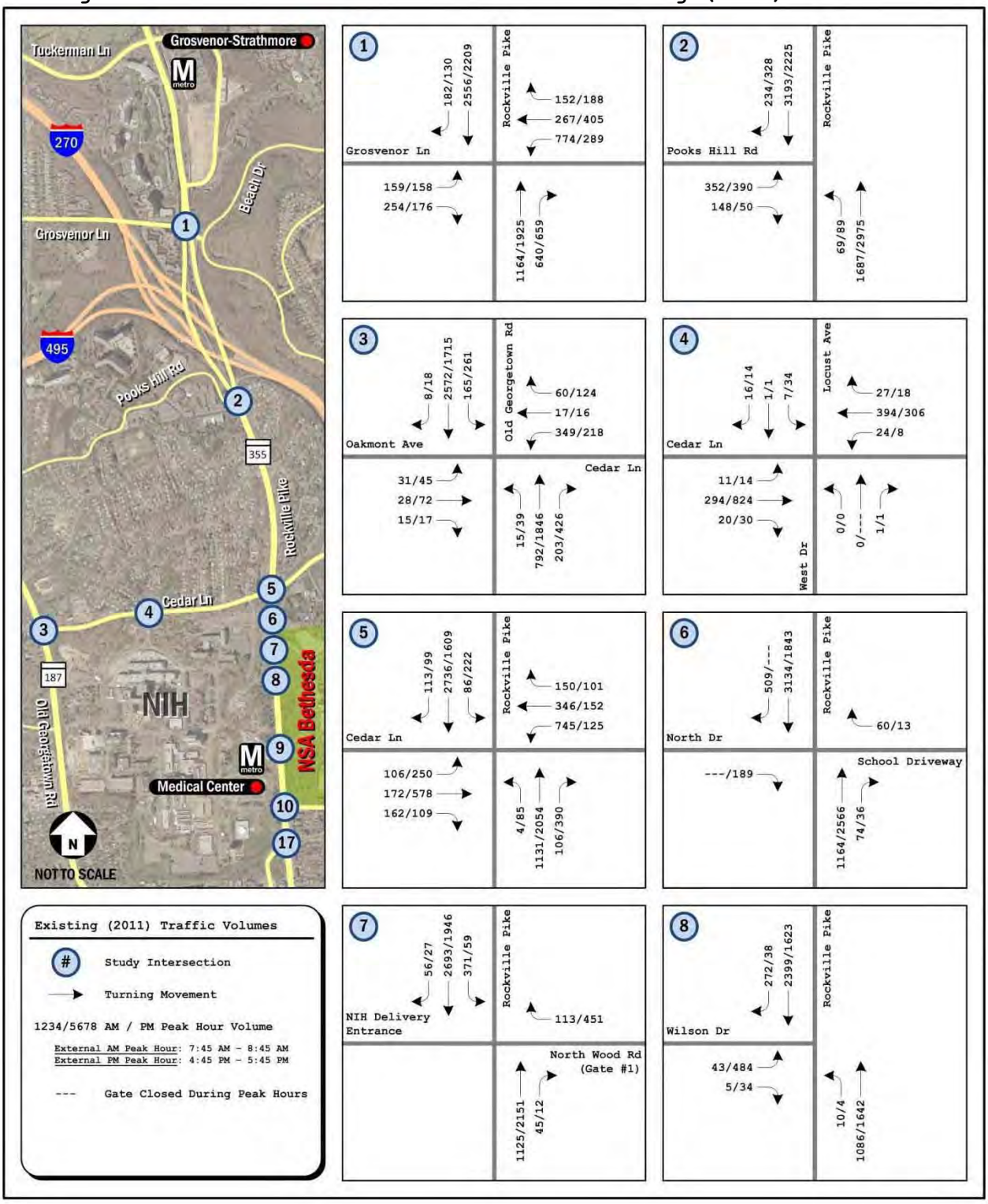
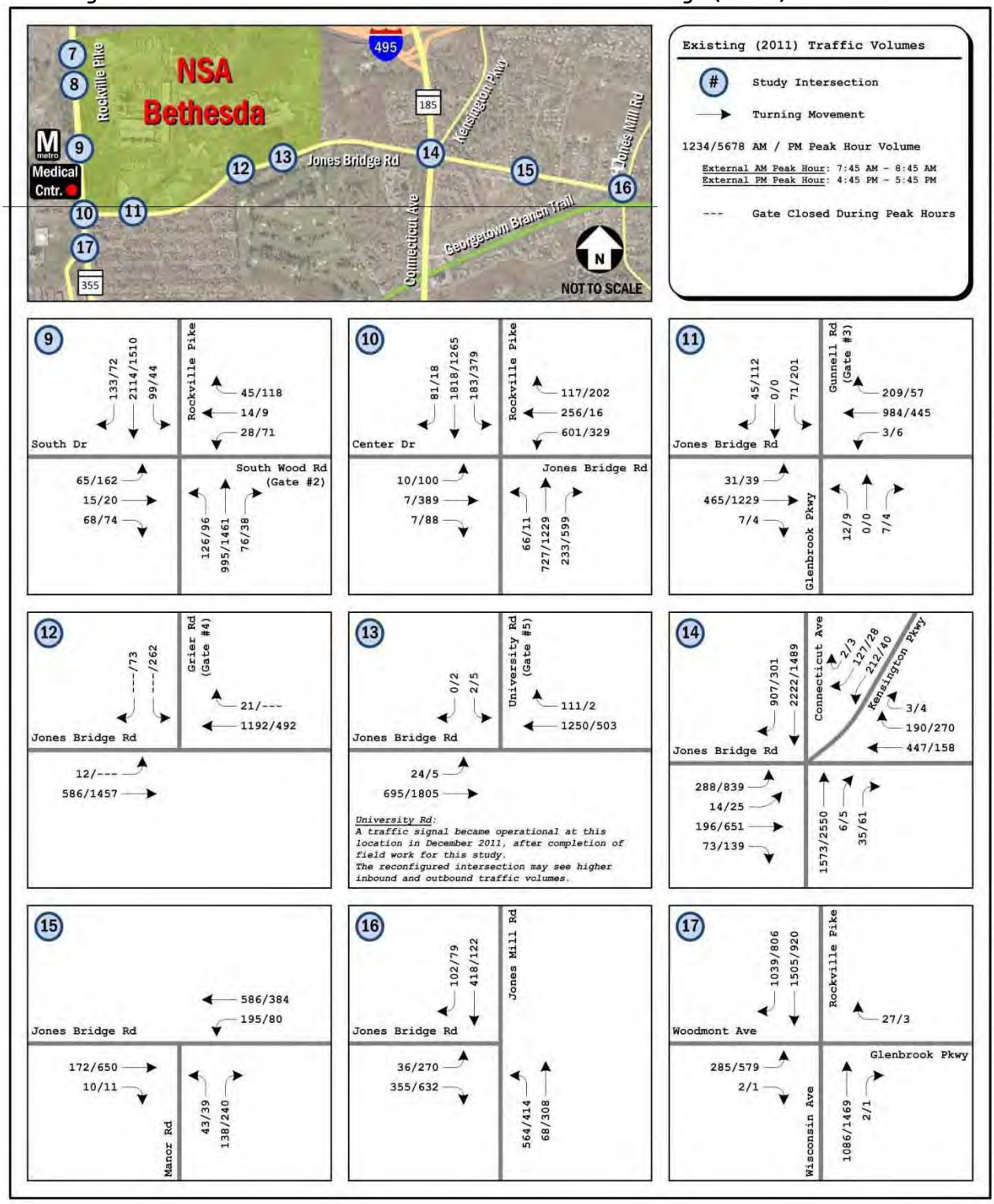


Figure 4B: External Traffic Volumes – Existing (2011) Conditions



3.1.1.5 External Existing Capacity Analysis

A capacity analysis is a way of assessing the performance of an intersection or a network of intersections based on the observed traffic volumes, lane geometry, and intersection operation. By comparing these field-measured characteristics to established baselines using equations and tables published in industry-standard reference guides, an intersection can be graded based on its calculated LOS as indicated by a letter grade of A through F. These capacity analysis results use the lane utilization set forth in Figures 3A and 3B and the existing traffic volumes depicted in Figures 4A and 4B.

M-NCPPC's LATR specifies the use of the Critical Lane Volume (CLV) traffic analysis method in conducting vehicle capacity analyses within Montgomery County. While the LATR indicates that unsignalized intersections should also use the CLV method, the Highway Capacity Manual (HCM) provides a much more accurate measure for determining the operations of stop-controlled intersections.

Critical Lane Volume Method

Capacity analyses for each of the signalized intersections for the external network were conducted following the CLV method established by M-NCPPC LATR guidelines. The CLV method, as established by the HCM, is a basis for calculating the peak hour vehicular capacity of an individual intersection on the basis of its lane configuration and phasing, without incurring bias from adjacent intersections. Similar to other means of calculating intersection capacity, the intersection capacity results are expressed in terms of the LOS, which is indicated by a letter grade of A through F.

LATR guidelines define a specific congestion standard that determines the associated threshold for each LOS letter grade based on criteria for the specific policy area within Montgomery County. This congestion standard represents the sum of critical lane volumes that the intersection can theoretically handle while remaining within the tolerable limits of delay that exist in a given policy area. In the area associated with NSA Bethesda, each study intersection in the network is associated with the LATR defined Bethesda policy area, which establishes a CLV standard of 1,600 for LOS F. The only study intersection outside this policy area is the intersection of Rockville Pike and Grosvenor Lane, which is in the North Bethesda policy area and has a CLV standard of 1,550.

Given this criteria and the CLV method provided in the LATR, capacity analyses were conducted for each of the signalized intersections within the study area. The CLV results for each of the signalized intersections can be found in Table 1. According to the HCM when using the level of service ratings, a LOS of D or better represents stable traffic operations, while a LOS of E or F represents unstable traffic operations with significant delays.

Table 1: NSA Bethesda External LOS Results (CLV Method)

	AM Peak Hour		PM Peak Hour		M-NCPPC Threshold	
	CLV	LOS	CLV	LOS	StandaRoac	Pass/Fail
1. Rockville Pike & Grosvenor Lane	1,356	D	1,306	D	1,550	Pass
2. Rockville Pike & Pooks Hill Road	1,283	C	1,308	D	1,600	Pass
3. Old Georgetown Road & Oakmont Ave/Cedar Lane	1,396	D	1,459	E	1,600	Pass
4. Locust Ave/West Drive & Cedar Lane	480	A	919	A	1,600	Pass
5. Rockville Pike & Cedar Lane	1,748	F	1,613	F	1,600	Fail AM+PM
6. Rockville Pike & North Drive/School Dwy	*unsignalized*		*unsignalized*		1,600	Pass
7. Rockville Pike & North Wood Road (Gate #1)	804	A	967	A	1,600	Pass
8. Rockville Pike & Wilson Drive	1,023	B	894	A	1,600	Pass
9. Rockville Pike & South Drive/South Wood Road (Gate #2)	1,081	B	970	A	1,600	Pass
10. Rockville Pike & Center Drive/Jones Bridge Road	1,098	B	1,287	C	1,600	Pass
11. Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road	798	A	1,040	B	1,600	Pass
12. Grier Road (Gate #4) & Jones Bridge Road	644	A	1,034	B	1,600	Pass
13. University Road (Gate #5) & Jones Bridge Road	*unsignalized*		*unsignalized*		1,600	Pass
14. Connecticut Avenue & Jones Bridge Road & Kensington Pkwy	1,431	D	1,626	F	1,600	Fail PM
15. Manor Road & Jones Bridge Road	724	A	970	A	1,600	Pass
16. Jones Bridge Road & Jones Mill Road	1,018	B	1,024	B	1,600	Pass
17. Rockville Pike/Wisconsin Avenue & Woodmont Ave	708	A	851	A	1,600	Pass

The existing traffic capacity analysis shown above indicates three intersections operate with a critical lane traffic volume at or above acceptable M-NCPPC threshold limits during at least some portion of the day. These three intersections are:

- Intersection #3, Old Georgetown Road & Oakmont Avenue/Cedar Lane during the PM peak hour (LOS E)
- Intersection #5, Rockville Pike & Cedar Lane during both the AM (LOS F) and PM peak hours (LOS F)
- Intersection #14, Connecticut Avenue & Jones Bridge Road & Kensington Parkway during the PM peak hour (LOS F)

The remaining study area signalized intersections currently operate at an acceptable LOS during both the AM and PM peak periods. While the three intersections listed above operate at levels beyond the acceptable range, it is acknowledged that several of the intersections along Rockville Pike experience significant delay due to heavy congestion in the area and that as a result, traffic progression is compromised. Field observations of congestion conditions during both peak periods will be discussed in a subsequent section.

Highway Capacity Manual Methods Using Synchro Traffic Analysis

While the CLV method provides procedures for determining the LOS of signalized intersections as required by the LATR, the HCM method provides a secondary signalized intersection analysis. Since the HCM method provides a more accurate analysis for unsignalized intersections, especially unsignalized intersections with stop signs posted on only the minor approaches, the procedures put forth in the HCM were used as a primary analysis method to complete the unsignalized capacity analysis.

The HCM method includes additional input factors such as lane width, truck percentage, pedestrian conflicts, and roadway grade in its calculation of the delay present at each intersection and also includes a progression factor to account for the interaction of adjacent intersections, so that the impacts of signalized progression along the Rockville Pike and Jones Bridge Road corridors can be better assessed. In this way, the HCM method is able to evaluate the capacity conditions across the entire network instead of individual intersections.

As with the CLV method, HCM techniques also express LOS conditions in terms of the letter grades A through F. However, instead of basing the LOS grade on the sum of the critical lane volumes across the entire intersection, results are then expressed as a LOS based on the delay experienced by an average vehicle at the intersection. The Synchro Traffic Analysis Software, which uses the HCM method, was used to calculate the results for the entire external network. As mentioned above, the HCM method is used as a primary analysis method to assess the capacity of the unsignalized intersections, specifically the #6, Rockville Pike and North Drive/School Driveway, and #13, Jones Bridge Road & University Road. For all others these results are only shown by way of comparison to the CLV results.

Using this capacity analysis method, many of the study area intersections operate at acceptable levels during both the AM and PM peak hours, as shown in Tables 2A and 2B. It should also be noted that unsignalized intersections with stop signs posted on the minor approaches do not have an overall LOS assigned, as the major approaches operate freely through the intersection and therefore incur no delay. The minor approaches could experience delay caused by waiting for gaps in traffic before entering the major roadway.

As stated before, the HCM states that an overall intersection LOS of D or better represents stable roadway operations, while a LOS E and F represent unstable roadway operations and significant delays. The intersections that fall below the intersection LOS D threshold (LOS of E or F) are:

- #1 Rockville Pike and Grosvenor Lane during the AM and PM peak hours
- #2 Rockville Pike and Pooks Hill Road during the AM peak hour
- #5 Rockville Pike and Cedar Lane during the AM and PM peak hours
- #10 Rockville Pike and Jones Bridge Road during the PM peak hour
- #13 Jones Bridge Road and University Road during the AM peak hours (southbound direction failing as two-way stop controlled intersections do not have an overall LOS)
- #14 Jones Bridge Road and Connecticut Avenue during the AM and PM peak hours

- #15 Jones Bridge Road and Manor Drive during the PM peak hour
- #16 Jones Bridge Road and Jones Mill Road during the AM peak hour.

As the HCM method allows additional variables such as peak hour factors, pedestrian volumes, heavy vehicle percentages, and progression factors from adjacent intersections, this method will serve as a more comprehensive, system-wide network evaluation as compared to the individual intersection capacity analysis results from the CLV method. However, this method is not recognized as the preferred analysis method by the M-NCPPC and therefore will be utilized primarily for purposes of evaluating queuing and progression through the traffic network.

Table 2A: NSA Bethesda External LOS Results (Synchro Method)

	Approach	AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
1. Rockville Pike & Grosvenor Ln	**Overall**	**121.0**	**F**	**122.0**	**F**
	Eastbound	63.9	E	59.7	E
	Westbound	32.6	C	56.0	E
	Northbound	200.7	F	150.8	F
	Southbound	44.5	D	133.1	F
2. Rockville Pike & Pooks Hill Rd	**Overall**	**125.1**	**F**	**44.3**	**D**
	Eastbound	68.7	E	79.2	E
	Northbound	11.2	B	37.0	D
	Southbound	191.9	F	47.1	D
3. Old Georgetown Rd & Oakmont Ave/Cedar Ln	**Overall**	**48.6**	**D**	**54.0**	**D**
	Eastbound	37.3	D	43.7	D
	Westbound	248.5	F	81.7	F
	Northbound	27.5	C	81.5	F
	Southbound	17.0	B	14.8	B
4. Locust Ave/West Dr & Cedar Ln	**Overall**	**12.2**	**B**	**38.3**	**D**
	Eastbound	15.3	B	48.9	D
	Westbound	8.6	A	13.3	B
	Northbound	27.2	C	27.3	C
	Southbound	27.9	C	29.1	C
5. Rockville Pike & Cedar Ln	**Overall**	**79.3**	**E**	**89.9**	**F**
	Eastbound	222.1	F	158.3	F
	Westbound	125.0	F	80.1	F
	Northbound	31.0	C	96.1	F
	Southbound	59.9	E	44.3	D
6. Rockville Pike & North Dr/School Dwy	Eastbound	0.0	A	11.1	B
	Westbound	9.9	A	9.6	A
7. Rockville Pike & NIH Delivery Entrance/ North Wood Rd (Gate #1)	**Overall**	**15.9**	**B**	**13.5**	**B**
	Westbound	18.5	B	66.6	E
	Northbound	50.3	D	14.7	B
	Southbound	3.1	A	0.7	A
8. Rockville Pike & Wilson Dr	**Overall**	**6.0**	**A**	**23.1**	**C**
	Eastbound	85.5	F	79.5	E
	Northbound	8.8	A	19.3	B
	Southbound	2.9	A	9.8	A
9. Rockville Pike & South Dr/ South Wood Rd (Gate #2)	**Overall**	**19.8**	**B**	**21.6**	**C**
	Eastbound	85.8	F	95.2	F
	Westbound	69.6	E	58.9	E
	Northbound	13.6	B	8.5	A
	Southbound	15.1	B	16.4	B
10. Rockville Pike & Center Dr/ Jones Bridge Rd	**Overall**	**40.1**	**D**	**57.5**	**E**
	Eastbound	84.3	F	77.8	E
	Westbound	56.5	E	104.8	F
	Northbound	32.8	C	66.0	E
	Southbound	35.4	D	24.3	C

Table 2B: NSA Bethesda External LOS Results (Synchro Method)

	Approach	AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
11. Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road	**Overall**	**13.4**	**B**	**33.6**	**C**
	Eastbound	2.8	A	15.8	B
	Westbound	7.6	A	16.5	B
	Northbound	59.7	E	37.9	D
	Southbound	96.6	F	112.5	F
12. Grier Road (Gate #4) & Jones Bridge Road	**Overall**	**15.9**	**B**	**22.6**	**C**
	Eastbound	6.6	A	19.2	B
	Westbound	20.7	C	22.9	C
	Southbound	0.0	A	35.1	D
13. University Road (Gate #5) & Jones Bridge Road	Eastbound Left	13.5	B	8.6	A
	Southbound	75.5	F	17.6	C
14. Connecticut Avenue & Jones Bridge Road & Kensington Pkwy	**Overall**	**112.3**	**F**	**164.8**	**F**
	Eastbound	205.0	F	167.2	F
	Westbound	68.5	E	48.0	D
	Northbound	25.0	C	256.2	F
	Southbound	35.0	C	50.8	D
	Southwestbound	1,060.9	F	304.9	F
15. Manor Road & Jones Bridge Road	**Overall**	**15.2**	**B**	**73.4**	**E**
	Eastbound	29.1	C	134.3	F
	Westbound	12.1	B	12.1	B
	Northbound	12.7	B	14.4	B
16. Jones Bridge Road & Jones Mill Road	**Overall**	**103.1**	**F**	**37.5**	**D**
	Eastbound	28.9	C	49.6	D
	Northbound	34.5	C	21.6	C
	Southbound	246.2	F	37.3	D
17. Rockville Pike/Wisconsin Avenue & Woodmont Ave/Glenbrook Pkwy	**Overall**	**9.5**	**A**	**28.8**	**C**
	Eastbound	72.1	E	129.9	F
	Westbound	63.0	E	57.7	E
	Northbound	4.9	A	7.4	A
	Southbound	3.6	A	6.0	A

Note that the Jones Bridge Road and University Road intersection (Gate #5) was unsignalized during the existing conditions data collection and analysis time period, but is now operating with a signal.

3.1.1.6 External Roadway Operational Conditions

The capacity analysis results presented in Section 3.1.1.5 provide an indication of heavy volumes resulting in congestion; however, they do not reflect the full extent of this congestion and the resulting queuing that occurs along NSA Bethesda's frontage.

High vehicular volumes were observed traveling southbound in the morning and northbound in the evening along major north-south roadways like Rockville Pike/Wisconsin Avenue, Connecticut Avenue, and Old Georgetown Road. These measurements are supported by field observations and match well with the expected commuter travel patterns in this portion of Montgomery County. However, because of high volumes in the peak direction and the lengthy distances between traffic signals along these roadways, traffic is able to disperse between the intersections. When peak direction traffic is more spread out, it becomes difficult to coordinate the traffic signals. As a result, the north-south approaches to intersections along Old Georgetown Road and Connecticut Avenue and the northern intersections along Rockville Pike

within the study area experience traffic arriving in a constant stream rather than in platoons (concentrated groups). Furthermore, given the long cycle lengths (the number of seconds for the traffic signal to service all approaches) present along these corridors, the cross-streets are allocated long periods of green time, sometimes upwards of 80 seconds out of a 180-second cycle. The combination of high vehicular volumes arriving at a generally uniform rate and these long delays of traffic along the main road result in queues that develop in the peak direction.

During the AM peak hour, queues were observed in the southbound lanes of Rockville Pike stretching north past the Capital Beltway. Similarly, stopped traffic exists along Rockville Pike throughout much of the study area during the PM peak hour. At NSA Bethesda Gate #2 (located at Rockville Pike and South Wood Road) queue spillback from adjacent intersections to the north at Cedar Lane and Gate #1, (located at Rockville Pike at North Wood Road) resulted in gridlock conditions, preventing vehicles from exiting the installation in either direction along Rockville Pike. Furthermore, the presence of high pedestrian volumes crossing Rockville Pike to access the Medical Center Metro station caused conflicts with left-turning traffic exiting via Gate #2, causing further delays. When the Medical Center Pedestrian Tunnel is constructed, pedestrians would cross below grade and this conflict point would be eliminated.

Although the primary east-west connectors in this section of Montgomery County are the Capital Beltway and the East-West Highway, the heavy traffic congestion present along these two routes causes a significant number of vehicles traveling east-west to divert to Jones Bridge Road. The Capital Beltway experiences major congestion during both peak periods because of the high traffic volumes it serves, while the location of East-West Highway in downtown Bethesda adds delay and congestion due to a higher level of traffic coming from the large commercial and residential area. Therefore, drivers in the vicinity of NSA Bethesda who seek to travel north-south on Rockville Pike, Connecticut Avenue, or Beach Drive may use Jones Bridge Road as an east-west connector.

As a result of these diverted volumes, heavy traffic volumes were observed traveling eastbound along Jones Bridge Road towards Connecticut Avenue during the evening peak. Vehicles traveling along this road encountered a queue in excess of 2,000 feet. The maximum observed queue stretched from Connecticut Avenue west as far as Grier Road (Gate #4 located at Jones Bridge Road and Grier Road), a distance of over half a mile.

In the morning, queues in the westbound direction were mostly averted because of the prohibition of northbound left turning traffic from Connecticut Avenue onto Jones Bridge Road. This restriction causes drivers to choose an alternate east-west route such as East-West Highway. As a result of these lower volumes, queues along Jones Bridge Road at the westbound approach of its intersection with Wisconsin

Avenue peak are approximately 400 feet in length, which is not unusual for an intersection with a long cycle length.

While these observations provide a fairly regular pattern during a typical work day, typical peak arrival and departure patterns at NSA Bethesda occur outside of the AM and PM peak hours, respectively. This pattern will be discussed in later sections of this study.

3.1.1.7 Commuter Traffic Growth

The intersection peak hour traffic counts collected in October 2011 after the completion of BRAC realignment and the volumes projected for 2011 in the 2008 NNMC BRAC EIS were compared to determine the level of growth of commuter traffic throughout the overall road network. (Note that the Jones Bridge Road and University Road intersection (Gate #5) was unsignalized during the 2011 existing conditions data collection and analysis time period, but is now operating with a signal).

As shown in Table 3, the 2008 NNMC BRAC EIS had generally projected higher traffic volume than the actual counts taken in October 2011. On MD 355 between Pooks Hill Road and Woodmont Avenue, the 2008 NNMC BRAC EIS projections were higher than the 2011 counts, with an average of 16/18 percent (northbound/southbound) and 15/10 percent (northbound/southbound) for AM and PM peaks, respectively. On Jones Bridge Road corridor between Connecticut Avenue and MD 355, the projections were higher than the 2011 counts, with an average of 32/21 percent (eastbound/westbound) and 13/28 percent (eastbound/westbound) for AM and PM peaks, respectively. This can be attributed to several factors including higher non-auto ridership, economic factors, diversion to alternative routes such as Connecticut Avenue to the east or Old Georgetown Road to the west, and other external causes.

The exceptions are the PM peak hour traffic northbound on MD 355 between Pooks Hill Road and Cedar Lane and southbound between Jones Bridge Road and Woodmont Road, respectively. The peak hour traffic counted in October 2011 was 8 percent higher than the 2008 NNMC BRAC EIS projection for the northbound PM peak between Pooks Hill Road and Cedar Lane and 13 percent higher for the southbound PM peak between Jones Bridge Road and Woodmont Road.

Table 3: Traffic Volume Growth Comparison

Count Location	Direction	2008 BRAC EIS Predicted Future Conditions		2011 Traffic Counts		Predicted 2011 vs Actual 2011 Conditions (%)	
		AM	PM	AM	PM	AM	PM
MD 355 between	Northbound	1,728	3,383	1,699	3,646	-2%	8%
Pooks Hill Rd and Cedar Ln	Southbound	3,539	2,134	2,911	2,011	-18%	-6%
MD 355 between	Northbound	1,657	2,790	1,096	1,824	-34%	-35%
Wilson Ln and Gate #2	Southbound	2,732	2,216	2,346	1,726	-14%	-22%
MD 355 between	Northbound	1,353	2,250	1,197	1,854	-12%	-18%
Gate #2 and Jones Bridge Rd	Southbound	2,567	2,185	2,093	1,770	-18%	-19%
MD 355 between	Northbound	1,663	2,592	1,400	2,082	-16%	-20%
Jones Bridge Rd and Woodmont Ave	Southbound	3,289	1,686	2,650	1,911	-19%	13%
Average of MD 355 Corridor	**Northbound**	**1,600**	**2,754**	**1,348**	**2,352**	**-16%**	**-15%**
	Southbound	**3,032**	**2,055**	**2,500**	**1,855**	**-18%**	**-10%**
Jones Bridge Rd between	Eastbound	675	2,068	528	1,692	-22%	-18%
Gate #5 and Connecticut Ave	Westbound	1,664	656	1,361	496	-18%	-24%
Jones Bridge Rd between	Eastbound	848	1,373	508	1,295	-40%	-6%
Gate #3 and MD 355	Westbound	1,365	772	1,047	529	-23%	-31%
Average of Jones Bridge Corridor	**Eastbound**	**762**	**1,721**	**518**	**1,494**	**-32%**	**-13%**
	Westbound	**1,515**	**714**	**1,204**	**513**	**-21%**	**-28%**

3.1.2 *NSA Bethesda Traffic using Rockville Pike and Jones Bridge Road*

In addition to comparing the 2008 projected volumes to the 2011 volumes, the percentage of NSA Bethesda traffic using Rockville Pike and Jones Bridge Road was calculated. Using a balanced method to determine the proportion of installation versus non-installation-bound traffic for these two corridors, eight locations were evaluated. The Rockville Pike corridor included the following four locations:

1. Southbound between Cedar Lane and North Drive.
2. Southbound between South Wood Road and Jones Bridge Road.
3. Northbound between Jones Bridge Road and South Wood Road.
4. Northbound between North Drive and Cedar Lane.

The Jones Bridge Road corridor included the following four locations:

1. Eastbound between Rockville Pike and Gunnell Road.
2. Eastbound between University Road and Connecticut Avenue.
3. Westbound between Connecticut Avenue and University Road.
4. Westbound between Gunnell Road and Rockville Pike.

Since the peak hour of Rockville Pike and Jones Bridge Road occurred during a different time than the installation peak hour, the full peak periods (5:30 A.M. – 9:00 A.M. and 3:00 P.M. – 6:30 P.M.) were used for determining the percentage of NSA Bethesda traffic relative to total network volume. This time period of nearly 4 hours accounts for both the peak of the installation and provide an approximate percentage for the AM and PM periods. The percentages do not take into account installation traffic associated with visitors and/or patients outside of the peak period. For example, the total AM peak period volume southbound along Rockville Pike between Cedar Lane and North Drive was 11,099. The total volume entering NSA Bethesda through

Gates #1 and #2 from the north was 2,455 during the same period. By dividing 2,455 into 11,099, the result would be 22.1%.

Based upon the procedures discussed above, during the AM peak period, the highest percentage of NSA Bethesda-bound traffic along these corridors occurred in the Jones Bridge Road westbound direction, between Connecticut Avenue and University Road with 41.6%. The lowest percentage occurred along Rockville Pike in the southbound direction, between South Wood Road and Jones Bridge Road with 1.7%. During the PM peak period, the highest percentage of NSA Bethesda-bound traffic along these corridors occurred in the Jones Bridge Road westbound direction, between Jones Bridge Road and Gunnell Road with 34.0%. The lowest percentage occurred along Jones Bridge Road in the eastbound direction, between Rockville Pike and Gunnell Road with 3.0%.

Tables 3-14 shows the AM and PM peak period comparison of NSA Bethesda-bound traffic and total volumes along Rockville Pike and Table 3-15 shows the AM and PM peak period comparison of NSA Bethesda-bound traffic and total volumes along Jones Bridge Road.

Table 3-14: AM and PM Peak Period Comparison of NSA Bethesda-bound Traffic and Total Traffic Volume along Rockville Pike

Rockville Pike - AM Peak Period (5:30 A.M. - 9:00 A.M.)				
Volume	**Rockville Pike between Cedar Lane and North Drive**		**Rockville Pike between Jones Bridge Road and South Wood Road**	
	Northbound	**Southbound**	**Northbound**	**Southbound**
Total - Rockville Pike	3,035	11,099	2,725	4,898
Total - Gates #1 & #2	443	2,455	672	84
Total - NSA Bethesda Contribution (%)	**14.6%**	**22.1%**	**24.7%**	**1.7%**
Rockville Pike - PM Peak Period (3:00 P.M. - 6:30 P.M.)				
Volume	**Rockville Pike between Cedar Lane and North Drive**		**Rockville Pike between Jones Bridge Road and South Wood Road**	
	Northbound	**Southbound**	**Northbound**	**Southbound**
Total - Rockville Pike	8,266	6,073	5,135	5,466
Total - Gates #1 & #2	2,371	444	201	248
Total - NSA Bethesda Contribution (%)	**28.7%**	**7.3%**	**3.9%**	**4.5%**

Table 3-15: AM and PM Peak Period Comparison of NSA Bethesda-bound Traffic and Total Traffic Volumes along Jones Bridge Road

Jones Bridge Road - AM Peak Period (5:30 A.M. - 9:00 A.M.)				
Volume	**Jones Bridge Road between Rockville Pike and Gunnell Road**		**Jones Bridge Road between Connecticut Avenue and University Road**	
	Eastbound	**Westbound**	**Eastbound**	**Westbound**
Total - Jones Bridge Road	1,105	2,703	680	4,443
Total - Gates #3, #4, & #5	257	106	201	1,850
Total - NSA Bethesda Contribution (%)	**23.3%**	**3.9%**	**29.6%**	**41.6%**
Jones Bridge Road - PM Peak Period (3:00 P.M. - 6:30 P.M.)				
Volume	**Jones Bridge Road between Rockville Pike and Gunnell Road**		**Jones Bridge Road between Connecticut Avenue and University Road**	
	Eastbound	**Westbound**	**Eastbound**	**Westbound**
Total - Jones Bridge Road	4,385	1,869	5,513	1,677
Total - Gates #3, #4, & #5	131	635	1,731	274
Total - NSA Bethesda Contribution (%)	**3.0%**	**34.0%**	**31.4%**	**16.3%**

3.1.3 *Vehicular Gate Access and Operations*

NSA Bethesda has five entrances, each of which also serves as a security checkpoint. Two entrances are located along Rockville Pike (Gates #1 and #2) and the remaining three are located along Jones Bridge Road (Gates #3, #4, and #5).

The locations of these entrances (Gates #1 through #5 respectively) are shown in Figure 2, as intersections 7, 9, 11, 12, and 13. They are discussed below.

3.1.3.1 Security Gate Configurations

The two entrances off Rockville Pike are connected by an internal loop road (Wood Road). The entrance at **North Wood Road (Gate #1, North Road Wood Gate)** is located just south of Cedar Lane, and is aligned with the entrance to the NIH Commercial vehicle inspections facility (CVIF). At this intersection, a half signal controls the northbound, westbound, and southbound left turn movements while allowing southbound through traffic along Rockville Pike to continue without interruption. Inbound and outbound pedestrian traffic is permitted at all times the gate is open, as is bicycle traffic via the inbound and outbound on-street bicycle lanes. This gate is configured with a total of four lanes, two of which are reversible, and operates under the following schedule:

- Monday through Friday, 5:00 AM - 5:30 AM: two lanes inbound, one lane outbound
- Monday through Friday, 5:31 AM - 7:30 AM three lanes inbound, one lane outbound

- Monday through Friday, 7:31 AM - 2:00 PM: two lanes inbound, one lane outbound
- Monday through Friday, 2:01 PM - 6:00 PM: one lane inbound, three lanes outbound
- Monday through Friday, 6:01 PM - 7:00 PM: two lanes inbound, one lane outbound
- All other times: Closed

The entrance at **South Wood Road (Gate #2, South Wood Road Gate)** is the main entrance to the installation, and is located across Rockville Pike from the NIH South Drive entrance and the WMATA Medical Center Metro station. This gate is open 24 hours, serving vehicular traffic and is the main access point for pedestrian traffic, most of which is generated by the Medical Center Metro station across Rockville Pike and its adjacent transit bus terminal. Pedestrian access is permitted 24 hours a day via a separate sidewalk checkpoint. Access for cyclists is provided along one inbound and one outbound on-street bicycle lane, which is served by the main vehicular security checkpoint. The South Gate is configured with a total of three lanes, one of which is reversible. Gate #2 operates under the following schedule:

- Monday through Friday, 5:00 AM - 2:00 PM: two lanes inbound, one lane outbound
- Monday through Friday, 2:01 PM - 7:00 PM: one lane inbound, two lanes outbound
- Monday through Friday, 7:01 PM – 4:59 AM: one lane inbound, one lane outbound
- Saturday and Sunday: two lanes inbound, one lane outbound

The three entrances off Jones Bridge Road are Gunnell Road (Gate #3), Grier Road (Gate #4), and University Road (Gate #5). At the time that observations were made, Gate #3 and Gate #4 were controlled by traffic signals with University Road terminating at a stop sign. However, a traffic signal has been constructed at Gate #5 and entered into operation in December 2011, following completion of the field observations conducted in support of this study.

The gate at **Gunnell Road (Gate #3, Gunnell Road Gate)** permits pedestrian access during its operating hours, providing convenient access to downtown Bethesda and to the Jones Bridge Road bus lines from the southern portion of the installation. Gate #3 is also convenient to the installation’s gas station. The gate has one inbound and one outbound lane, with pedestrian access permitted at all times that the gate is open. Gate #3 operates under the following schedule:

- Monday through Friday, 5:00 AM – 7:00 PM: one lane inbound, one lane outbound

- All other times: Closed

Gate #3 will be under construction starting summer 2012 (upon completion of Gate #4 to ensure at least four gates are operational). It is expected that Gate #3 construction will be complete by December of 2012, with a new guardhouse and Gunnell Road upgrades.

The next gate to the east on Jones Bridge Road is located along **Grier Road (Gate #4, Grier Road Gate)**. This gate is currently closed for construction and will reopen in summer 2012, while a new guard house and Grier Road undergo upgrades. During the time period that the existing conditions were collected and analyzed, this gate handled all inbound commercial vehicles and had one inbound travel lane and one outbound travel lane, under the following schedule:

- Monday through Friday, 5:00 AM – 2:00 PM: Inbound commercial vehicle traffic only
- Monday through Friday, 2:01 PM – 3:00 PM: one lane inbound commercial vehicle traffic, one lane outbound
- Monday through Friday, 3:01 PM – 6:00 PM: one lane outbound
- All other times: Closed

The easternmost gate of NSA Bethesda is located at the intersection of Jones Bridge and **University Road (Gate #5, University Road Gate)**. Gate #5 features on-street bike lanes in both the inbound and outbound directions and these lanes integrate into the vehicular travel lanes within NSA Bethesda. The new gatehouse at the Gate #5 contains one inbound and one outbound lane for privately owned vehicle (POV) use in parallel with a CVIF with two inbound lanes. Gate #5 serves as the main gate for deliveries and truck traffic during its hours of operation. At all other times, consistent with operating procedures in place today, delivery vehicles would be inspected at Gate #2, the 24-hour gate. Gate #5 currently operates under the following schedule:

- Monday through Friday, 5:00 AM – 6:00 PM: one lane for POV inbound, two lanes for CVIF, one lane outbound
- All other times: Closed

3.1.3.2 Gate Traffic Volumes

In addition to calculating the overall intersection and system peak periods throughout the study network, peak period counts were summed at each of the five access gates with the overall gate percentage (inbound and outbound movements combined) to arrive at an overall trip generation estimate for NSA Bethesda. This value can later be compared to the typical number of staff and visitors present on-site to determine the peak hour mode split between automotive and non-automotive travel modes. The system peak is defined as the hour-long period with the highest vehicular traffic across all 17 external study

intersections. In contrast, the gate peak hour is the hour of maximum volume at all five access gates, which should correlate strongly with the peak hour of installation-generated trips and is typically referred to as the peak hour of the generator. It should be noted that the peak hour of NSA Bethesda was over an hour earlier than the peak hour of the adjacent street traffic during both peak periods (Table 6).

Table 6: NSA Bethesda Gate and System Peak Hour Traffic Volumes

Gate	Movement	Gate Peak Hour				System Peak Hour			
		AM		PM		AM		PM	
		6:00 – 7:00 AM		*3:45 – 4:45 PM*		*7:45 – 8:45 AM*		*4:45 – 5:45 PM*	
1. North Wood Road	Inbound	864		99		416		71	
(Gate #1)	Outbound	75	40%	738	38%	113	40%	451	33%
2. South Wood Road	Inbound	482		127		190		102	
(Gate #2)	Outbound	63	23%	214	16%	87	21%	198	19%
3. Gunnell Road	Inbound	413		126		240		96	
(Gate #3)	Outbound	74	21%	394	24%	116	27%	313	26%
4. Grier Road	Inbound	57		---		33		---	
(Gate #4)	Outbound	---	2%	478	22%	---	2%	335	21%
5. University Road	Inbound	309		8		135		7	
(Gate #5)	Outbound	2	13%	10	1%	2	10%	7	1%
Overall Traffic Volume	Inbound	2,125		360		1,014		276	
	Outbound	214		1,834		318		1,304	
	Total	**2,339**	100%	**2,194**	100%	**1,332**	100%	**1,580**	100%

The total trips generated by NSA Bethesda during the vehicular count periods of 5:30 AM – 9:00 AM and 3:00 PM – 6:30 PM with gate percentages (inbound and outbound combined) are shown in Table 7. While these values are not critical for the transportation analysis prepared for NSA Bethesda EIS, they do represent a large portion of the total number of trips realized on-site during an average work day. For comparison purposes, the total gate peak hour trips shown above represent between 35 and 40 percent of the total traffic for the installation during the peak periods shown on Table 7.

Table 7: NSA Bethesda Peak Period Traffic Volumes

Gate	Movement	Peak Period Traffic Volumes					
		AM		PM		Total	
1. North Wood Road	Inbound	2,104		303		2,407	
(Gate #1)	Outbound	295	39%	1,906	36%	2,201	37%
2. South Wood Road	Inbound	1,058		414		1,472	
(Gate #2)	Outbound	284	22%	755	19%	1,039	20%
3. Gunnell Road	Inbound	1,125		374		1,499	
(Gate #3)	Outbound	310	23%	1,172	25%	1,482	24%
4. Grier Road	Inbound	156		---		156	
(Gate #4)	Outbound	---	3%	1,155	19%	1,155	11%
5. University Road	Inbound	807		31		838	
(Gate #5)	Outbound	4	13%	40	1%	44	7%
Overall Traffic Volume	Inbound	5,250		1,122		6,372	
	Outbound	893		5,028		5,921	
	Total	**6,143**	**100%**	**6,150**	**100%**	**12,294**	100%

3.1.3.3 Gate Vehicle Occupancy and Classification

Following the external intersection turning movement counts described in Section 3.1.1.4, vehicle occupancy and classification counts were conducted at each of NSA Bethesda gates on Tuesday October 25, 2011. These counts provide an understanding of the means by which staff and visitors travel to NSA Bethesda. These characteristics can be used to further clarify the mode split.

Vehicle Occupancy

Vehicle occupancy data was collected at each of the gates serving NSA Bethesda in order to determine the number of individuals in both inbound and outbound private vehicles. This count excluded all commercial vehicles as well as transit and shuttle buses and did not count the total number of individuals in each vehicle where there were 3 or more passengers. The results of that count, as shown below in Table 8, indicate the following:

- During the AM peak hour of the entire external traffic network, 864 of the 1,047 (83 percent) total vehicles entering the installation arrived as a single occupant vehicle (SOV). This is comparable to the PM peak hour when 1,211 of the 1,436 (84 percent) total vehicles exiting the installation departed as SOVs.

- The peak hour movements associated with the outbound movement during the AM and the inbound movement during the PM also experience similar percentages; however, there were significantly fewer vehicles making these movements.

- The number of vehicles shown to enter and exit the installation during both peak periods having three or more passengers is less than 1 percent of the total installation traffic while

approximately 14 percent of the vehicles entering and exiting the installation had two individuals.

Based on the information shown in Table 8, gate traffic accessing NSA Bethesda has an average occupancy of 1.150 occupants per vehicle during the AM system peak hour and 1.165 occupants per vehicle during the PM system peak hour. Note that this value does not account for shuttle bus traffic and that all vehicles carrying more than three occupants are treated as having only three occupants because of the difficulty of counting passengers in large carpool vehicles.

The 2011 occupancy measurements show a slight improvement towards the objectives of the 2008 Transportation Management Plan (TMP) of the then-NNMC, which include the goal to "Increase Average Vehicle Occupancy (AVO) ratios from 1.12 to 3.0 by 2011." The measured occupancy values observed at the gate entrances from October 2011 show a slight improvement from 1.12 occupants per vehicle to 1.150-1.165 occupants per vehicle. However, it should be noted that the 2008 TMP values are based on AVO ratios, which are defined as the number of employees on the installation per vehicles parked at the installation. Therefore, a direct comparison cannot be made between the 2008 TMP-stated AVO and 2011 conditions without obtaining staffing throughout the day and parking lot occupancy.

Table 8: NSA Bethesda Vehicle Occupancy Summary

							All Gates		
		Gate 1	**Gate 2**	**Gate 3**	**Gate 4**	**Gate 5**	Vehicle Trips	Person Trips	2011 Occupancy
Inbound 1	**AM**	369	141	216	13	125	**864**	864	
	PM	66	63	86	0	3	**218**	218	
Inbound 2	**AM**	101	34	27	0	15	**177**	354	
	PM	11	16	3	0	1	**31**	62	
Inbound 3+	**AM**	2	1	1	0	2	**6**	18	
	PM	2	0	0	0	0	**2**	6	
Inbound Total	**AM**	472	176	244	13	142	**1,047**	1,236	***1.181***
	PM	79	79	89	0	4	**251**	286	***1.139***
Outbound 1	**AM**	151	66	91	0	9	**317**	317	
	PM	493	131	300	282	5	**1,211**	1,211	
Outbound 2	**AM**	2	8	7	0	1	**18**	36	
	PM	90	34	40	41	2	**207**	414	
Outbound 3+	**AM**	0	0	0	0	0	**0**	0	
	PM	8	7	2	1	0	**18**	54	
Outbound Total	**AM**	153	74	98	0	10	**335**	353	***1.054***
	PM	591	172	342	324	7	**1,436**	1,679	***1.169***
All Traffic	**AM**	625	250	342	13	152	**1,382**	1,589	***1.150***
	PM	670	251	431	324	11	**1,687**	1,965	***1.165***

Vehicle Classification

The vehicle classification count conducted at the installation gates collected the total number of vehicles that were not classified as a

private vehicle. Those included the following vehicle types: small trucks (delivery vans and small box trucks), large trucks (large box trucks and tractor trailers), transit vehicles (buses and shuttle buses), and bicycles. The results indicate that the heaviest concentrations of non-auto trips were found at Gates #2 and #3, which is most likely due to their proximity to the Medical Center Metro station and to downtown Bethesda, respectively. The overall results for the entire installation are shown in Table 9.

Based on the totals below and the total number of private vehicle trips (see Table 8), it is estimated that approximately 12 percent of the AM peak hour traffic and 6 percent of the PM peak hour traffic consists of non-private vehicles.

Table 9: NSA Bethesda Vehicle Classification Summary

	All NSA Bethesda Gates							
	Small Trucks		*Large Trucks*		*Transit Vehicles*		*Bikes*	
	In	Out	In	Out	In	Out	In	Out
Morning								
5:30 AM	10	2	2	0	1	0	3	0
5:45 AM	6	5	1	0	1	2	5	0
6:00 AM	7	8	6	0	2	2	6	2
6:15 AM	11	2	2	1	6	8	5	0
6:30 AM	3	2	3	1	9	8	5	2
6:45 AM	2	0	4	1	8	6	7	2
7:00 AM	7	0	6	0	10	5	8	1
7:15 AM	10	1	1	1	10	9	14	0
7:30 AM	6	2	3	4	5	3	8	0
7:45 AM	**8**	**2**	**2**	**5**	**9**	**9**	**13**	**0**
8:00 AM	**8**	**1**	**4**	**3**	**7**	**8**	**8**	**0**
8:15 AM	**9**	**2**	**6**	**5**	**7**	**5**	**3**	**0**
8:30 AM	**6**	**4**	**0**	**2**	**10**	**9**	**8**	**0**
8:45 AM	3	2	0	1	6	6	1	7
Evening								
3:00 PM	3	12	1	8	11	4	0	7
3:15 PM	3	7	0	7	5	8	0	3
3:30 PM	3	14	1	12	4	4	1	9
3:45 PM	1	4	0	3	7	6	0	0
4:00 PM	2	3	0	3	13	2	2	10
4:15 PM	2	2	0	1	5	6	0	7
4:30 PM	1	0	0	3	8	6	1	7
4:45 PM	**2**	**0**	**0**	**1**	**8**	**5**	**0**	**8**
5:00 PM	**4**	**1**	**0**	**3**	**5**	**8**	**1**	**11**
5:15 PM	**1**	**0**	**0**	**3**	**6**	**4**	**0**	**5**
5:30 PM	**1**	**1**	**0**	**2**	**4**	**6**	**0**	**6**
5:45 PM	1	1	0	1	5	3	0	8
6:00 PM	3	1	0	3	3	8	1	4
6:15 PM	1	2	0	1	3	4	1	2

Note: The BOLD text references the system AM and PM peak hour.

3.1.3.4 Observed Gate Operations

Due to the secure nature of NSA Bethesda, the five security gates are the only means of ingress and egress for staff and visitors to the WRNMMC and other tenants of NSA Bethesda. The installation is staffed 24 hours a day, but experiences the majority of staff and visitor traffic during normal business hours. The peak period for inbound traffic is during NSA Bethesda's AM peak hour (6:00 AM – 7:00 AM). All personnel entering the installation must undergo security screening and minor queues were observed at Gates #1 and #2 for inbound traffic as a result of the screening process. However, the gate queues were generally observed to not interfere with the operation of Rockville Pike and Jones Bridge Road. In addition, recent upgrades to Gates #1 and #2 have further helped to minimize security screening related queuing

Separate from the minor queues at Gates #1 and #2, queues (five to ten vehicles) were observed along the Southbound Rockville Pike left turn approach at intersection #7, Rockville Pike and North Wood Road, extending back beyond the storage lane. However, because the system AM peak hour (7:45 AM – 8: 45 AM) differs from the NSA Bethesda AM peak hour (6:00 AM – 7:00 AM), minor delays were observed along the Rockville Pike southbound through lanes. At the time of data collection in October 2011, no queues were observed along Jones Bridge Road.

As is the case during the AM peak, the PM peak hour for NSA Bethesda outbound traffic differs from the system PM peak hour. Outbound NSA Bethesda traffic can only exit the installation during the green time allocated to an individual signal phase at Gates #1 and #2. The minor nature of these approaches relative to the high volumes seen along Rockville Pike also means that these approaches allocate less green time than the main roadway through traffic movements. Therefore, even though the outbound traffic is not subject to delays from security procedures, the traffic signal controls that exist adjacent to Gates #1 and #2 cause outbound traffic to experience delays.

In addition to the delays caused by signals, outbound vehicles exiting NSA Bethesda were funneled from a large number of parking facilities to a relatively small number of security gates. The resulting bottleneck effect manifested itself in outbound delays at Gates #1, #2, and #4. Right-turning traffic at Gates #1 and #2 was observed to be impeded by heavy traffic along Rockville Pike in the northbound direction, with left-turning traffic at Gate #2 experiencing delays as a result of heavy traffic from adjacent intersections, competing right turns from vehicles and buses exiting the NIH campus, and high pedestrian volumes at the crosswalk along the southern side of this intersection. The resulting queues at Gate #2 were estimated to reach up to 600 feet or approximately 45 vehicles. Similarly, queues at Gate #4 were observed to spill back onto South Palmer Road, totaling approximately 1,100 feet. As indicated earlier, Gate #4 is currently

closed during construction of a new gate facility and upgrades to Grier Road.

While there was a queue observed for outbound traffic at Gate #4 during the PM peak hour, there was a relative lack of delay at Gates #3 and #5. Queues at Gate #3 were observed to be no more than 600 feet in length (30 vehicles), with no significant queues at all observed at Gate #5. However, at the time that field observations were conducted, the new traffic signal at Gate #5 had not yet been activated, so it is possible that with this new signal, drivers will divert to University Road as a way to balance the outbound traffic distribution.

The two Gates off Rockville Pike are connected by an internal loop road (Wood Road). Access to the central portion of Wood Road between North Palmer Road and South Palmer Road in front of Building 1 is restricted because of anti-terrorism and force protection measures.

3.1.3.5 Internal Roadway Conditions

In addition to the external roadway network and conditions at the security gates, conditions along NSA Bethesda's internal roadway network were also analyzed as a part of this report. NSA Bethesda serves numerous tenants and must therefore have a functional and comprehensive internal circulation network. This network, along with the 12 internal study intersections covered in this section of the report, is shown in Figure 5. All 12 internal study intersections are stop-controlled.

3.1.3.6 Internal Existing Lane Utilization

The external roadway and internal NSA Bethesda lane geometry and traffic control were collected. Again, several visits were made to NSA Bethesda to ensure that accurate information was collected and available for this report. Based on those field visits, the lane geometry and traffic control indicated in Figure 6 was assumed for purposes of this study.

3.1.3.7 Internal Existing Peak Hour Traffic Volumes

In addition to the external intersections studied as part of NSA Bethesda EIS, several intersections within the confines of the installation were selected to be studied as part of the future alternatives considered on the installation and are shown on Figure 5. There are a total of 12 internal study intersections and the manual turning movement counts for each of these were counted on Tuesday, October 25, 2011, consistent with the method used for the external intersections as described in Section 3.1.1.4. In addition, 19 ATR counts were obtained covering the period between October 25th and November 1st to provide 24-hour counts throughout the installation.

While the peak period of the external network generally occurred from 7:45 – 8:45 AM and 4:45 – 5:45 PM, the peak period internal to NSA Bethesda is significantly earlier at 6:00 – 7:00 AM and 3:45 – 4:45

PM. Since this period represents the worst-case scenario for traffic congestion within the installation, it was used for purposes of evaluating the internal intersections. The peak hour traffic volumes assumed for the internal intersections are shown on Figure 7.

Figure 5: Internal Study Intersections

Figure 6: Internal Lane Geometry and Traffic Control

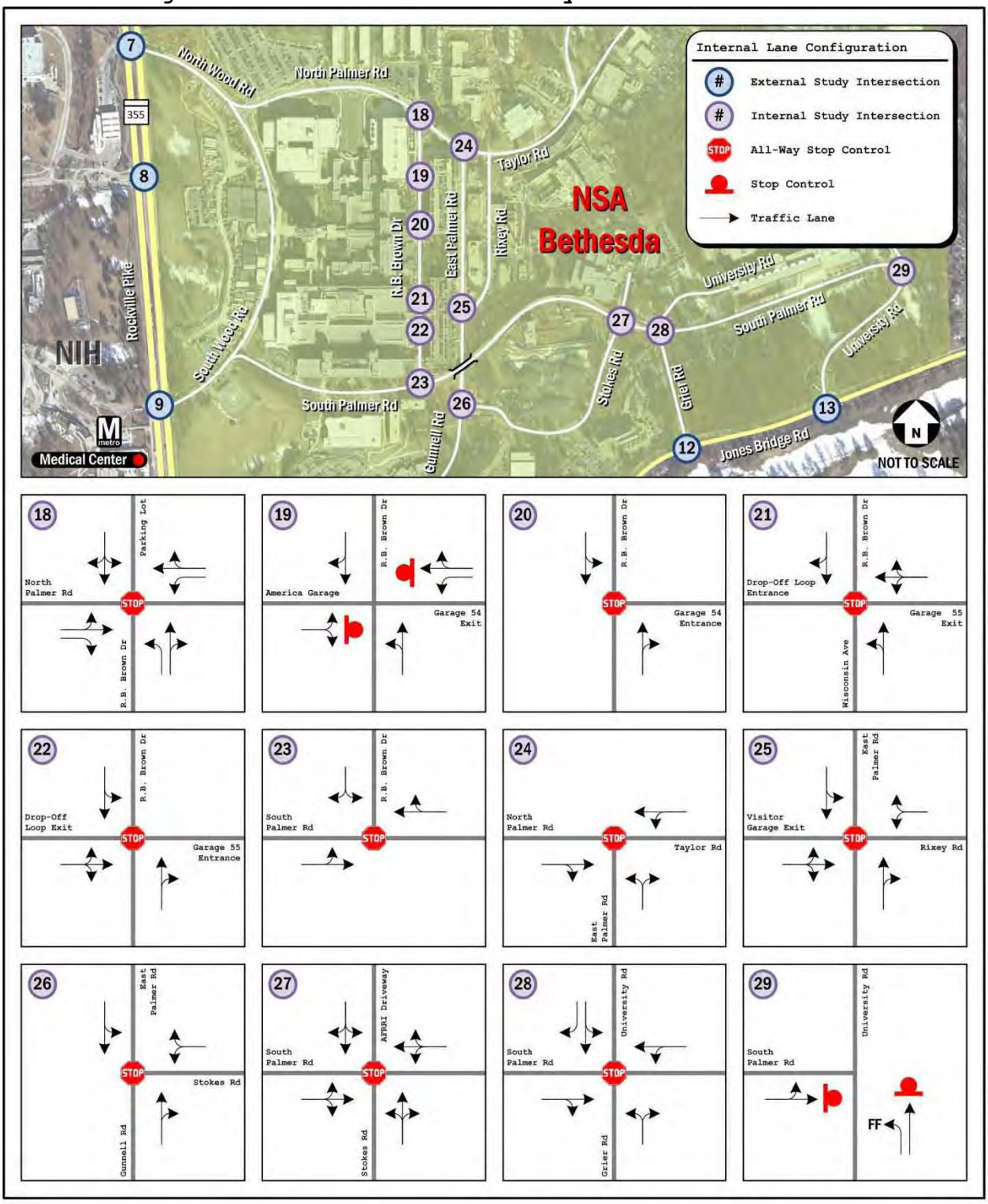
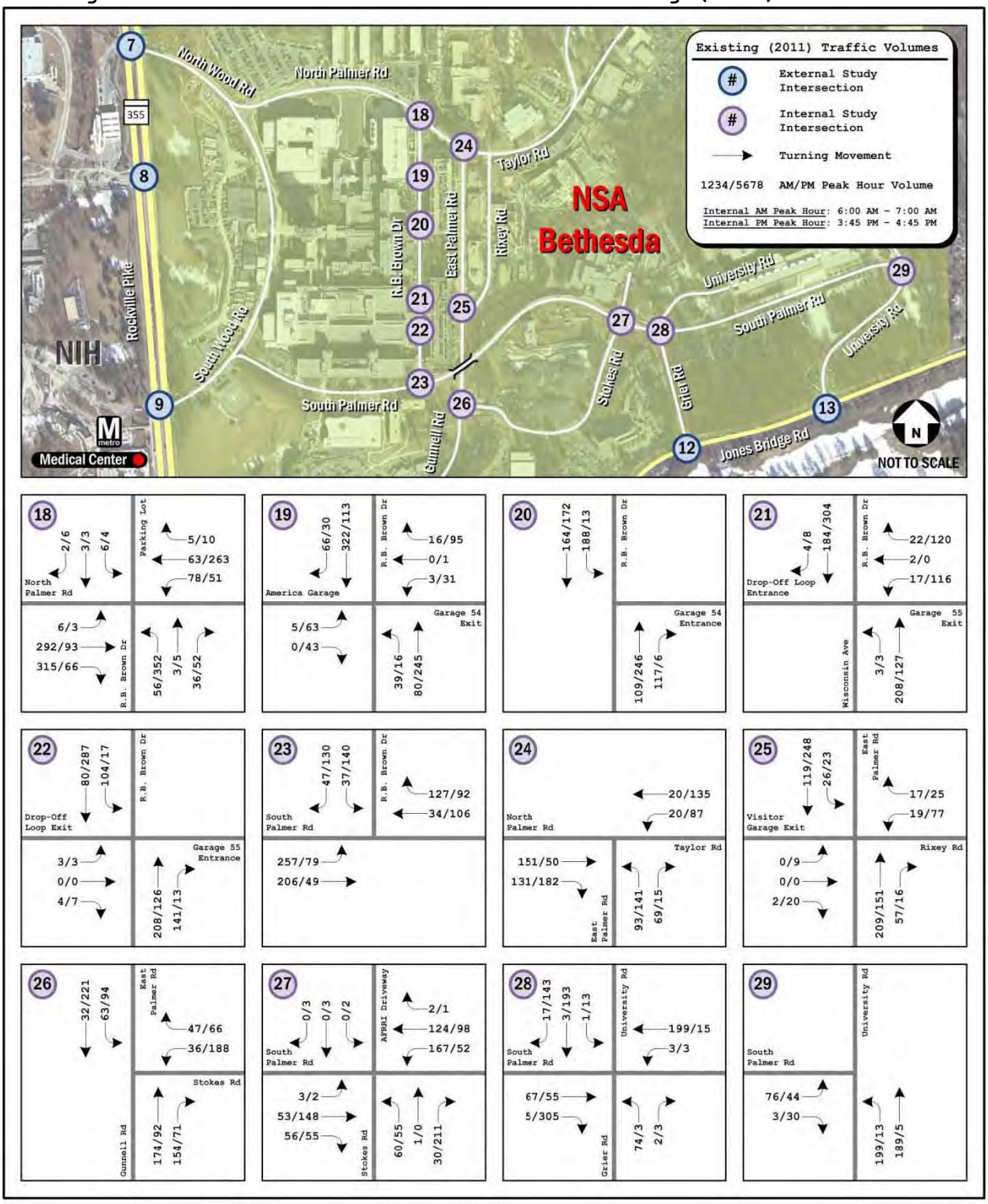


Figure 7: Internal Traffic Volumes - Existing (2011) Conditions



3.1.3.8 Truck Access and Circulation Patterns

Truck access to NSA Bethesda was permitted along Grier Road (Gate #4) at the time the existing conditions were obtained, with inbound traffic at this gate restricted to commercial vehicles only between 5:00 AM and 3:00 PM, Monday through Friday, the only times that inbound traffic is permitted at this location. The truck inspection facilities are now located at the Gate #5 inspection complex, which has an overhanging shelter for inspection staff and improved security controls. Apart from this development, the location of loading facilities and the egress route for truck traffic from the installation remains the same. These loading facilities and the ingress and egress routing for trucks and other heavy vehicles are shown in Figure 8.

3.1.3.9 NSA Bethesda Internal Capacity Analysis

To evaluate the internal NSA Bethesda network, the study area intersections depicted in Figure 5 were analyzed utilizing the HCM method discussed in Section 3.1.1.5. These procedures, computed using Synchro Traffic Analysis software, were used because all the internal study intersections are controlled by stop signs.

Utilizing the HCM method in conjunction with the lane utilization shown on Figure 6 and the peak hour traffic volumes shown on Figure 7, it was determined that each of the internal study intersections, with one exception, currently operate at acceptable levels of service during both peak periods as shown in Table 10. The only exception is the intersection of R.B. Brown Drive with the American Garage and the staff parking garage. The exiting movements from each of the garages at this intersection currently operate beyond acceptable levels primarily due to the heavy pedestrian volume at this location. More than 900 pedestrians utilize sidewalks along R.B. Brown Drive at this intersection during the PM peak hour, which the HCM calculates to cause significant delays in traffic. Without these pedestrians, the HCM analysis would show acceptable levels.

It should be noted that field observations do not show significant levels of delay at this location. These high delay values do not match the actual delays that were observed in the field. Instead, it is likely that the computed delay values result from the fact that HCM calculation procedures give total priority to pedestrians at stop-controlled approaches. In this case, the extremely high volume of pedestrians leaves virtually no gaps for exiting vehicles. Field observations show that the actual conditions of these approaches are more balanced, with pedestrians occasionally yielding to vehicles entering and exiting the parking facilities when they notice a queue beginning to form. This common courtesy prevents the high values of delay that were calculated using the HCM procedures from actually occurring.

Figure 8: Truck Access and Service/Loading Facilities

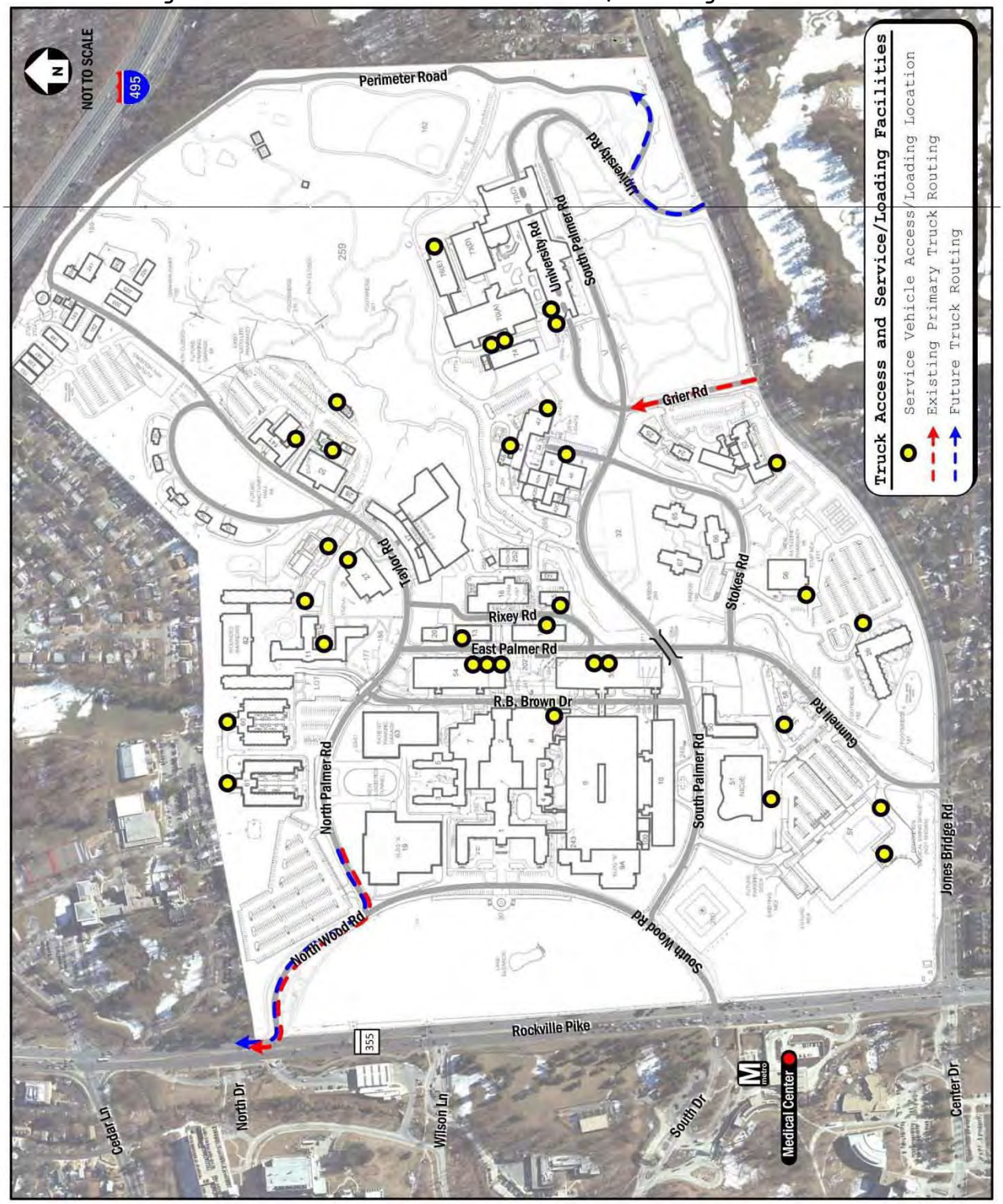


Table 10: NSA Bethesda Internal Level of Service Results

	Approach	AM Peak Hour		PM Peak Hour	
		Delay	LOS	Delay	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	**Overall**	**10.1**	**B**	**15.5**	**C**
	Eastbound	9.6	A	19.2	C
	Westbound	9.0	A	9.3	A
	Northbound	10.6	B	9.3	A
	Southbound	8.6	A	14.3	B
19. R.B. Brown Drive & America Garage/ Garage 54 Exit	Eastbound	17.6	C	***	*F*
	Westbound	12.8	B	***	*F*
	Northbound Left	3.1	A	0.6	A
20. R.B. Brown Drive & Garage 54 Entrance	**Overall**	**10.5**	**B**	**8.8**	**A**
	Northbound	9.2	A	9.0	A
	Southbound	11.5	B	8.5	A
21. R.B. Brown Drive & Driveop-Off Loop Entrance/ Garage 55 Exit	**Overall**	**9.1**	**A**	**11.3**	**B**
	Westbound	8.1	A	10.9	B
	Northbound	9.4	A	9.5	A
	Southbound	8.8	A	12.3	B
22. R.B. Brown Drive & Driveop-Off Loop Exit/ Garage 55 Entrance	**Overall**	**9.7**	**A**	**9.4**	**A**
	Eastbound	8.1	A	7.8	A
	Northbound	10.1	B	8.3	A
	Southbound	9.0	A	10.0	A
23. R.B. Brown Drive & South Palmer Road	**Overall**	**9.8**	**A**	**10.6**	**B**
	Eastbound	10.3	B	8.9	A
	Westbound	8.6	A	10.7	B
	Southbound	9.1	A	11.4	B
24. East Palmer Road & North Palmer Road/Taylor Road	**Overall**	**9.4**	**A**	**10.1**	**B**
	Eastbound	9.6	A	9.5	A
	Westbound	8.4	A	10.5	B
	Northbound	9.3	A	10.3	B
25. East Palmer Road & Visitor Garage Exit/Rixey Road	**Overall**	**10.0**	**A**	**9.9**	**A**
	Eastbound	7.7	A	8.3	A
	Westbound	8.4	A	9.7	A
	Northbound	10.6	B	9.4	A
	Southbound	8.8	A	10.6	B
26. East Palmer Road/Gunnell Road & Stokes Road	**Overall**	**8.9**	**A**	**13.7**	**B**
	Westbound	8.3	A	14.5	B
	Northbound	9.2	A	10.5	B
	Southbound	8.7	A	14.7	B
27. AFRRI Dwy/Stokes Road & South Palmer Road	**Overall**	**9.5**	**A**	**10.5**	**B**
	Eastbound	8.2	A	10.1	B
	Westbound	10.4	B	10.9	B
	Northbound	8.8	A	10.7	B
	Southbound	0.0	A	8.6	A
28. University Road/Grier Road & South Palmer Road	**Overall**	**8.7**	**A**	**12.5**	**B**
	Eastbound	8.4	A	13.7	B
	Westbound	9.0	A	9.2	A
	Northbound	9.0	A	8.9	A
	Southbound	6.9	A	11.9	B
29. University Road & South Palmer Road	Westbound	*3.9*	A	5.2	A
	Northbound	*15.1*	C	9.4	A

**** HCM unsignalized intersection capacity analysis techniques result in abnormally high levels of delay at intersections with large pedestrian volumes. These conditions were not observed in the field.*

3.1.3.10 Internal Observation Findings

Inbound traffic arrives on installation at a relatively constant rate, and the variety of destinations on installation means that this traffic begins to disperse throughout NSA Bethesda's roadway network almost immediately after entering the installation. Because inbound traffic is dispersed throughout the installation, vehicular conditions on the internal roadway network are generally acceptable, with the only interruptions coming at stop-controlled intersections and pedestrian crosswalks.

The only significant congestion observed on the installation were the queues of outbound traffic observed passing through the security gates during the PM peak hour and the slow-moving traffic that occasionally preceded these queues. However, as was described in Section 3.1.2.4, these queues result from the necessities of signal timing at the external intersections adjacent to the security gates and not from any particular deficiency in NSA Bethesda's internal roadway network or the gates themselves.

3.1.4 *Pedestrian and Bicycle Facilities*

In recent years, interest in alternate travel modes in the Washington, DC metropolitan area has grown. Factors like traffic congestion, increased health and exercise concerns, and environmental stewardship have caused a marked shift in mode share towards pedestrian and bicycle travel. An inventory of facilities at and around NSA Bethesda for use by pedestrians and cyclists was conducted in order to determine their adequacy in terms of installation access and internal maneuverability. This section also serves as the existing condition for the LATR required Pedestrian and Bicycle Impact Statement.

3.1.4.1 Installation Access for Pedestrians and Cyclists

The primary generator of pedestrian and bicycle traffic in the vicinity of NSA Bethesda is the Medical Center Metro station, located on the west side of Rockville Pike across from Gate #2. Transit facilities available at this and other regional transportation hubs will be described in further detail in Section 3.1.4. Pedestrians and cyclists traveling to NSA Bethesda from this location can use the existing crosswalks to traverse Rockville Pike before gaining access through the 24-hour Gate #2 and entering the internal roadway network. Furthermore, planned improvements at this intersection include the addition of a pedestrian tunnel beneath Rockville Pike in order to reduce conflicts between vehicles and pedestrians traveling between Medical Center Metro station and NSA Bethesda. Additional information about pedestrian and bicycle facilities along the internal roadway network are discussed in Section 3.1.3.2.

External Shared-Use Trails

Field observations performed at and around NSA Bethesda indicate that there is a population of installation staff that commutes as a

pedestrian or cyclist from the surrounding neighborhoods. These users can take advantage of a number of shared-use paths in the vicinity of the installation, including the Bethesda Trolley Trail spur that runs parallel to Rockville Pike along the western edge of NSA Bethesda. This trail, along with other regional shared-use paths and non-auto facilities, are shown in Figure 9.

The Bethesda Trolley Trail spur provides connectivity with Rock Creek and the Rock Creek Park trail network to the north as well as with the North Bethesda Trail and downtown Bethesda to the south. To the north, trail users have access to a direct and efficient path between the installation and Kensington and other residential neighborhoods, while southbound travelers from NSA Bethesda can connect to the existing pedestrian network in downtown Bethesda, only a mile away. For a cyclist this trip would take only 5 to 10 minutes from Gate #2, making this connection ideal for local commuters and installation staff.

Pedestrian Drop-Off and Pick-Up Areas

In addition to gaining access to NSA Bethesda by foot from the local street network or via the Medical Center Metro station, pedestrians also have the option to use two vehicular drop-off and pick-up areas in the vicinity of the installation. As shown in Figure 9, there exists a Kiss-and-Ride facility adjacent to the Medical Center Metro station and Gate #2, while to the north of the installation along Cedar Lane there is a drop-off loop adjacent to one of the NIH campus' pedestrian access gates. Both of these facilities provide access to pedestrians who may be members of a carpool or other ride-sharing form of transportation. For bicyclists, there are seven bicycle routes near NSA Bethesda, including the Bethesda Trolley Trail Spur and Jones Bridge Shared-use Path adjacent to the installation and Georgetown Branch Trail, West Cedar Lane Shared-use Path, Rock Creek Trail, Capital Crescent Trail, and North Bethesda Trail serving the North Bethesda region.

Figure 9: Connectivity to Local Pedestrian and Bike Facilities

Gate Access

It is important to note that not all security gates at NSA Bethesda permit access by non-vehicular users. Access to the installation by pedestrians is only permitted at certain gates, as shown in the schedule below.

- Gate #1 (North Wood Road Gate): 5:00 AM – 7:00 PM
- Gate #2 (South Wood Road Gate): 24 hours
- Gate #3 (Gunnell Road Gate): 5:00 AM – 7:00 PM
- Gate #4 (Grier Road Gate): No Pedestrian Access (pedestrian access will be added during gate improvements in 2012)
- Gate #5 (University Road Gate): 5:00 AM – 6:00 PM

Because of its proximity to the Medical Center Metro station, Gate #2 sees the majority of pedestrian traffic. Gate #2 is also the primary access point for cyclists because of its proximity to the Bethesda Trolley Trail spur along Rockville Pike. However, traffic coming to the installation from the north may use the non-auto facilities at Gate #1, and traffic coming from the east may access the installation from Gate #5, especially if their destination is the USU, which is very near to this location. Additionally, recent construction programs undertaken by the Montgomery County Department of Transportation include the addition of shared-use paths along Jones Bridge Road and Cedar Lane. These improvements further serve to connect NSA Bethesda to the surrounding neighborhoods and commercial centers.

3.1.4.2 Pedestrian Infrastructure and Use

Aside from bicycling, and the installation's shuttle system, discussed in Section 3.1.4.4, the main method of internal circulation is on foot.

Existing Pedestrian Infrastructure

With the exception of some sidewalk closures in the vicinity of construction zones, the existing sidewalk network at NSA Bethesda is adequate, with curb ramps and other pedestrian amenities present at the vast majority of curb cuts and crosswalks. The current state of pedestrian facilities at NSA Bethesda is shown in Figure 10 and the current locations of curb ramps and sidewalks are shown in Figure 11. The 2011 NSA Bethesda Accessibility Plan provides recommendations toward improved pedestrian access throughout the installation, including improvements along R.B. Brown Drive, North Palmer Road, and the grade separation between East and South Palmer Roads.

Existing Pedestrian Volumes

In the vicinity of NSA Bethesda, pedestrian traffic volumes vary widely. Pedestrian traffic concentrations can be found along the region's shared-use trails like the Bethesda Trolley Trail spur and

near major transportation hubs like the Medical Center Metro station. Additionally, the popularity of downtown Bethesda as a commercial, retail, and dining destination means that high pedestrian volumes were also identified along the southern edge of the installation. Pedestrian volumes along the external study network can be found in Figures 12A and 12B and reflect the external peak hour time period. Pedestrian volumes counts throughout NSA Bethesda were conducted in combination with the vehicular turning movement counts. Pedestrians were observed crossing east-west at the intersection of Rockville Pike and North Wood Road, which is an intersection without a cross walk. For the counts conducted outside of NSA Bethesda, these movements were collected on October 18, 19, 20 and 26, 2011. Those movements collected internal to the installation were collected on October 25, 2011.

Pedestrian conditions within NSA Bethesda internal study network are characterized by high traffic volumes near parking garages, the Medical Center, and USU and low traffic volumes near ancillary support facilities. Although some pedestrian bridges do exist in the vicinity of the hospital complex, the high number of pedestrians traveling between the hospital and adjacent parking facilities causes a large number of pedestrians attempting to cross the installation’s roadways. This leads to delays along R.B. Brown Drive and North Palmer Road, although not to the level shown by the HCM delay calculation procedures (discussed in Section 3.1.2.10). Additionally, pedestrians accessing the installation from the nearby Medical Center Metro station create pedestrian-vehicle conflict areas along South Wood Road and South Palmer Road. During the morning an installation security officer was observed directing traffic in this area to ensure pedestrian safety. Internal pedestrian volumes are shown in Figure 13.

Figure 13 represents data gathered in 2008 for the BRAC NNMC EIS and addition data gathered in 2012 where construction had taken place since 2008, mostly along North Palmer Road.

Figure 10: Installation Pedestrian Facilities – Sidewalk and Buffer Widths

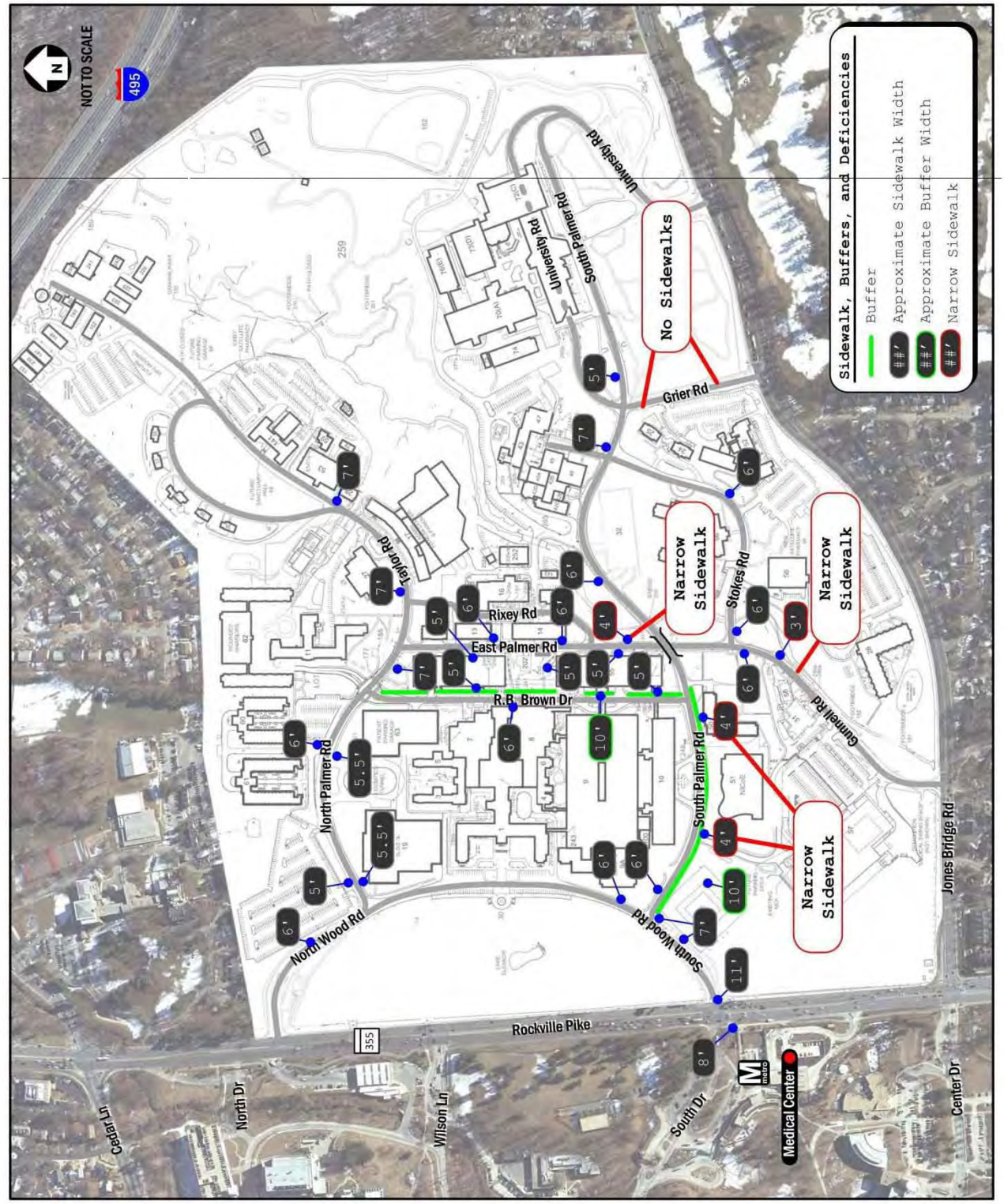


Figure 11: Installation Pedestrian Facilities – Curb Ramps and Sidewalk Locations

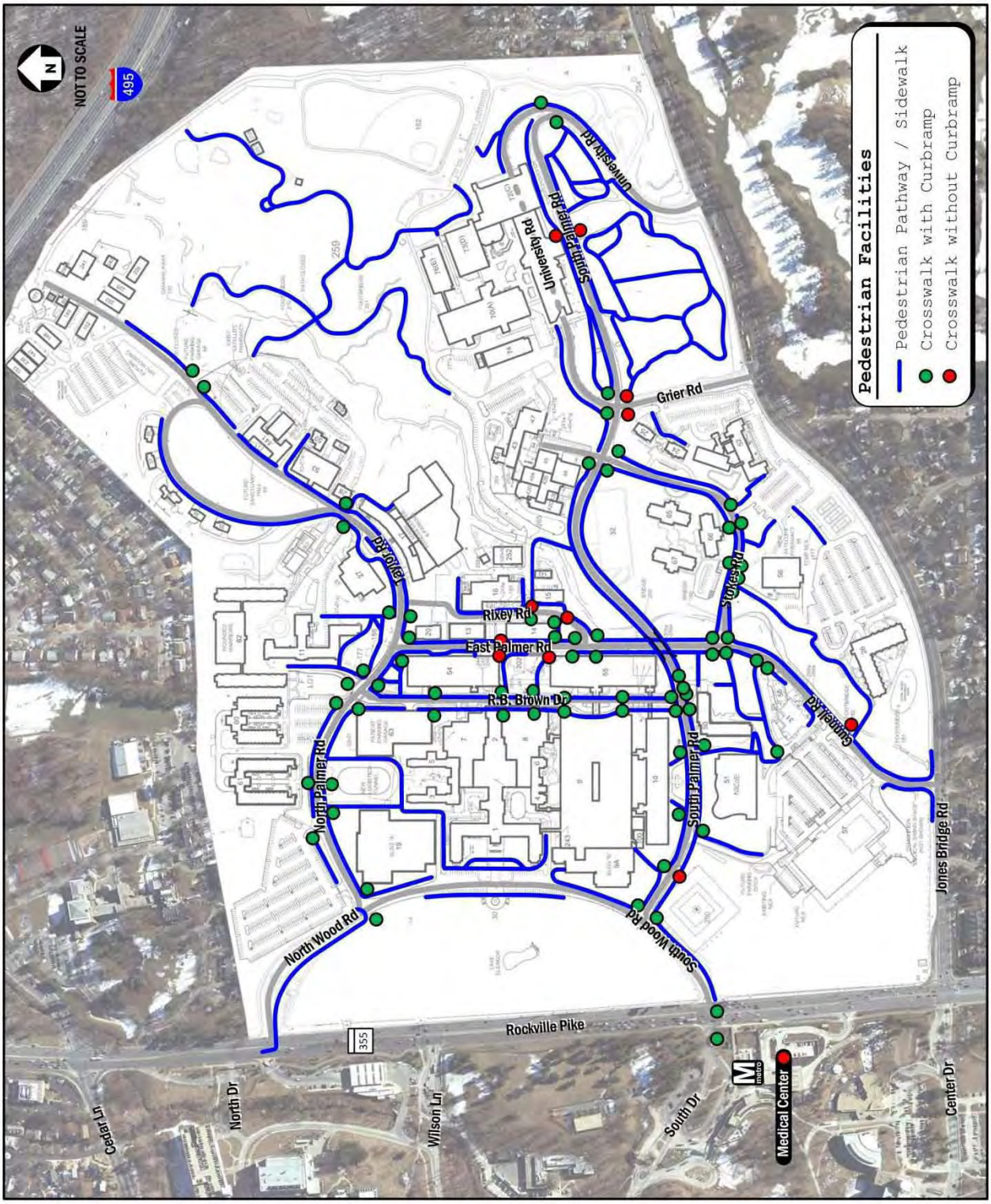


Figure 12A: External Pedestrian Volumes

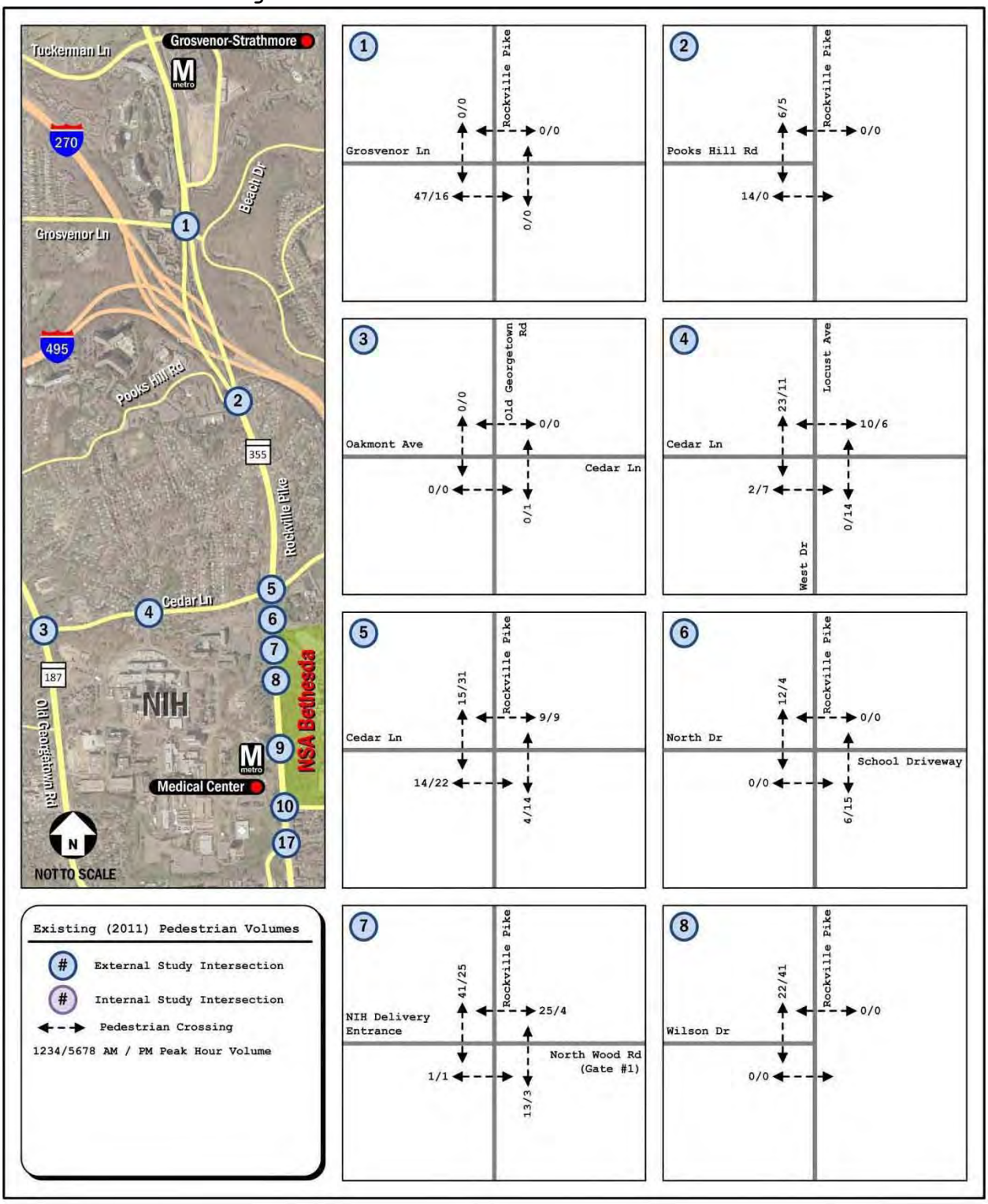


Figure 12B: External Pedestrian Volumes

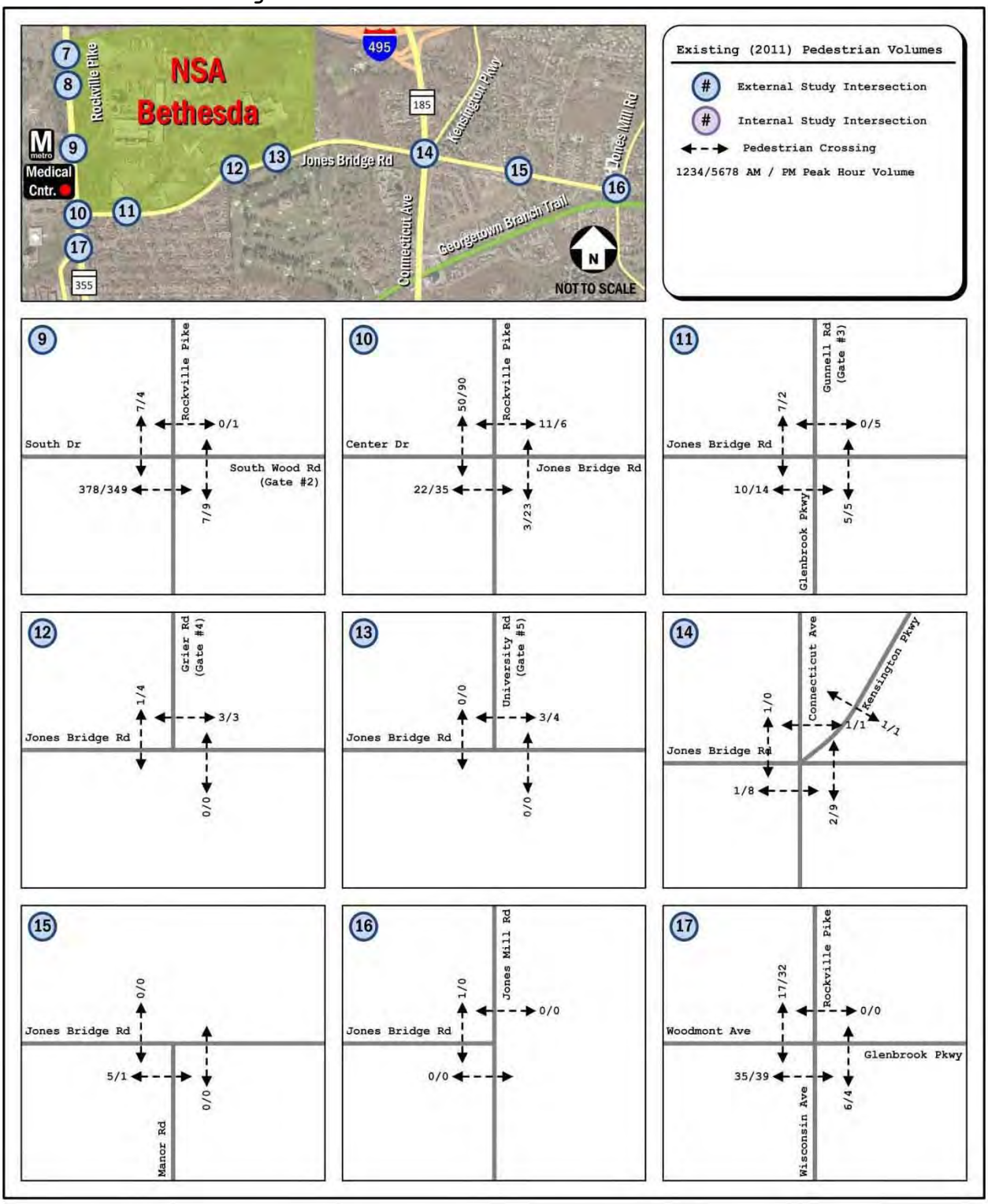
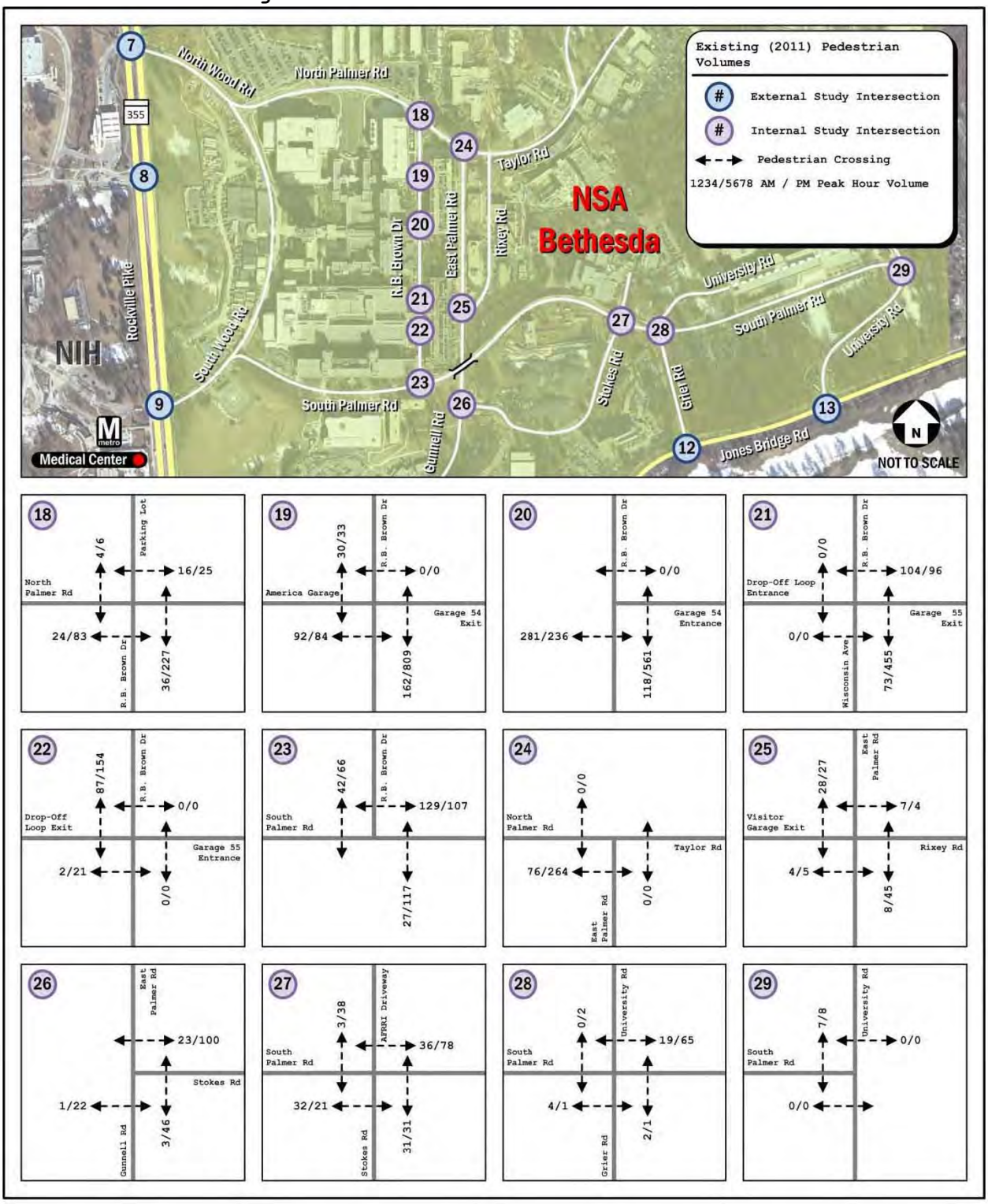


Figure 13: Internal Pedestrian Volumes



Bicycle Facilities and Use

The volume of bicycle traffic accessing NSA Bethesda during the study periods is shown in Table 9. This section includes a discussion of the provisions for bicycle travel and parking within NSA Bethesda and provides a more thorough breakdown of the volume of cyclists accessing the installation on a daily basis.

Despite the widespread availability of bicycle parking within NSA Bethesda, there is only a minimal number of bicycle travel infrastructure present on the installation. Bicycle lanes exist at the entrances to the installation at Gates #1, #2, and #5 and inside the installation these bike lanes integrate with the vehicular traffic. Furthermore, as documented in Section 3.1.3.2, sidewalk widths within the installation are generally 7 feet or less, rendering these pathways too narrow to serve as shared-use facilities. Therefore, cyclists traveling throughout NSA Bethesda are confined to the roadway network. Although low speed limits along these roads reduce the danger to cyclists, the lack of separated bicycle lanes and the presence of narrow travel lane widths and steep grades in some areas significantly reduce the level of protection afforded to cyclists. Dedicated bicycle lane will be provided at Gate #4 once construction is complete.

Existing Bicycle Facilities

A number of bicycle racks were observed during visits to the installation. These racks are spread out over a large area within NSA Bethesda. By cutting down the distance between bicycle parking and a cyclist’s eventual destination, the attractiveness of cycling is increased. The number of bicycle storage slots seems to match the demands of their location, for example the USU, Medical facility, and residential areas racks hold more than other locations. Existing bicycle rack locations are shown in Figure 14.

Existing Bicycle Traffic Volumes

Bicycle traffic volumes were collected on October 26, 2011. These volumes, shown in Table 9, were further analyzed to develop the bicycle arrival and departure distribution through the security gates as shown in Table 11. The total number of bicyclists accessing the installation during the peak periods was 32 vehicles during the AM peak hour and 31 vehicles during the PM peak hour. It should be noted that these counts were conducted in October and therefore likely show lower bicycle traffic volumes than can be expected during the traditional cycling season of April through September. Despite this, the volume of bicycles using the gates is well below the number of bicycles that were observed on NSA Bethesda during field observations, indicating that a number of bicycles are parked on-installation for internal trips only. Given the size of the NSA Bethesda, some users might desire to keep a bicycle on the installation for non-commuting, internal trip purposes. Additionally, any bicycle trips generated by the on-installation residential population would not be included in

the data shown in Table 11, potentially explaining the low gate bicycle counts.

Table 11: Bicycle Traffic Volumes at Security Gates

		Gate 1	Gate 2	Gate 3	Gate 4	Gate 5	All Gates
Inbound Total	**AM**	13	8	3	0	8	**32**
	PM	0	1	0	0	0	**1**
Outbound Total	**AM**	0	0	0	0	0	**0**
	PM	6	12	6	3	3	**30**
All Traffic	**AM**	13	8	3	0	8	**32**
	PM	6	13	6	3	3	**31**

3.1.5 ***Availability of Transit***

A number of transit services are provided in the vicinity of NSA Bethesda. Within the vicinity of the installation, service is provided by WMATA, Montgomery County's Ride On bus system, the Bethesda Circulator, and the Maryland Area Regional Commuter (MARC) operated by the Maryland Transit Administration. NSA Bethesda also operates a number of shuttles that serve the internal installation network as well as the Medical Center and Silver Spring Metrorail stations. These transit services are shown in Figure 15.

3.1.5.1 WMATA Transit Services

NSA Bethesda is located across Rockville Pike from the Medical Center Metro station on the Metrorail Red Line, a transit rail service providing connection to downtown Washington and other regional destinations through an 86-station network. Like many Metro stations, Medical Center is home to a surface transit center as well that serves as a major stop and transfer hub for several WMATA and Montgomery County Ride On bus services.

This station opens at 5:00 AM on weekdays and at 7:00 AM on weekends; and closes at 12:30 AM from Sunday through Thursday, and at 3:30 AM on Friday and Saturday. The trains operate with headways of 3 to 6 minutes during the peak weekday morning and afternoon periods, and with headways of 6 to 15 minutes during the weekday off-peak periods.

According to the last full study published by WMATA in 2006, the average number of weekday entries at this station is 5,255. On average there are 425 entries and 1,040 exits in the AM peak hour and 920 entries and 270 exits during the PM peak hour respectively.

Figure 14: Bicycle Parking Inventory

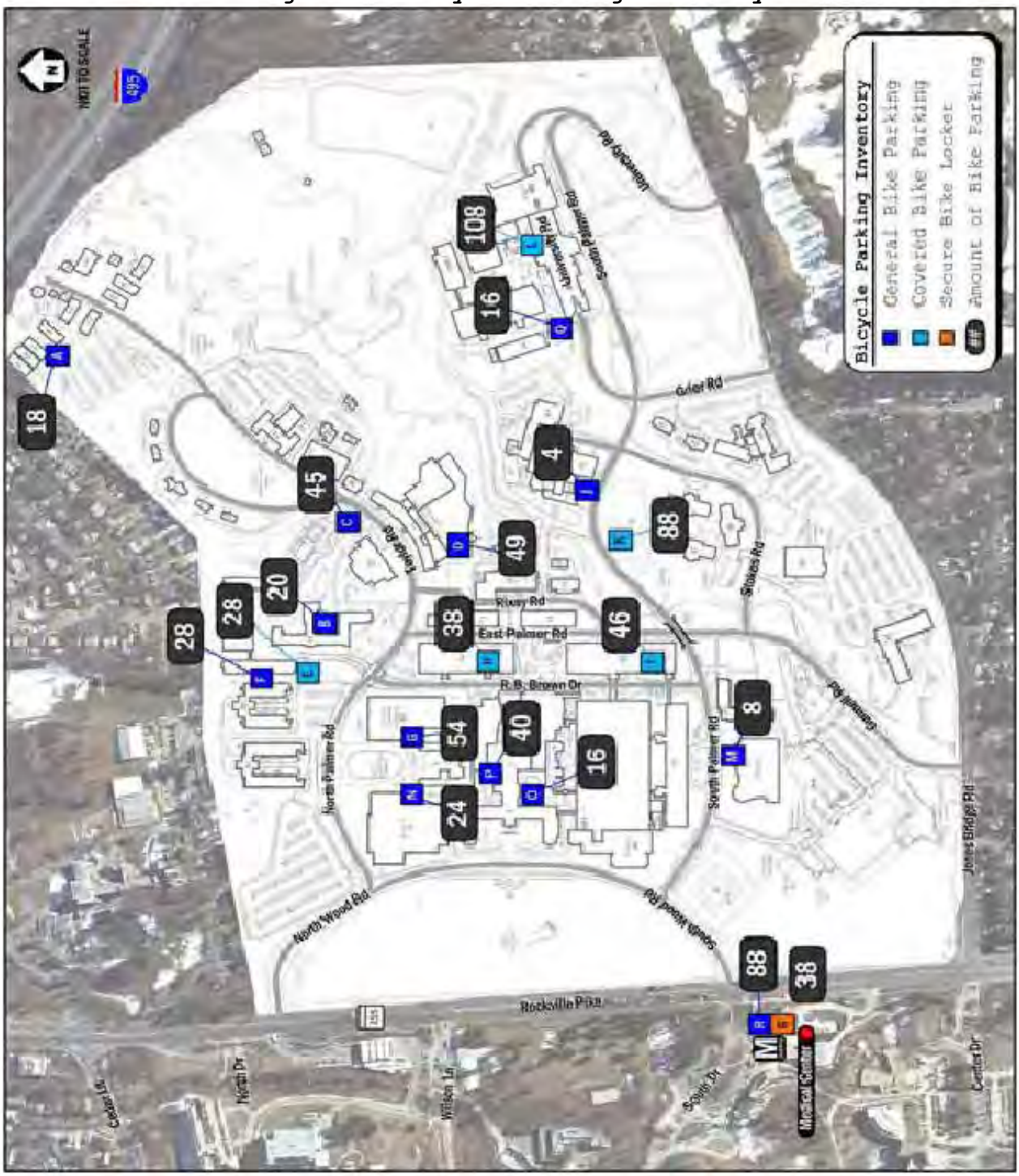


Figure 15: Local Public Transit Availability

A number of WMATA Metrobus routes also pass through the study area, including two routes that stop at the Medical Center Metro station:

Bethesda-Silver Spring Line (Routes J1, J2, and J3)

- Route J1 provides rush hour only service between the Silver Spring and the Medical Center Metro station via Jones Bridge Road with 30 minute headways. Routes J2 and J3 routes offer through service between the Silver Spring Metrorail station and Montgomery Mall to the northwest of NSA Bethesda with intermediate stops in the Bethesda CBD and at the Medical Center Metro station. These routes operate with 7-minute headways during peak hours and 20-minute headways during off-peak hours.

I-270 Express (Routes J7 and J9)

- Routes J7 and J9 comprise the I-270 Express, running between the Lakeforest Transit Center in Gaithersburg and the Bethesda Metrorail station. The only difference between the two routes is the paths taken through downtown Bethesda and Gaithersburg. The J9 bus provides service in the peak commuter direction at 10 to 20 minute headways during the peak hour and the J7 bus provides limited-stop service in the opposite direction at 20 to 30 minute headways.

3.1.5.2 MTA Services

Commuter rail service is available through the MARC Brunswick Line, providing service between Union Station in downtown Washington and Martinsburg, West Virginia or Frederick, Maryland depending on the route. MARC runs nine trains inbound to Washington in the morning and ten trains outbound in the evening. All trains stop in Rockville about 6 miles to the north of NSA Bethesda, where a connection can be made to the Metrorail Red Line. An additional stop is located at Kensington, approximately 3 miles northeast of the installation.

MTA also operates several commuter bus lines that utilize the new Intercounty Connector (MD 200) that travels east-west across Montgomery and Prince George’s counties. One of these routes, the MTA 203 Commuter Bus – Columbia to Bethesda, began operation on January 3, 2012, between the Snowden River Park and Ride in Columbia and the Medical Center Metro station adjacent to the NSA Bethesda via US 29, Intercounty Connector, and Connecticut Avenue.

3.1.5.3 Montgomery County Ride On Bus Services

Montgomery County operates the Ride On bus system, which provides service along most major roadways within the county. Five Ride On routes serve the Medical Center Metro station:

- Bethesda – Medical Center (Route 30): Route 30 is a local collector route that circles through the neighborhoods around the

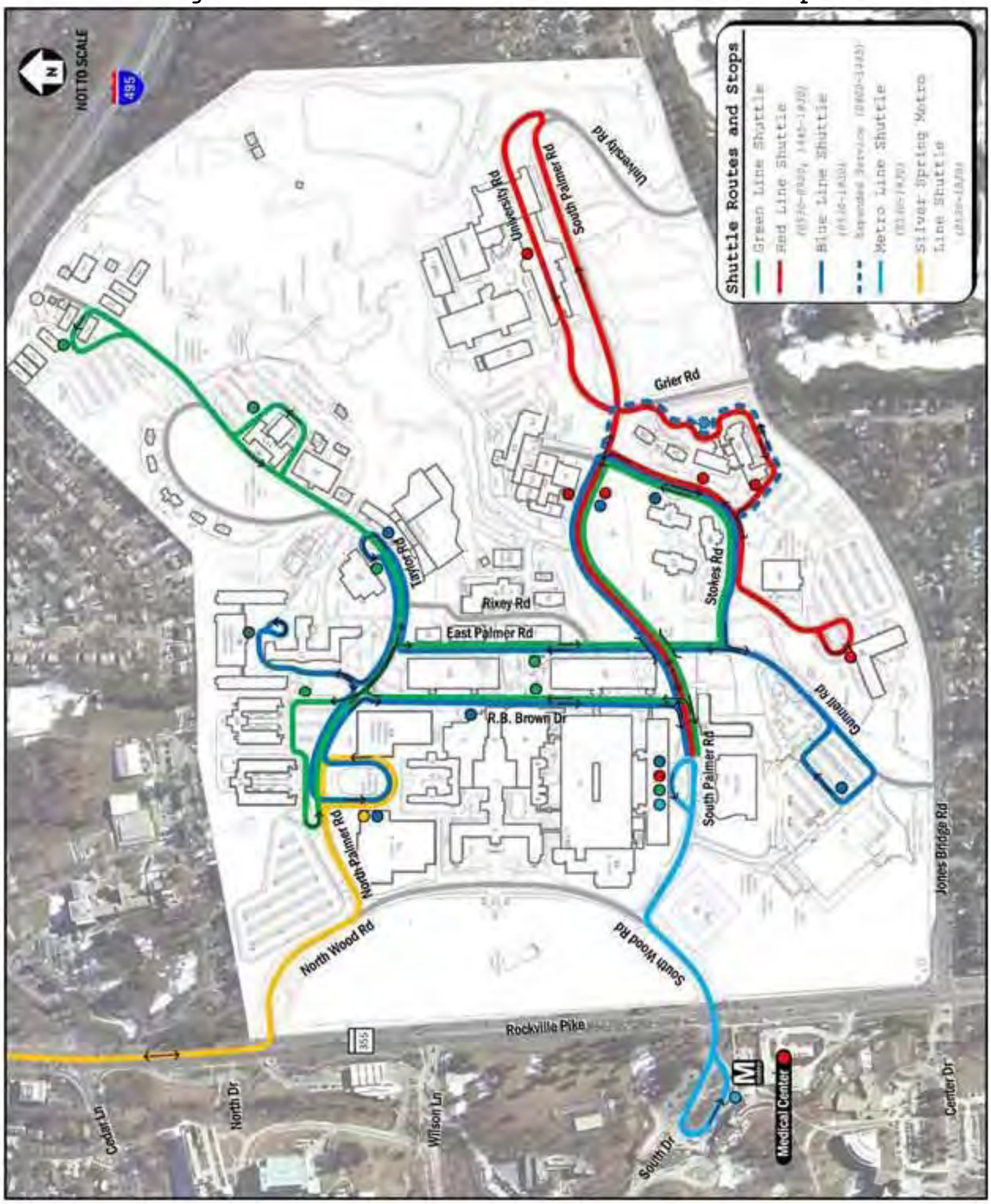
NIH campus before terminating at the Bethesda Metro Station. The service operates Monday to Friday at 30-minute headways.

- Glenmont – Medical Center (Route 33): Route 33 provides rush hour-only service to the Glenmont Metro station at 30-minute intervals via Kensington Parkway and the Kensington MARC station.
- Aspen Hill – Friendship Heights (Route 34): Route 34 provides service from Wheaton to Friendship Heights via downtown Bethesda and Wisconsin Avenue at 15-minute headways on weekdays and 30-minute headways on weekends.
- Rockville – Rockville Pike – Medical Center (Route 46): Route 46 connects NSA Bethesda with Rockville via Rockville Pike and primarily serves as a feeder to the Metro stations along this route. Weekday service provides 15-minute headways during the day and 30-minute headways in the evening. This route also provides service on weekends at less frequent intervals.
- Germantown – Bethesda EXPRESS (Route 70): Route 70 is an express service running between the Germantown Milestone park-and-ride lot and Bethesda. The bus provides limited-stop service between the Medical Center Metro station and these locations with service every 12 minutes.

3.1.5.4 NSA Bethesda Shuttle Services

NSA Bethesda operates five shuttle bus lines. Three color-coded shuttle lines operate within the installation, with two lines providing connections to external destinations. The Metro Line Shuttle provides service between the Medical Center Metro station and Building 10 of the installation. At Building 10, a transfer can be made to the three internal lines. Similarly, Silver Spring Metro Line Shuttle provides service every 15 minutes to the Silver Spring Metro station, with a transfer provided to the Blue Line Shuttle at the America Building. The two external lines are Patient Shuttles that give priority to patients and visitors of patients of NSA Bethesda, with installation staff allowed to ride as space permits. The NSA Bethesda shuttle service, along with all bus stops and each line’s hours of operation, is shown in Figure 16.

Figure 16: NSA Bethesda Shuttle Routes and Stops



3.1.6 *Travel Time and Delay Survey*

Travel time runs were conducted in October 2011 for the morning and evening peak periods along various corridor sections of the study area. Table 12 provides a summary of the travel time results, while Figure 17 displays the travel time run locations. Two travel time runs were conducted throughout the area surrounding NSA Bethesda: one located along Rockville Pike between Chelsea Lane to the south and Tuckerman Lane to the north and the second along Jones Bridge Road between Rockville Pike to the west and Jones Mill Road to the east. Along Rockville Pike, travel runs were conducted in the southbound direction during the AM peak period and the northbound direction during the PM peak period to reflect the peak direction. Along Jones Bridge Road, the peak direction is in the westbound direction in the AM peak hour and the eastbound direction during the PM peak hour. For comparison purposes, the average time estimated to drive these sections was estimated by reviewing the distance and existing speed limit in order to arrive at a free-flow travel time.

Below, Table 12 and Figures 18A through 18D represent the free flow travel time and actual travel time experienced in the peak direction of these two road sections.

The results show the northbound direction of Rockville Pike is more congested in the evening peak hour than the southbound direction of Rockville Pike in the morning peak hour. However, Jones Bridge Road is equally congested in the eastbound and westbound directions.

Table 12: Travel Time and Delay Survey Summary

Corridor (Peak Period)	Corridor Length (mi)	Average Travel Time (mm:ss)	Average Delay (mm:ss)	Observed Speed Limit (mph)	Average Speed (mph)
MD 355 Southbound (AM)	2.151	12:07	08:29	35-45	10.65
MD 355 Northbound (PM)	2.133	14:59	11:21	25-45	8.55
Jones Bridge Road Westbound (AM)	1.719	11:36	08:29	30-35	8.89
Jones Bridge Road Eastbound (PM)	1.719	11:24	08:17	30-35	9.04

Figure 17: Travel Time and Delay Survey Study Area and Measurement Locations

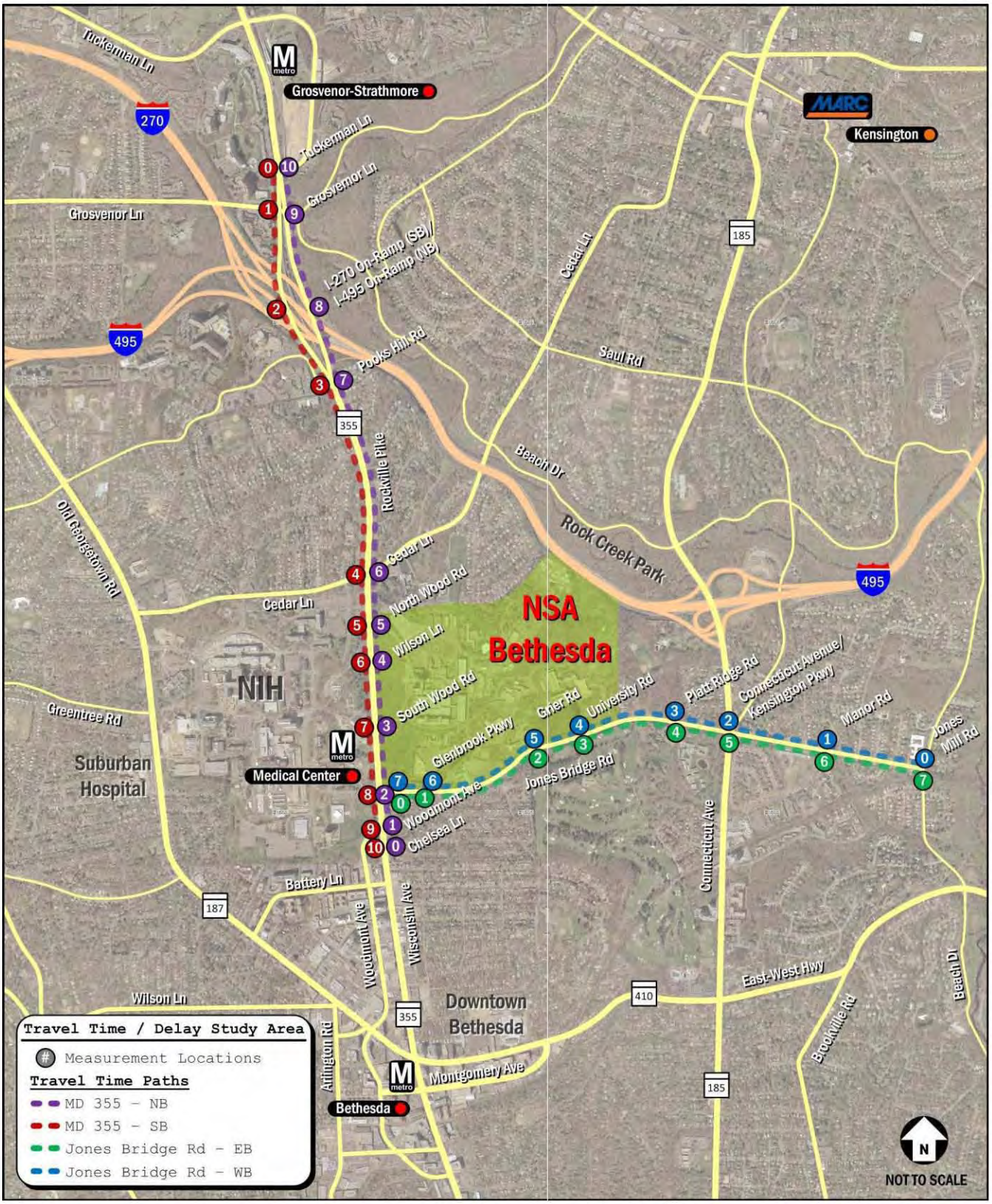


Figure 18A: Travel Time/Delay Survey Results – Rockville Pike, Southbound AM

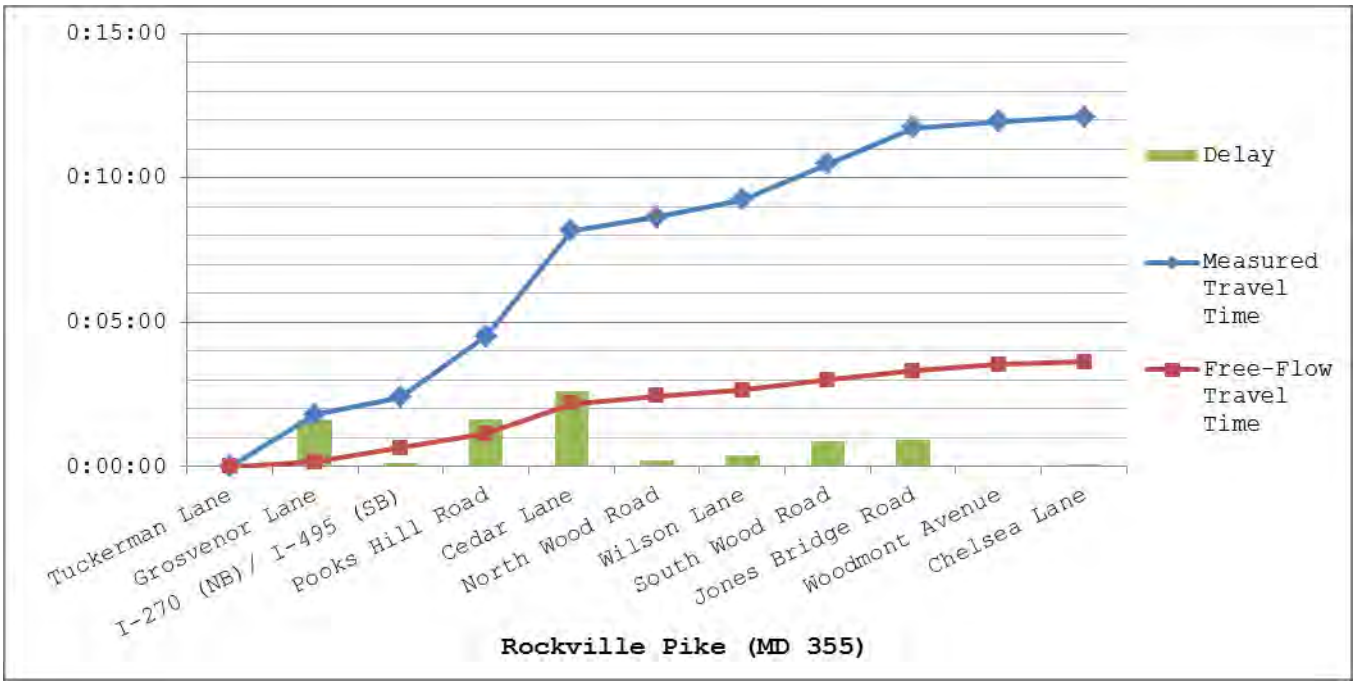


Figure 18B: Travel Time/Delay Survey Results – Rockville Pike, Northbound PM

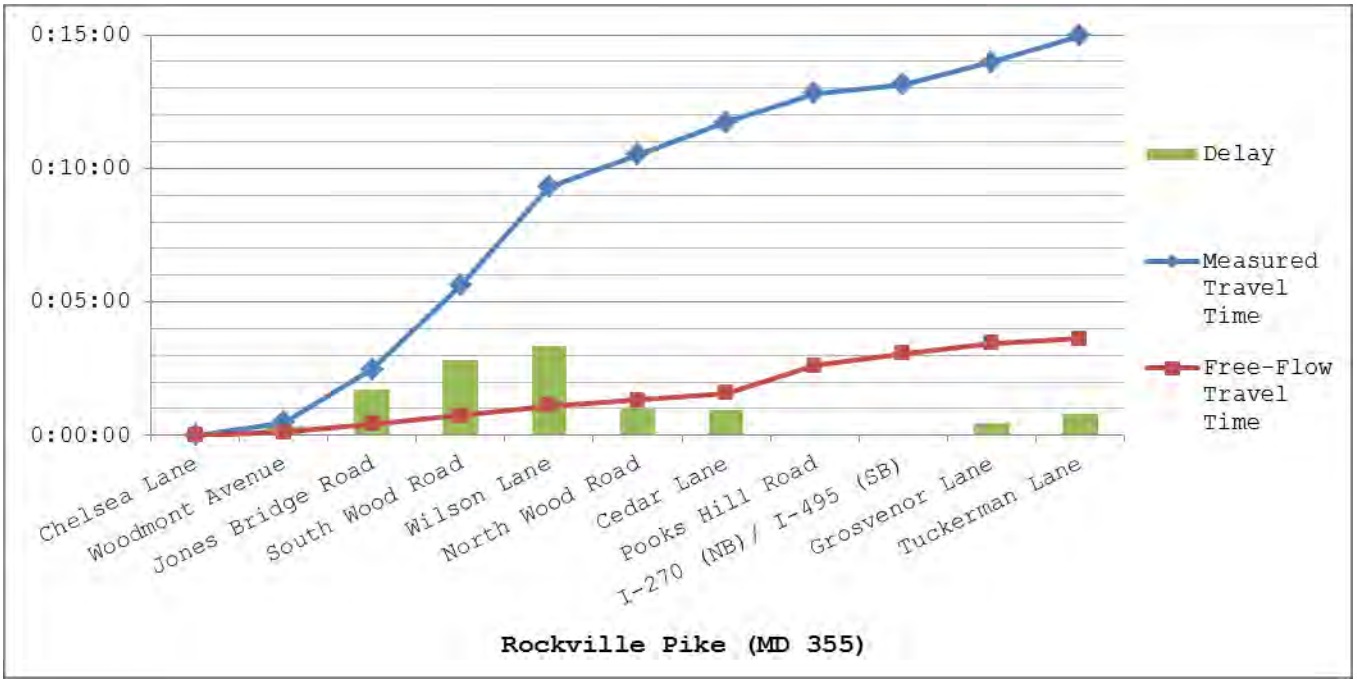
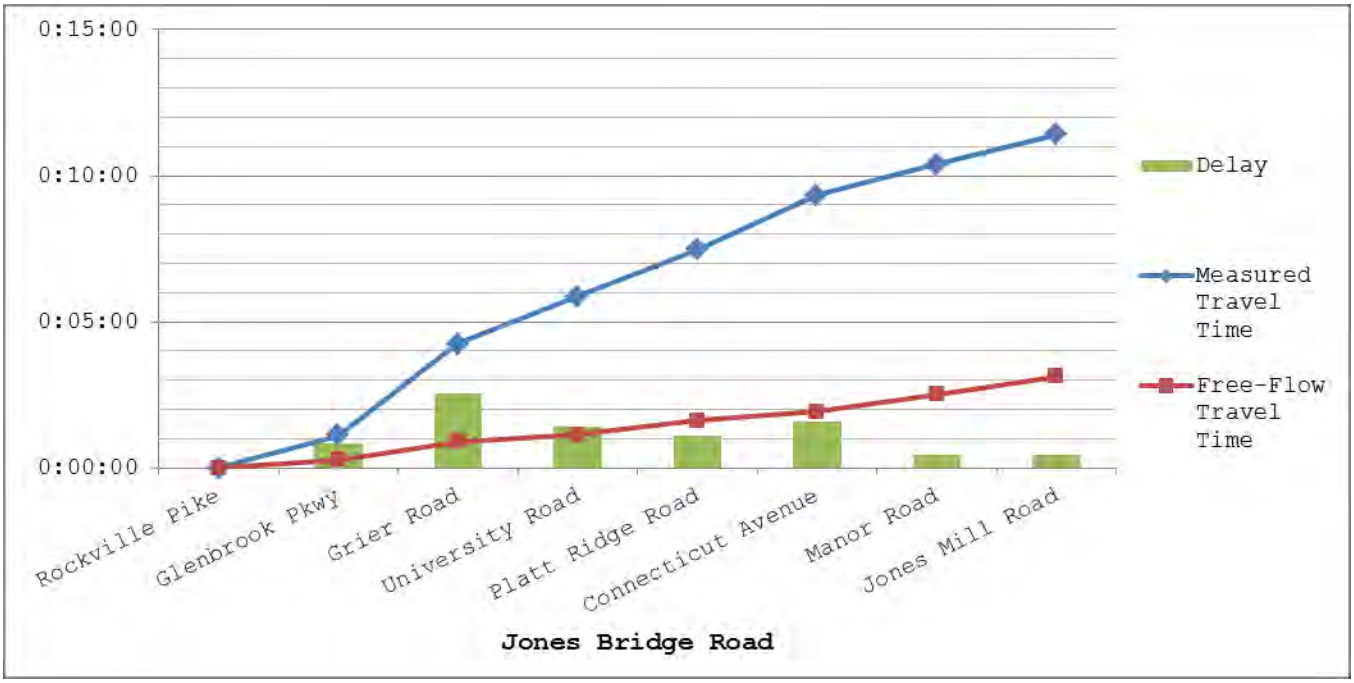


Figure 18C: Travel Time/Delay Survey Results – Jones Bridge Road, Westbound AM

Figure 18D: Travel Time/Delay Survey Results – Jones Bridge Road, Eastbound PM



3.2 Future Conditions

The collection of existing condition data and analysis of existing roadways provided the baseline for evaluating the external and internal roadways serving NSA Bethesda. The next step in determining the impact of the Medical Facilities Development and University Expansion requires the development of a No Build condition with short-term planned projects in place without a proposed action (or the Build Alternatives). Once this scenario is established, this report will discuss the traffic benefits and impacts of the Build Alternatives.

3.2.1 *The 2018 No Build Condition Development*

The 2018 No Build condition will provide a future roadway operation base to compare the future Build Alternatives. The creation of the 2018 No Build condition consists of determining roadway improvements, land use change, and parking facility assumptions. These assumptions will directly affect the amount of traffic assigned to the external and internal roadway network. The following are the 2018 No Build condition assumption general categories:

- **External Roadway Improvements:** Roadway improvements along the key roadways serving NSA Bethesda listed in the BRAC Mobility Projects Matrix by the BRAC Implementation Committee.

- **External Transit Improvements:** Transit improvements that serve NSA Bethesda, helping to reduce the need to drive and park at the installation.

- **Background Developments:** Significant developments proposed in the vicinity of NSA Bethesda provided by the M-NCPPC.

- **Gate Improvements:** Intersection improvements separated from the external roadway improvement list serving the NSA Bethesda Gates #3 and #4 entrances. These improvements are funded and expected to be completed by 2012. Improvements to Gates #1, #2, and #5 have been previously completed and are part of the baseline assessment.

- **Internal Roadway Improvements:** Roadway improvements along internal installation roadways expected to be completed by 2018.

- **Planned Projects:** Planned projects at NSA Bethesda expected to be completed by 2018.

- **Internal Installation Parking:** Parking facilities expected to be operational in 2018.

The next section will break down the general categories into detailed descriptions covering all seven assumption categories.

3.2.1.1 External Roadway Improvements

The MSHA has approved funding the construction of several roadway improvements around NSA Bethesda. These projects include widened approaches with additional turning lanes, removal of channelized right turning bays to provide safer bicycle and pedestrian crossings, and extension of existing turning bays to reduce incidents of blocking through traffic. The operational analysis for the No Build condition and all Build Alternatives includes these roadway improvements. Figure 19 shows the external project locations. Appendix D1 contains these designs. The letter on the map coincides with the numbers listed after each intersection below.

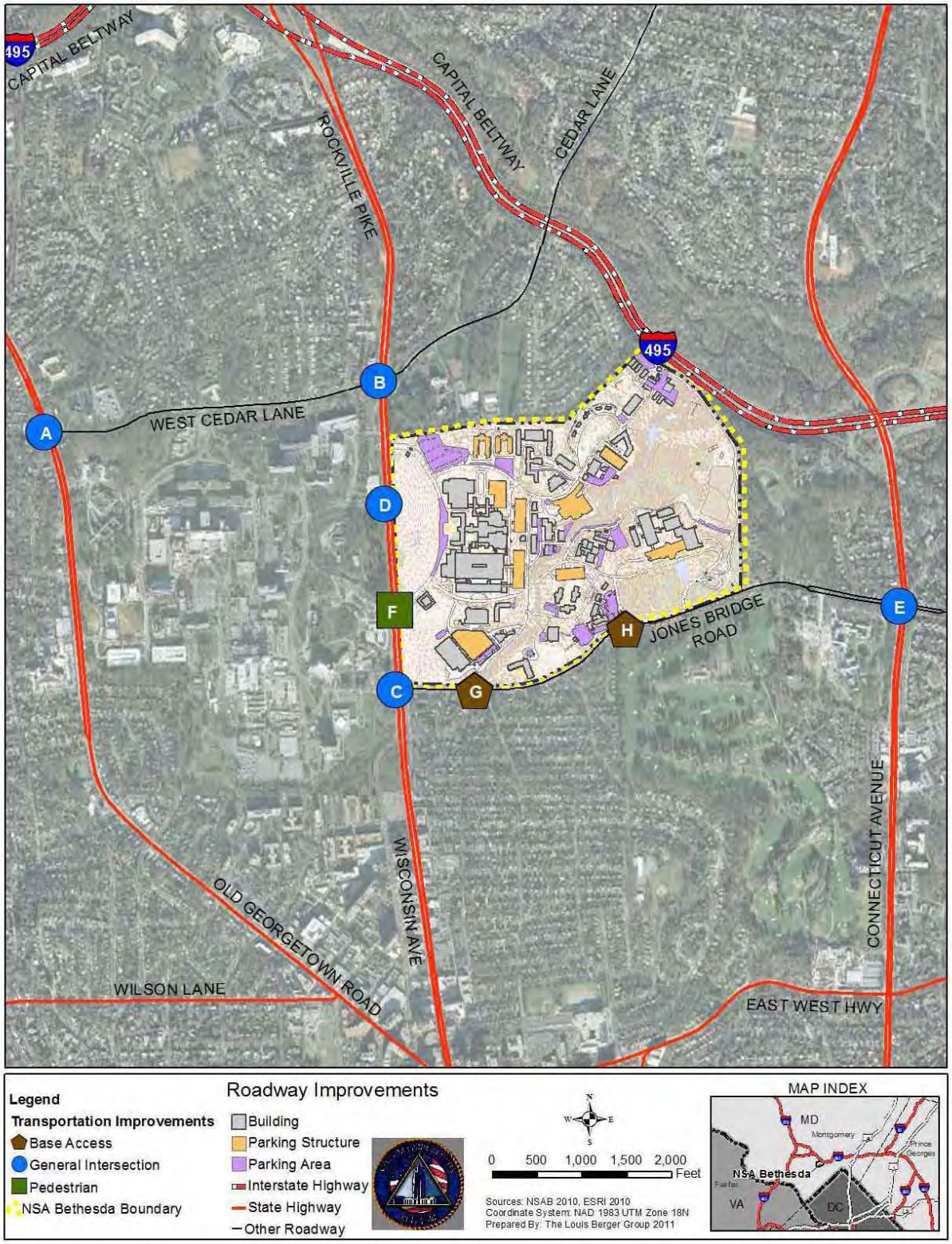
Old Georgetown Road at West Cedar Road (A):

Cedar Lane would have an additional left turn lane, shared with the through movement and an additional right turn lane. Both the exclusive right and left turn lanes are a total of 300 feet, an extension of 100 feet from the original left turn lane. The northbound Old Georgetown Road approach has a new 150-foot exclusive right-turn lane, matching the existing exclusive left turn lane. In total, two new approach lanes would be added to this intersection.

Rockville Pike at West Cedar Road (B):

The Rockville Pike northbound approach would have an exclusive new right turn lane extending back to the North Wood Road (Gate #1) intersection. The Rockville Pike southbound approach would have a new 300-foot shared right turn/through lane, with the new through lane extended to the North Drive intersection. The Cedar Road westbound approach would include a 600-foot exclusive double left turn bay, a 150-foot extension to the existing single left turning lane. In addition, the left most through lane would operate as an exclusive through lane rather than the existing shared through/left lane. The West Cedar Road eastbound approach would have a 300-foot extension to the existing right turn lane and an exclusive double left turning bay, 50-feet longer than the existing single turning lane.

Figure 19: External Project Locations



Rockville Pike at Jones Bridge Road (C):

The Rockville Pike southbound approach would have a new left turn move from the existing left-most through lane to provide two lanes for turning left onto Jones Bridge Road, plus the existing left turn lane would be extended approximately 50 feet. The Jones Bridge Road westbound approach would be reconfigured to change the existing left-most through lane into a left turning lane, extending back to the Gunnell Road intersection (Gate #3). The existing right turn lane would remain 225 feet in length; however, the channelized right turn bay would be removed to provide safer bicycle and pedestrian movements at the intersection. The Center Drive approach would have a separate left turn bay, matching the 50-foot existing right turn bay. The signal would be upgraded to include the latest vehicle detector system that would continually adjust the signal timings, based upon the vehicle demand at each roadway approach.

Rockville Pike at Wilson Drive (D):

The Rockville Pike southbound approach would have a new right turn lane, extended to the North Wood Road (Gate #1) intersection.

Connecticut Avenue at Jones Bridge Road (E):

The Connecticut Avenue southbound approach would have the existing right turn lane extended past Woodlawn Road. The Jones Bridge Road eastbound approach would include an exclusive double left turning bay, and shared left turn/through movement, providing three lanes for the left turning movement. The exclusive left turning lanes would be over 250-feet longer than the existing left turning lanes and the right turning lane would be extended to the Platt Ridge Road intersection, a 600-foot extension. The Jones Bridge Road westbound approach would have an exclusive double right bay extending over 200-feet longer than the existing right-turn bay, with the far right lane also serving Kensington Parkway. This approach would also have a second exclusive through lane extending over 500-feet. The existing right through lane would extend back to Montgomery Avenue.

3.2.1.2 External Transit Improvements

Montgomery County is constructing one transit improvement project that would directly affect the development of the 2018 No Build condition. The operational analysis for the No Build condition and all Build Alternatives would include this transit improvement. Figure 19 shows the transit project location.

METRO Pedestrian Access/Rockville Pike Crossing Project (F):

This project would consist of two features, the construction of a new underground tunnel under Rockville Pike connecting the east side of Rockville Pike with the west side, accessed by elevators, escalators, and stairs, and the construction of elevators on the east side of

Rockville Pike that would directly connect with the Medical Center Metro station mezzanine. The Rockville Pike tunnel would eliminate the need for pedestrians to cross the roadway when walking between NSA Bethesda and NIH or the Medical Center bus stop. The new elevators connecting to the Medical Center Metro station's mezzanine would provide a direct connection between the underground Metro station and NSA Bethesda without the need to cross Rockville Pike. The current pedestrian crossing is shown in Figure 20, which averages 378 pedestrians an hour crossing during the AM peak period.

Figure 20: Pedestrian Crossing at Rockville Pike and Gate #2

3.2.1.3 Background Developments

M-NCPPC identified ten proposed developments to include in this study to account for background traffic growth along the external roadway network. This background traffic is important as it accounts for changes in traffic along the major roadways connecting to NSA Bethesda. Table 13 contains the list of background developments, their location, and number of units or square footage. Figure 21 shows the locations of each proposed development.

Trip Generation

Each proposed development will generate trips through the external roadway network that services NSA Bethesda. As required by Montgomery County's LATR, trip generation rates will be derived from the LATR trip generation rates listed in LATR Appendices A and C. Appendix A contains trip generation rates for proposed developments located outside of the Bethesda CBD. Appendix A also includes trip reduction equations to account for potential trips using transit. Appendix C contains special trip generation rates for proposed developments within the Bethesda CBD (M-NCPPC determined that proposed projects along Rockville Pike, south of Jones Bridge Road would fall into this category). These rates account for potential trips using transit. Both

LATR Appendices A and C also include directional distribution (percentage of trips entering and exiting the proposed site) for both the AM and PM peak hour.

According to LATR policy, if a trip generation rate is not available for a specific proposed development in LATR Appendix A for proposed projects outside of the Bethesda CBD or LATR Appendix C for proposed projects within the Bethesda CBD, then the latest release of the Institute of Transportation Engineers (ITE) Trip Generation Manual should be used. Trip generation rates in the ITE Trip Generation Manual also include directional distribution, but do not account for potential trips using transit in an area such as Bethesda. The manual provides suburban/rural peak hour trip generation rates; therefore, the rates would reflect a conservative estimate.

Both the LATR and ITE trip generation manuals either include within the trip generation rate or provide a pass-by percentage to avoid counting an existing trip (for example, a trip already accounted for in the existing conditions destined for a grocery store that would also stop at a proposed gas station).

To determine the net number of trips at each proposed development site, the study calculated the number of trips generated by existing developments and subtracted that from the number of trips generated by the proposed development. For sites without any existing development, the study only calculated the number of new trips. Since the LATR provided separate trip distribution percentages for office and residential generation rates, the study separated the trip generation rates for each mixed use proposed development by office, residential, and retail. By separating these three land use types, negative net trips generated sometimes occurred as a proposed new development could be smaller than the existing development. Figure 21 shows the locations of background developments, while Table 14 provides the trip generation rates for proposed development. The detailed trip generation tables for each background development are included in Appendix D2.

Table 13: Background Developments

	Facility Name	Location	Dwelling Units (DU)/Square Footage (SF)
1	FASEB Office Addition	Southwest quadrant of Rockville Pike and Pooks Hill Road; north of Alta Vista Road; access to Rockville Pike and Pooks Hill Road	40,000 SF Office addition
2	Alta Vista at ACC	Southeast quadrant of Old Georgetown Road and Alta Vista Road; access to Alta Vista Road and Camberly Ave	37 Single-Family DUs
3	NIH – Porter Neuroscience Research Lab	West side of NIH campus near Old Georgetown Road	200 vehicles per day
4	Suburban Hospital	Southwest corner of Old Georgetown Road and Southwick Street	114,996 SF Expansion; 134,996 SF Standard of Care
5	Glen Aldon on Battery Lane	North/south sides of Battery Lane; West of Woodmont Avenue	694 High-Rise DUs replacing 260 Mid-Rise DUs
6	Woodmont View	Northwest corner of Woodmont Avenue and Battery Lane	46 Mid-Rise DUs, 3,200 SF Restaurant, and 1 Extended Stay Multi-Family Facility for 5 families replacing 4,200 SF General Office and 1 Single-Family DU
7	8300 Wisconsin Avenue	Between Wisconsin Avenue and Woodmont Avenue; north of Battery Lane	150 Room Hotel, 350 High-Rise DUs, and 50,000 SF Grocery store
8	Woodmont Central - A	Southwest corner of Wisconsin Avenue and Battery Lane	81,107 SF Office and 10,505 SF Retail replacing existing Gas Station (with Conv. Retail and Car Wash
9#	Naval Support Activity Bethesda-BRAC Integration	East side of Rockville Pike; north of Jones Bridge Road	2,500 additional employees and 484,000 additional medical center visitors annually
10	Chevy Chase Lake East	Southeast quadrant of Connecticut Ave and Manor Road	74,356 SF Office and 174,016 SF Retail replacing 67,009 SF retail

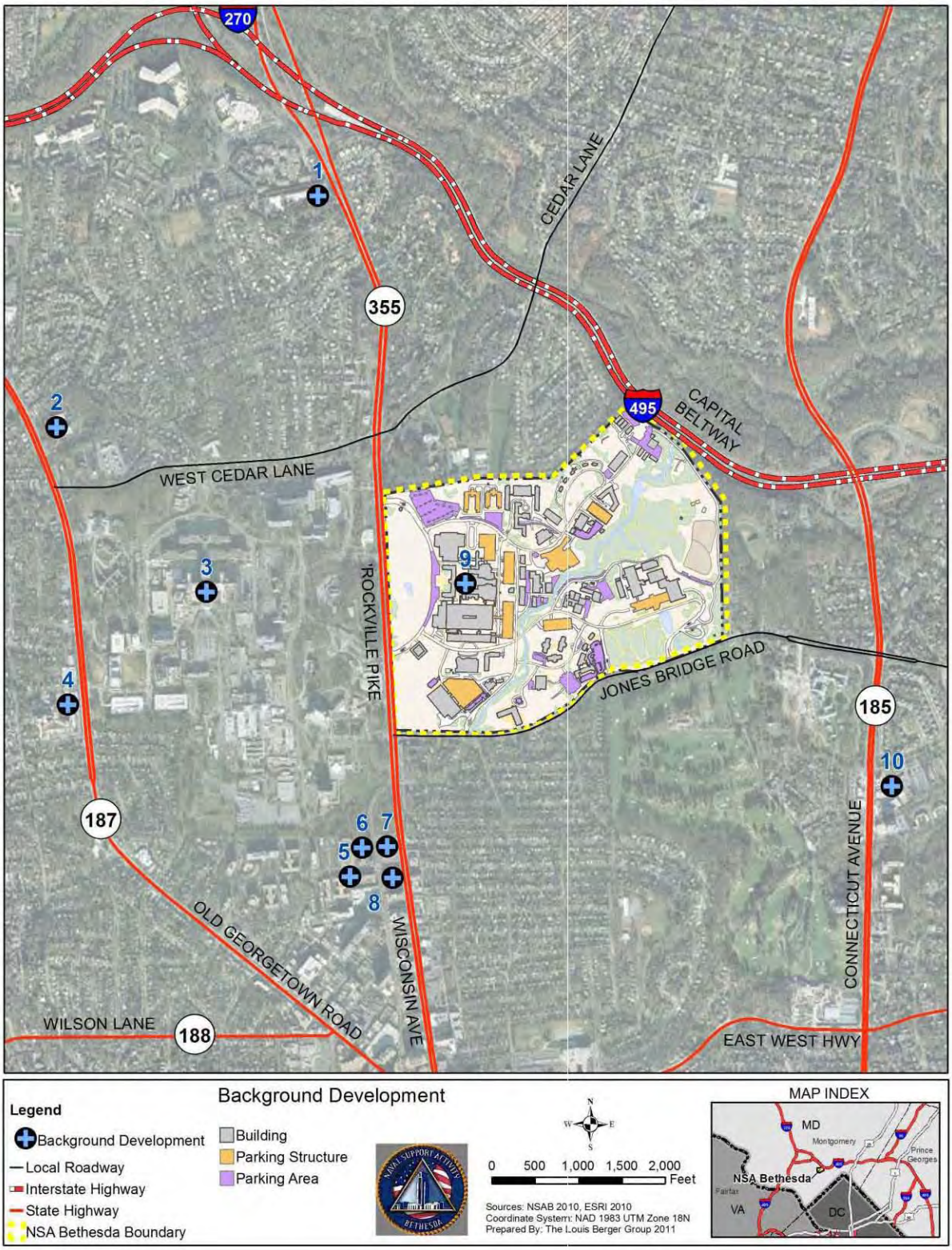
#This project is complete and reflected in the existing condition traffic volumes.

Table 14: Proposed Background Development Trip Generation Rates

	Facility Name	Type	AM Peak Hour				PM Peak Hour			
			In	Out	Pass-by	Total	In	Out	Pass-by	Total
1	FASEB Office Addition	Office	38	2	0	40	4	38	0	42
2	Alta Vista at ACC	Residential	7	22	0	29	22	12	0	34
3	NIH – Porter Neuroscience Research Lab	Office	40	0	0	40	0	36	0	36
4	Suburban Hospital	Medical	111	35	0	146	51	130	0	182
5	Glen Aldon on Battery Lane	Residential	19	72	0	91	61	30	0	91
6	Woodmont View	Office	-5	-1	0	-6	-1	-5	0	-6
		Residential	4	16	0	20	13	7	0	21
		Retail	0	2	0	2	10	5	0	15
7	8300 Wisconsin Avenue	Residential	21	84	0	105	70	35	0	105
		Retail	63	31	0	94	173	170	0	343
8	Woodmont Central - A	Office	104	18	0	122	31	91	0	122
		Retail	-18	-17	0	-35	-10	-8	0	-18
9*	Naval Support Activity Bethesda-BRAC Integration	N/A								
10	Chevy Chase Lake East	Office	103	15		118	22	105	0	127
		Retail	68	64	87	132	274	252	351	526

*This project is complete and reflected in the existing condition traffic volumes.
Facility 1 and 2 used rates provided by specific proposed development proponents.
Facility 3 used vehicle volumes provided by NIH.
Facility 5, 7, and 8 used LATR Appendix C, Bethesda CBD trip generation rates.
Facility 6 used a combination of LATR and ITE for trip generation rates.
Facility 2 and 10 used LATR Appendix A, county-wide trip generation rates.
Facility 10 used a 40 percent pass-by percentage rate provided by M-NCPPC during a phone conversation.

Figure 21: Location of Background Developments



Based upon the trips generated using the LATR and ITE, the proposed background developments would produce 858 trips during the AM peak hour and 1,584 trips during the PM peak hour. These proposed developments are located throughout the project study area and would add trips to Rockville Pike, Jones Bridge Road, and West Cedar Lane. The next section will cover the distribution of these trips into the traffic network and discuss the impacts to study area roads. As these are background trips, they were added to the external roadway network such as Rockville Pike, Jones Bridge Road, Old Georgetown Road, and Connecticut Avenue, but would not enter or exit NSA Bethesda.

Trip Distribution

The trip distribution for each facility is based upon area-wide percentage flows contained in LATR Appendix D and the existing roadway flows and turning movements, with the exception of the Federation of American Societies for Experimental Biology (FASEB) Office Addition and Suburban Hospital. The traffic studies for those two developments were provided by Montgomery County Planning Department/M-NCPPC and contained generation rates and distribution percentages.

The FASEB Office Addition project located on Rockville Pike near the Pooks Hill Road intersection uses the following forecasted distribution pattern for both the AM and PM peak hours: 23 percent from I-270, 21 percent from I-495 east of Rockville Pike, 19 percent from Wisconsin Avenue, 14 percent from Rockville Pike, 12 percent from I-495 west of I-270, 7 percent from Old Georgetown Road, and 4 percent from Cedar Lane.

The Suburban Hospital project located on Old Georgetown Road near the McKinley Street intersection uses the following forecasted distribution pattern for both AM and PM peak hours: 53 percent southbound and 38 percent northbound during the AM peak from Old Georgetown Road north of West Cedar Lane, 39 percent southbound and 38 percent northbound during the PM peak, 7 percent westbound and 9 percent eastbound during the both the AM and PM peak hours from West Cedar Lane.

For the retail developments, the ITE trip generation procedure for site impact analysis uses existing traffic flows along the roadway serving the site to determine which direction each trip headed when leaving or entering the site (turned left or right when entering).

For the office and residential trips, the LATR Appendix D provided the trip distribution percentages by Montgomery County superzones and from Virginia, the I-270 corridor, and Howard and Prince George’s counties. To account for the number of retail trips using the Interstate, the average of the LATR Appendix D office and residential distribution percentages were used. As a result, 60 percent of all retail trips were removed from Rockville Pike, north of Pooks Hill Road at the I-495 interchange.

The trip distribution for all background projects was developed separately and then combined to form the complete background development distribution. Figures 22A and 22B show the completed background development trip distribution.

3.2.1.4 Gate Improvements

There are five gates serving NSA Bethesda; planned improvements at two are expected to be completed by 2012. The gates, #3 and #4, are along Jones Bridge Road and provide access to different parts of the installation. The operational analysis for the No Build condition and all Build Alternatives would include these gate improvements. Appendix D3 shows the designs for Gates #3 and #4. Figure 19 shows the project locations. Gates #1, #2, and #5 have recently been upgraded to include increased accessibility for vehicles, bicycles, and pedestrians.

Gate #3: Jones Bridge Road and Gunnell Road (G):

The Gunnell Road approach would be expanded to have two lanes: one exclusive right turn and a shared through and left turning lane. The gate entrance would also be expanded by one lane to have two lanes entering the installation with a new guardhouse constructed, but narrowing back to one lane immediately following the first intersection serving the Navy Exchange (NEX) facility. The upgrades would include sidewalk improvements that will allow safer pedestrian access.

Gate #4: Jones Bridge Road and Grier Road (H):

The Grier Road approach to Jones Bridge Road would be expanded to have two lanes: one exclusive right turn and an exclusive left turning lane. The gate entrance would remain one lane inbound with a new guardhouse constructed. The upgrades would include sidewalk and bicycle lanes construction; these will allow safer access for pedestrian and bicyclists.

3.2.1.5 Internal Roadway Improvements

No internal roadway improvements are funded at this time; therefore, the operational analysis for the No Build condition and all Build Alternatives do not include any new internal roadway improvements.

Figure 22A: Background Development Trip Distribution

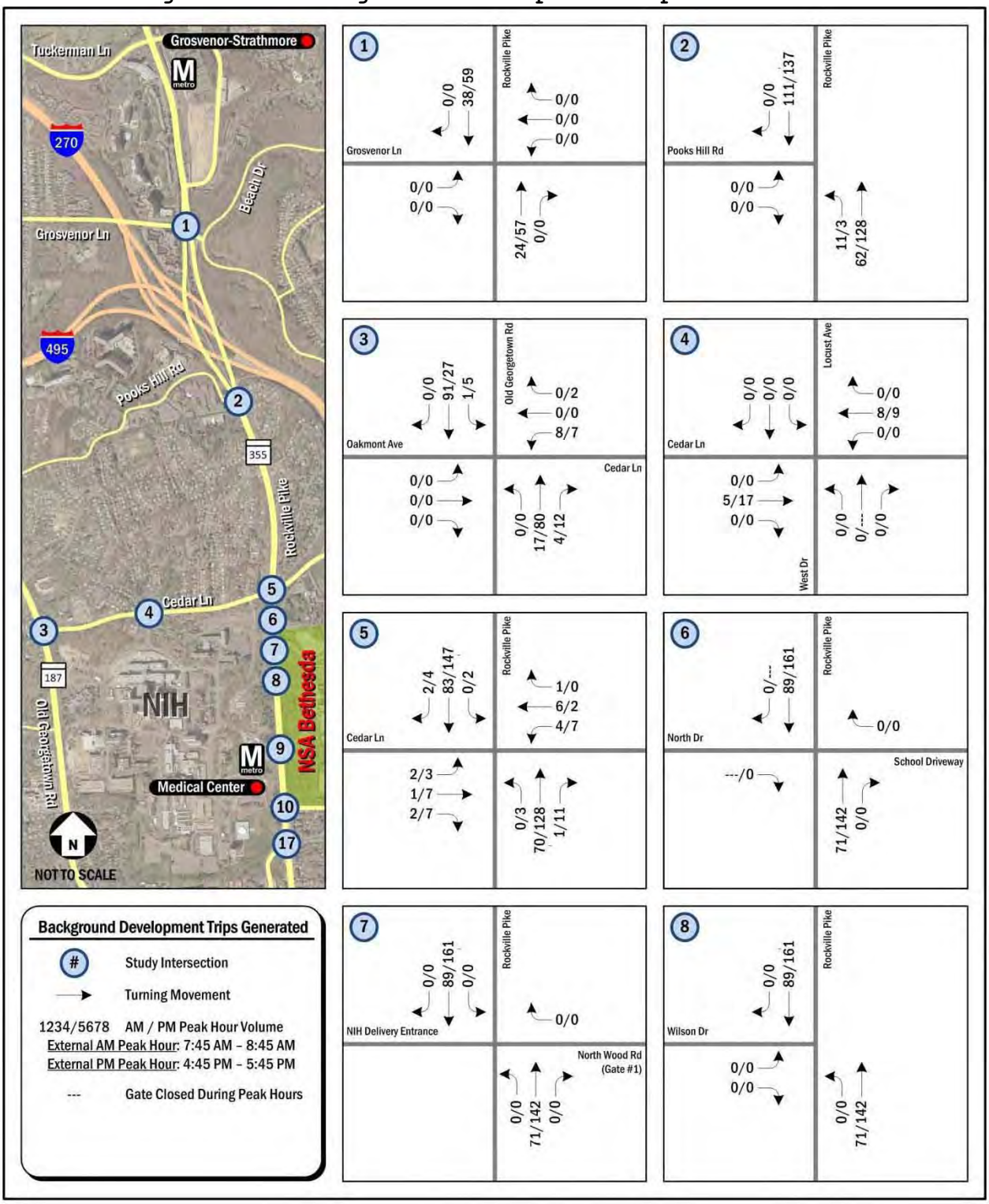
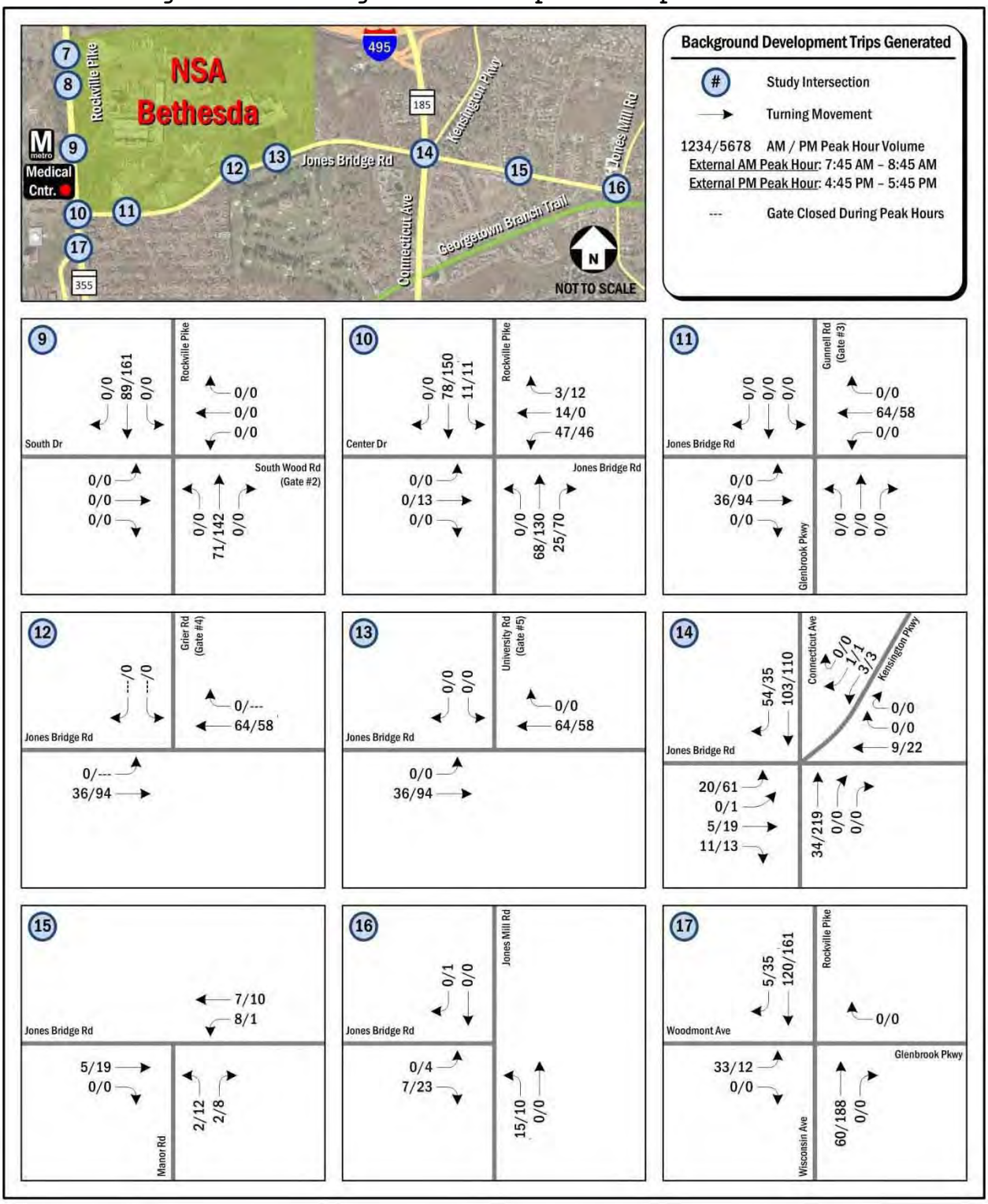


Figure 22B: Background Development Trip Distribution



3.2.1.6 Short-Term Planned Projects

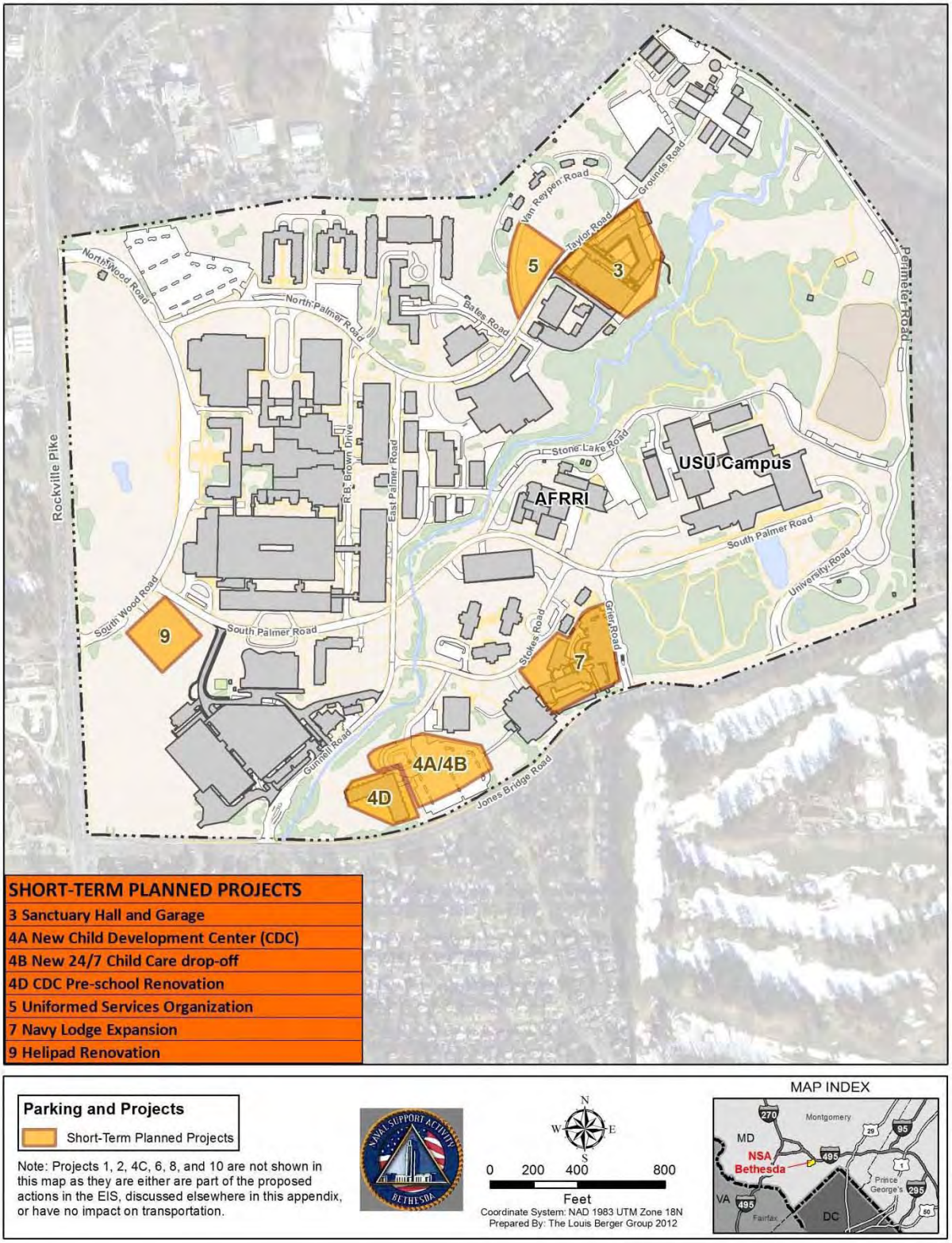
The 2012 NSA Bethesda Master Plan identified short-term planned projects within the installation with an expected completion by 2018. Each of these planned projects would generate new trips along the internal roadway system, the gates, and the external roadway. Table 15 contains the list of background developments, their locations, the number of new employees, and any other independent variables provided by NSA Bethesda that describes the facility expansion (number of units, square footage, or number of children). Figure 23 shows the planned project locations. Note that the NEX is not a planned project as it is currently under construction. However, the study lists the NEX on the planned project list to ensure the No Build condition includes the trips created by the commercial land use.

Table 15: Planned Projects

	Facility Name	Location	New Employees	Other Independent Variable
3	Sanctuary Hall (WWTL) and Parking Garage	Taylor Road, between the Fitness Center and warehouse area	14	200 beds
4	Child Development Center (CDC)	Adjacent to the existing CDC	63	326 children
5	United Service Organization (USO)	Across Taylor Road from new Sanctuary Hall	5	36,000 Square Feet
7	Navy Lodge	Along Grier Road between Gate #4 and South Palmer Road	10	64 Rooms
9	Helipad	Along South Wood Road between Gate #2 and South Palmer Road	0	N/A
	Medical Facility (Naval Dosimetry Center)	Along R.B. Brown Drive	6	N/A
	Navy Exchange	Along Gunnell Road between Gate #3 and Stokes Road	75	101,971 square feet (additional space)
	USU Growth	Along South Palmer Road	306	N/A
	Federal Credit Union		5	N/A

***Note: The master plan anticipates programmatic staff growth over the period of the Master Plan. While not indicated on Figure 23, it is noted on the table to include all the anticipated trip increases.**

Figure 23: Planned Project Locations



Trip Generation

Each planned development would generate trips in and out of NSA Bethesda; however, several factors will require some adjustment. First, the installation's parking is limited both by space constraints and by the NCPC parking ratio policy. Second, the proximity of the Medical Center Metro station provides high frequency transit service and is located across the street from Gate #2.

Current installation data was used for determining the trip generation for the Wounded Warrior Transition Lodge (WWTL), Navy Lodge Expansion, and NEX at NSA Bethesda. For the remaining planned projects, the ITE trip generation rates were used to determine the total unconstrained parking rates. Those rates were then reduced by 66 percent to reflect the one space for every three employees parking ratio required at NSA Bethesda. Table 16 shows each proposed background development with the ITE trip generation rates and directional distributions. Appendix D2 contains the detailed trip generation tables.

Table 16: Proposed Background Development Trip Generation Rates

	Facility Name	Independent Variable	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
3	Sanctuary Hall (WWTL)	200 beds	25	9	34	30	28	58
4	Child Development Center (CDC)	63 staff	164	145	309	142	160	302
5	United Service Organization (USO)	5 staff	0	0	0	1	3	4
7	Navy Lodge	64 rooms	15	9	24	20	18	38
9	Helipad	N/A	0	0	0	0	0	0
	Naval Dosimetry Center	6 Staff	1	1	2	1	1	2
	Navy Exchange	101,971 SF	0	0	0	34	34	68
	USU Growth	306 Staff	60	13	73	47	53	100
	Federal Credit Union	5 Staff	3	2	5	7	7	14

Based upon the trips generated, the planned development would produce 447 trips during the AM peak hour and 586 new trips during the PM peak hour.

The six employees from the medical facility (Naval Dosimetry Center) and 306 employees from the USU Growth projections are included in the No Build condition. They are expected to be in place by 2018 whether the Medical Facilities Development and the University Expansion are constructed or not.

3.2.1.7 Internal Installation Parking

Parking spaces at NSA Bethesda are located throughout the installation. There is a mixture of structured parking facilities (eight parking structures: four freestanding garages and four parking garages under buildings), parking lots, and parking available along the internal roadway network. Garages directly serve the medical facility, USU, and Building 17, with more planned to serve the Wounded Warrior complex, and NEX. There is a parking structure located near the center of the installation called the Multi Use Parking Structure (MUPS).

Each facility has spaces assigned to various groups of users. For example, a structured facility might have spaces reserved for ranking officers, rideshare use, American with Disabilities Act (ADA) compliant use, patients, government officials, visitors, residents, and staff. To ensure parking facilities best serve all installation missions, parking tags are assigned to staff and can only be used in specific facilities based upon the tag designation. There are four tag designations: medical facility, USU/Armed Forces Radiobiology Research Institute (AFRRI), barracks/lodging, and all others.

As part of its ongoing transportation management program, in September 2011, NSA Bethesda implemented a parking management program that controls the number of staff who can park at the installation based on the availability of staff parking spaces, including incentives for carpool usage. Employees receiving Federal transit subsidies are not allowed to receive hanging tags. Patients and visitors have dedicated parking available for their use.

There are currently a total of 7,686 spaces available at NSA Bethesda, composed of 3,525 staff spaces, 2,436 patient spaces, 1,120 visitor spaces (includes parking for retail), 457 barracks/lodge spaces, and 148 government vehicle spaces. Table 17 lists the existing parking facilities with space distribution and Figure 24 shows the existing parking facility locations.

By 2018, there would be two new parking structures added to NSA Bethesda, a new 495-space parking structure serving the retail needs of the Navy Exchange and a 470-space parking structure serving the WWTL, with approximately 326 spaces available for staff use. Two new parking lots would also be added to serve the Navy Exchange, the K-Lot and P-Lot, totaling 49 spaces. In addition, I-Lot would be reduced to 50 spaces, E-Lot would be reduced to 35 spaces, U-Lot would be increased to 95 spaces, and the lower 139-space lot in the Z-lot complex and Building 7 parking would be removed.

The resulting future 2018 NSA Bethesda parking facilities and their space distribution would differ from the existing conditions. There would be a total of 8,112 spaces, consisting of 3,584 staff spaces, 2,286 spaces for patients, 1,512 spaces for visitors, 601 spaces for barracks/lodges, and 129 government vehicle spaces. To provide ample parking for construction purposes, NSA Bethesda will be reassigning 100 staff spaces for government use resulting in 3,484 staff spaces and 229 government spaces. Table 18 shows the 2018 No Build condition parking facilities and space distribution. Figure 25 shows the 2018 No Build condition parking facility locations.

Table 17: Existing Parking facilities with Space Distribution

Surface Parking	Staff	Patient	Visitor/ Retail	Barracks/ Lodging	Gov't	Capacity
A-LOT	0	0	8			**8**
C-LOT	23					**23**
D-LOT	75	0				**75**
E-LOT	272	0				**272**
G-LOT	394	0			15	**409**
H-LOT	49	54	54	6	1	**164**
I-LOT	0	150	124		2	**276**
J-LOT	36		12			**48**
L-LOT				20		**20**
M-LOT			12			**12**
N-LOT	62	0	0			**62**
O-LOT		15				**15**
Q-LOT	0	0		80		**80**
S-LOT					2	**2**
T-LOT			23			**23**
U-LOT	0	0	57			**57**
X-LOT	19	0	20			**39**
Y-LOT	0	0	0	0	25	**25**
Z-LOT	60	0	144		28	**232**
Daycare	0	0	22		2	**24**
NSAB Ball Field	0	0	60		0	**60**
Structured Parking	**Staff**	**Patient**	**Visitor/ Retail**	**Barracks/ Lodging**	**Gov't**	**Capacity**
Building 17	99	95	114	236	6	**550**
Building 32	82	626	470		24	**1,202**
Building 54	749	0				**749**
Building 55	392	533			28	**953**
Building 60	0	0		51		**51**
Building 61	0	0		64		**64**
Building 63	0	924				**924**
Building 71	1,117	32			2	**1,151**
Facilities Mgmt. Trans.	0	0			13	**13**
On-Street Parking						
R.B. Brown Drive	7	0				**7**
North Palmer Road	11	7				**18**
East Palmer Road	4	0				**4**
Stone Lake Road	74	0	0			**74**
Entire Campus	**3,525**	**2,436**	**1,120**	**457**	**148**	**7,686**

Figure 24: Existing Parking Facility Locations

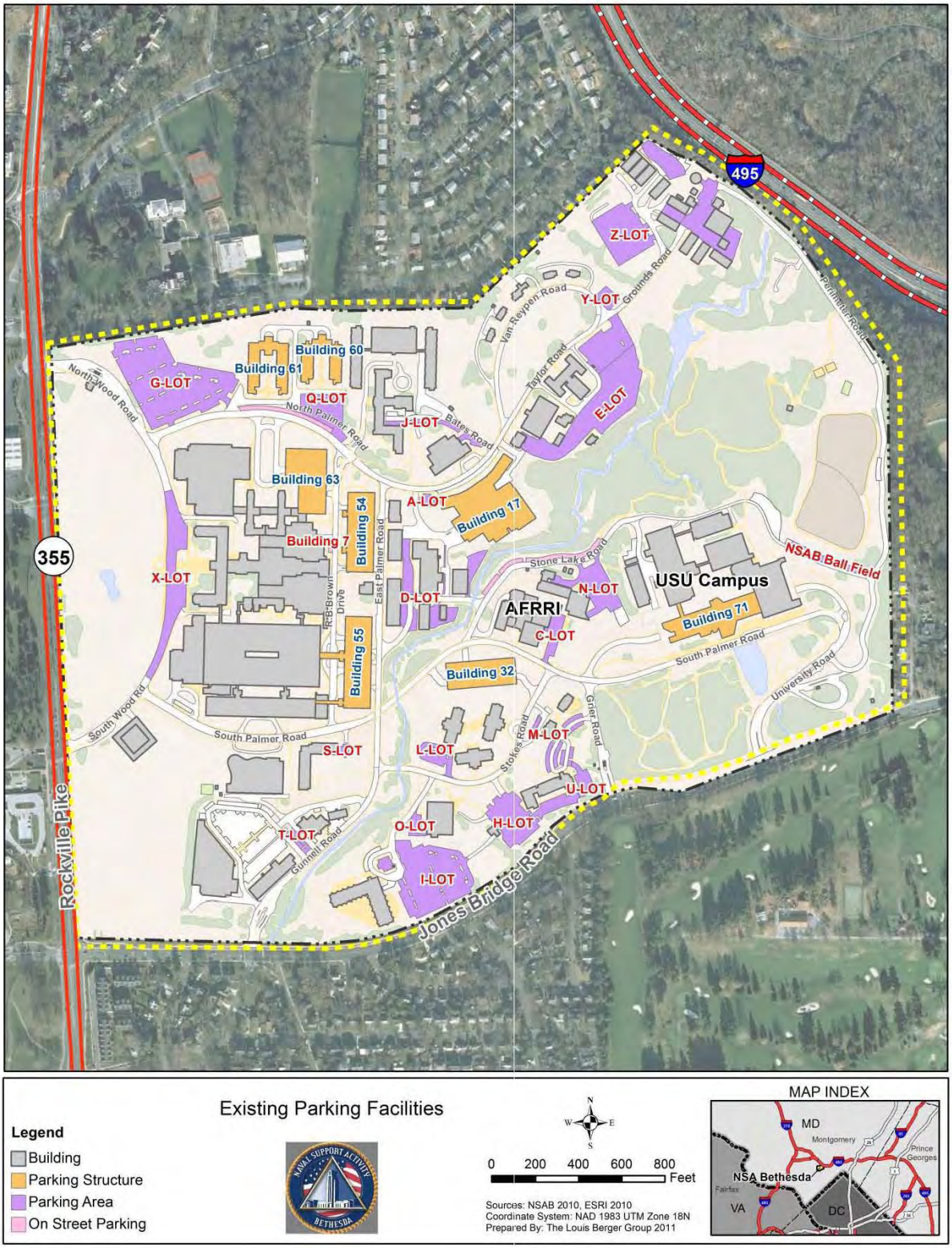
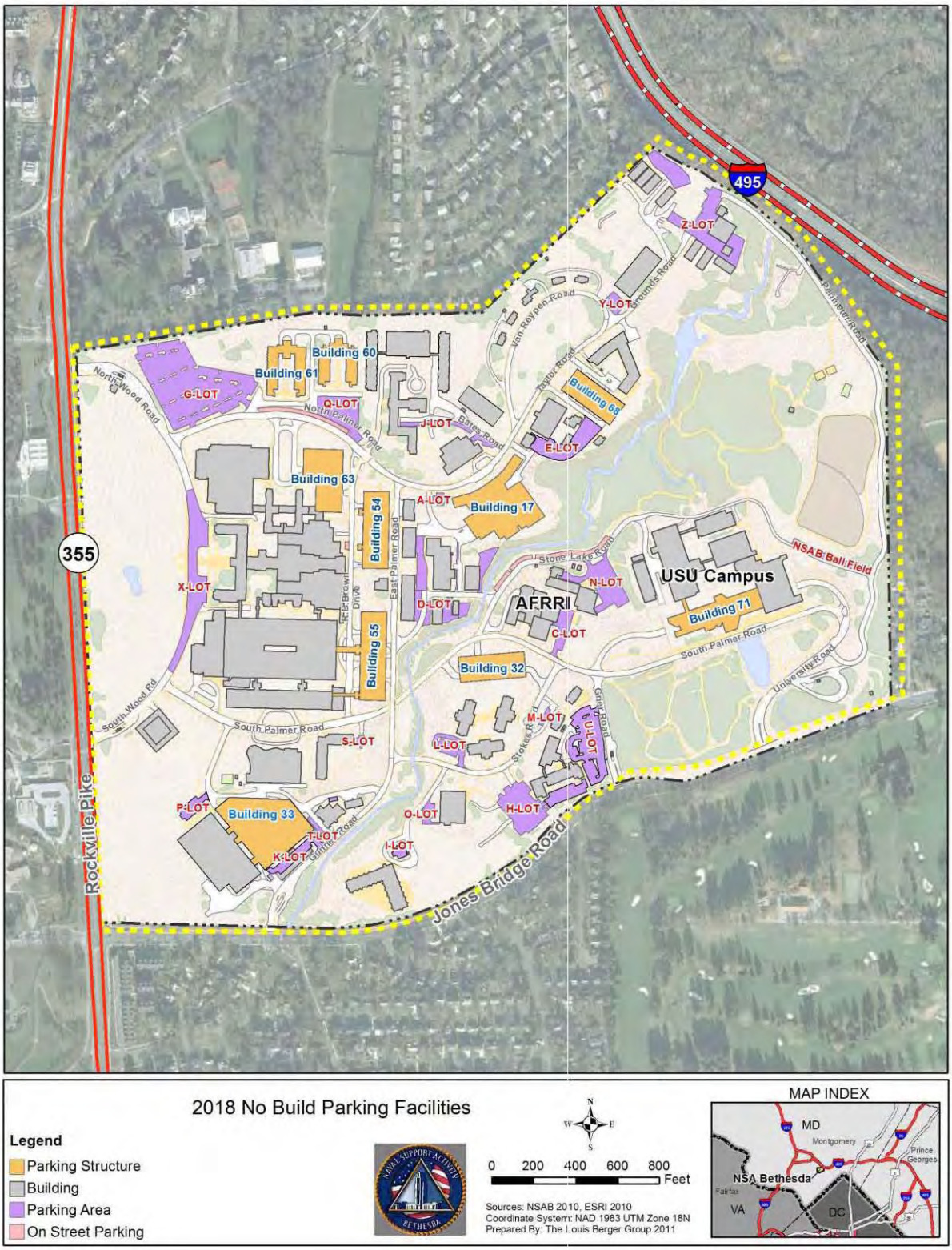


Table 18: 2018 No Build Condition Parking facilities with Space Distribution

Surface Parking	Staff	Patient	Visitor/ Retail	Barracks/ Lodging	Gov't	Capacity
A-LOT	0	0	8			**8**
C-LOT	23					**23**
D-LOT	75	0				**75**
E-LOT	35					**35**
G-LOT	394	0			15	**409**
H-LOT	49	54	54	6	1	**164**
I-LOT			48		2	**50**
J-LOT	36		12			**48**
K-LOT (NEW)			25			**25**
L-LOT				20		**20**
M-LOT			12			**12**
N-LOT	62	0				**62**
O-LOT		15				**15**
P-LOT (NEW)	0	0	24			**24**
Q-LOT	0	0		80		**80**
S-LOT					2	**2**
T-LOT			23			**23**
U-LOT	6		89			**95**
X-LOT	19		20			**39**
Y-LOT					25	**25**
Z-LOT	24		58		11	**93**
NSAB Ball Field	0	0	60		0	**60**
Structured Parking	**Staff**	**Patient**	**Visitor/ Retail**	**Barracks/ Lodging**	**Gov't**	**Capacity**
Building 17	99	95	114	236	6	**550**
Building 32	82	626	470		24	**1,202**
Building 33 (NEW)	0		495			**495**
Building 54	749	0				**749**
Building 55	392	533			28	**953**
Building 60	0	0		51		**51**
Building 61	0	0		64		**64**
Building 63	0	924				**924**
Building 68 (NEW)	326			144		**470**
Building 71	1,117	32			2	**1,151**
Facilities Mgmt. Trans.	0	0			13	**13**
On-Street Parking						
R. B. Brown Drive	7	0				**7**
North Palmer Road	11	7				**18**
East Palmer Road	4	0				**4**
Stone Lake Road	74	0	0			**74**
Entire Campus	**3,584**	**2,286**	**1,512**	**601**	**129**	**8,112**
Construction Reassignment	**-100**				**+100**	
Entire Campus	**3,484**	**2,286**	**1,512**	**601**	**229**	**8,112**

Figure 25: 2018 No Build Condition Parking Facility Locations



NSA Bethesda has 11,686 existing staff with 12,611 staff projected by 2018, an increase in 925 staff. Based on the comparison between the existing and No Build condition parking space inventory, there will be a net loss of 41 staff parking spaces at NSA Bethesda. There would be no parking spaces to accommodate the 655 new staff added through the planned projects. For consistency with ongoing NSA Bethesda studies, current installation data were included in the No Build condition. It is assumed that all other new staff added through the planned projects would access the installation by means other than SOVs if parking is not available. Table 19 contains the final No Build condition trip generation.

Table 19: Final No Build Condition Trip Generation

	Facility Name	Independent variable	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
1	Sanctuary Hall (WWTL)	200 beds	25	9	34	30	28	58
7	Navy Exchange	33,029 SF	0	0	0	34	34	68
8	Navy Lodge Expansion	64 Rooms	**15**	**9**	**24**	**20**	**18**	**38**

Trip Distribution

The trip distribution for the planned projects follows the same distribution percentages established in the 2008 NNMC Transportation Study in support of the BRAC EIS completed in March 2008, with one exception. The percentage of trips destined to/from West Cedar Lane was revised from 30 to 4 percent, to reflect the existing condition turning movement counts taken at Rockville Pike at West Cedar Lane. This resulted in Rockville Pike being revised from 10 to 36 percent.

Each planned project trip was assigned the shortest path through the internal NSA Bethesda roadway network between the appropriate entrance/exit gate and the parking facility expected to handle the trip, based on the updated employee distribution percentages. Once outside NSA Bethesda, trips followed the external network, following the appropriate distribution percentage through the network. The destination parking facility was based on the new or expanded facility directly serving Sanctuary Hall (WWTL) (Building 68), Navy Lodge (U-LOT), or NEX (Building 33). Figure 26 shows the updated distribution percentages based on the 2008 NNMC Transportation study and Figures 27A, 27B, and 27C show the planned project trip distribution.

In addition to the trip distribution for the planned projects, most of I-Lot and the 139-space lot in the Z-Lot complex will be closed by 2018. The closing of these lots will shift current users to other facilities within NSA Bethesda. Because the re-assignment of these spaces will be determined by NSA Bethesda and spaces potentially could be spread across multiple lots, this study did not model these movements.

Figure 26: Updated NSA Bethesda Distribution Percentages Based upon 2008 NNMC Transportation Study

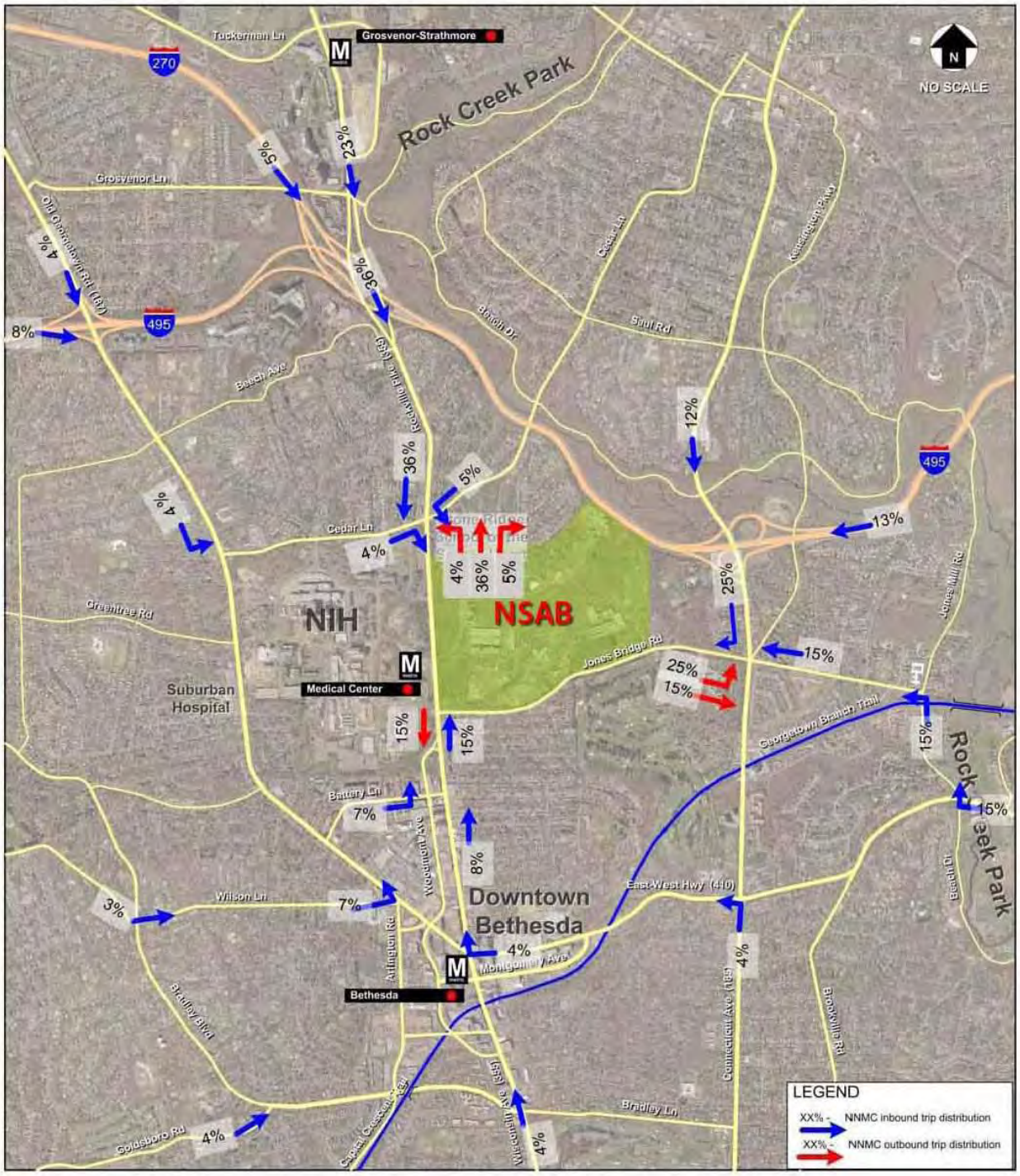


Figure 27A: Planned Project Trip Distribution

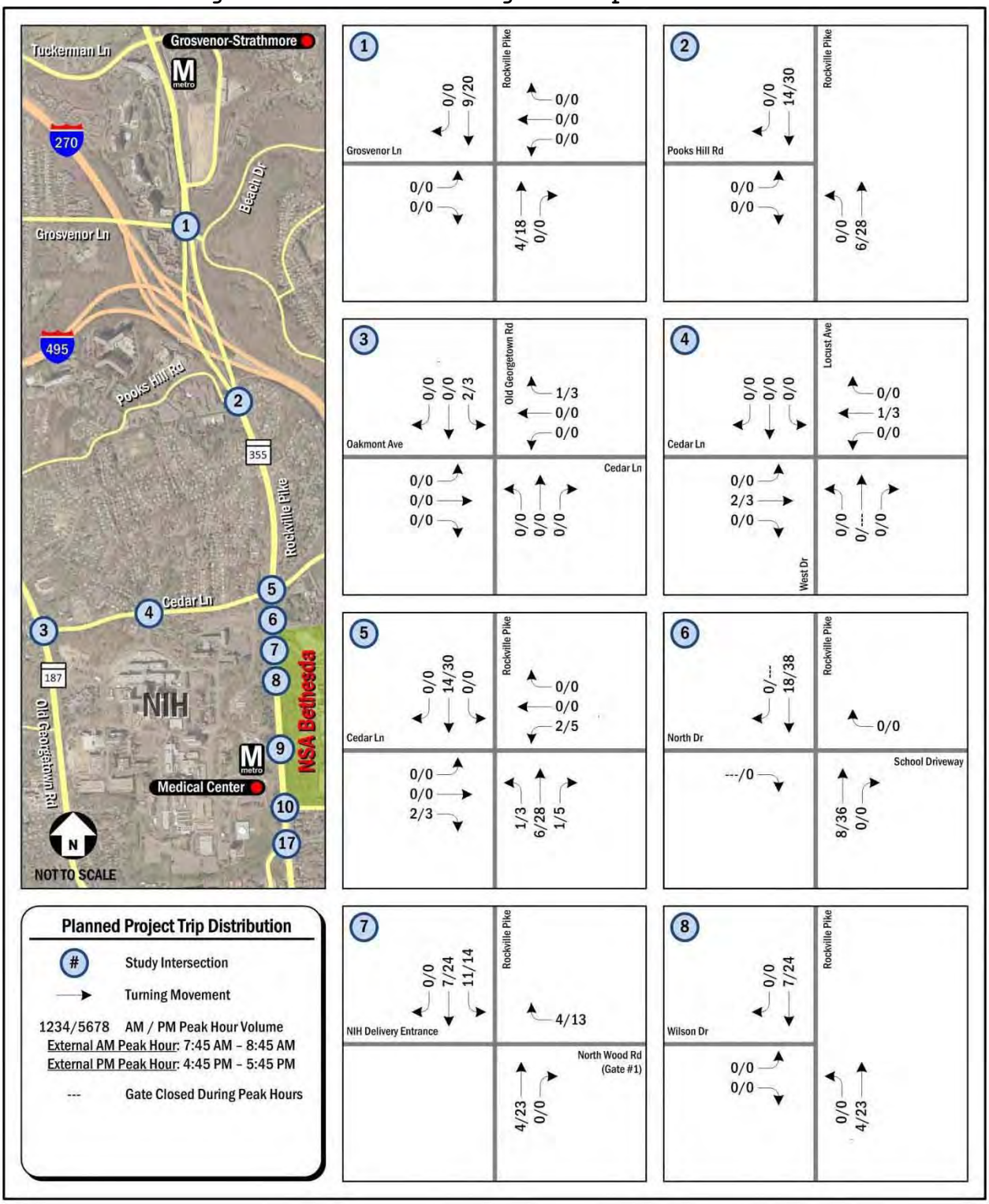


Figure 27B: Planned Project Trip Distribution

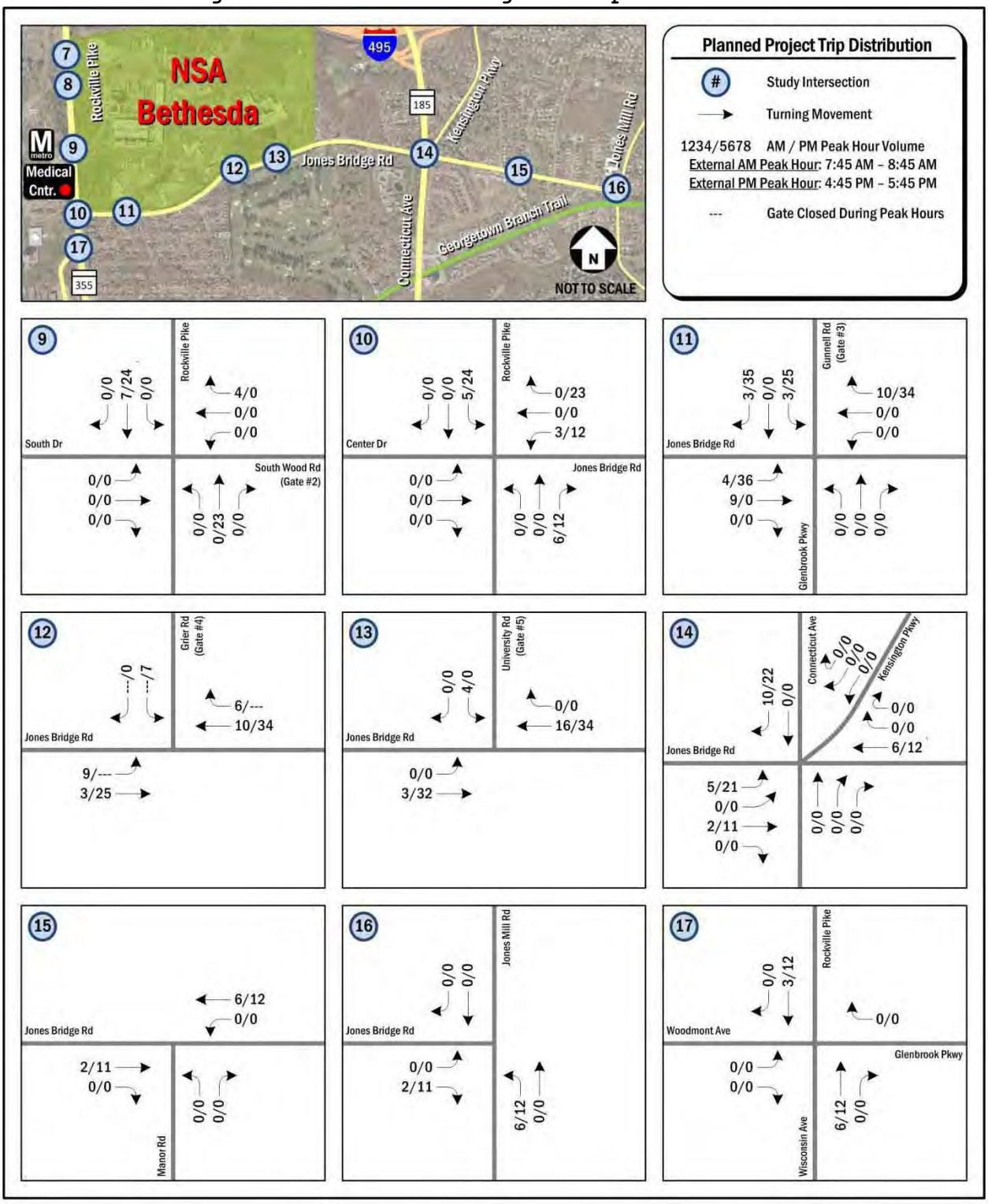
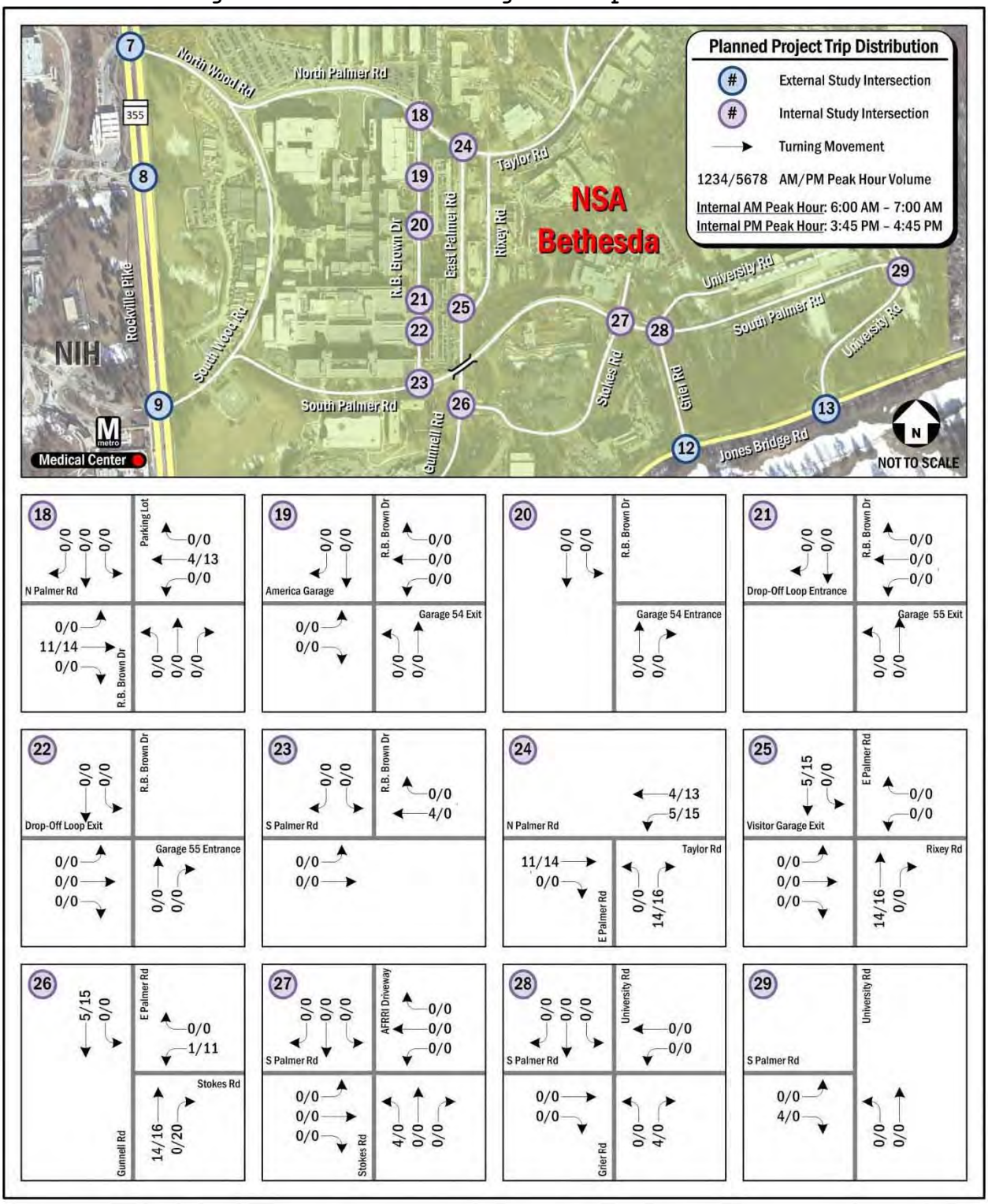


Figure 27C: Planned Project Trip Distribution



3.2.1.8 2018 No Build Condition Trip Distribution

The 2018 No Build condition trip distribution consists of the background (external) and planned (internal) development trips added to the 2011 existing condition turning movement volumes. This combined distribution provides the data required to conduct the No Build condition operational analysis. Figures 28A, 28B, and 28C contain the 2018 No Build condition projected turning movement counts.

3.2.2 *The 2018 No Build Condition Alternative Operational Analysis*

The operational analysis for the 2018 No Build condition provides a base condition, which will be compared to each Build Alternative. The analysis consists of an external intersection, external arterial, and internal intersection analysis based on the traffic flows developed in the trip distribution section.

Following the same procedure used for the existing conditions operational analysis, the traffic study used the CLV procedure to determine the intersection CLV LOS for all external signalized intersections. As a secondary means of analyzing the external intersections, the traffic study used the HCM, which provides the vehicle delay and vehicle density. Based on the vehicle delay, the HCM LOS is calculated. As the CLV method is not the most accurate analysis method when applied to unsignalized intersections, the traffic study used the HCM as a primary means of analyzing intersections for all external unsignalized intersections and all internal intersections, which are all unsignalized.

3.2.2.1 External Intersection Analysis

Following the same process as the existing conditions analysis for the external intersections, the 17 external intersections, including nine along Rockville Pike, six along Jones Bridge Road, and two along West Cedar Lane were analyzed.

The 2018 No Build condition includes all projects listed in the external roadway improvements (including the gate improvements) and the transit improvement, representing the future network. Figures 29A, 29B, and 29C show the 2018 No Build condition lane geometry and traffic control.

Figure 28A: 2018 No Build Condition Projected Turning Movement Counts

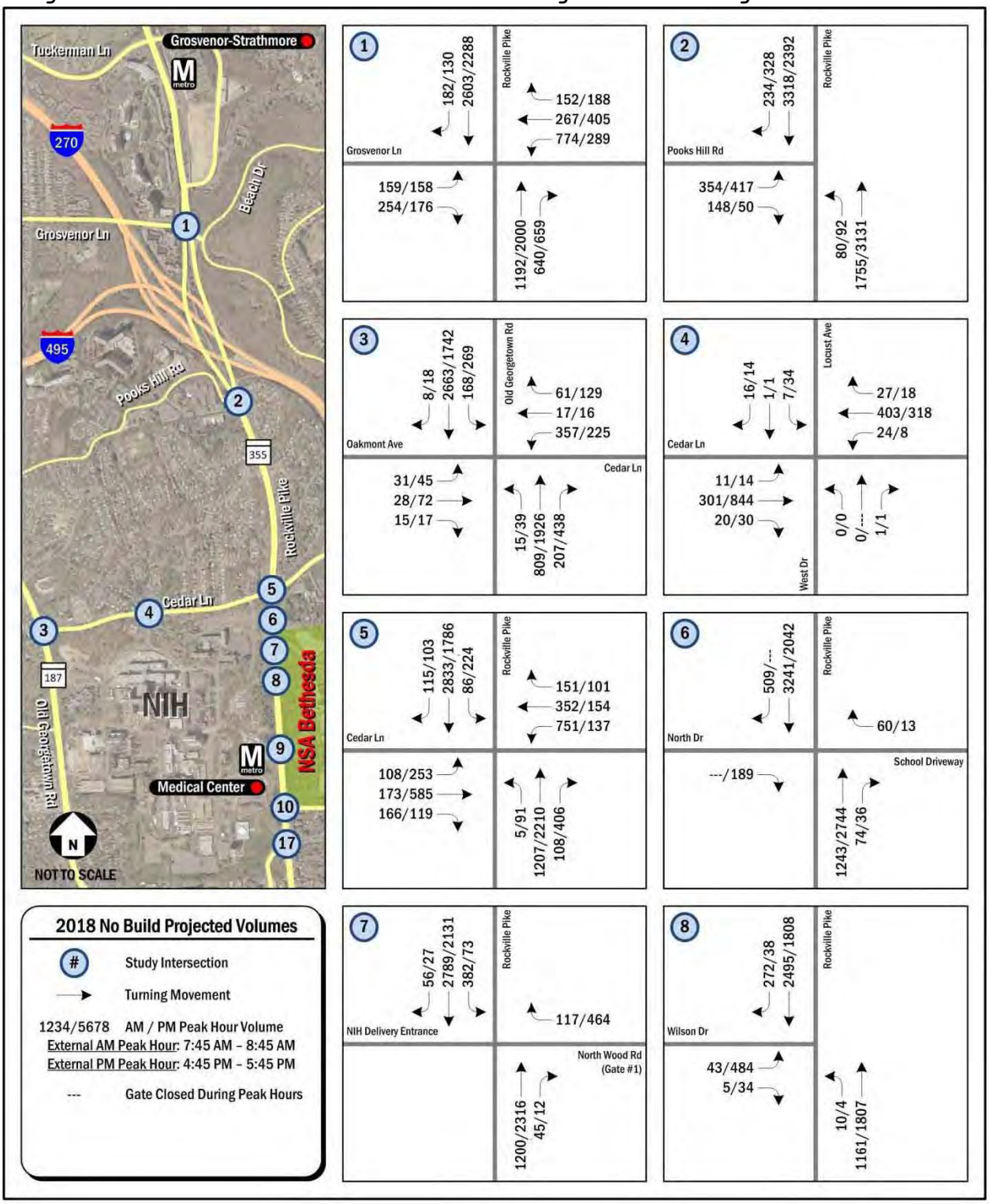


Figure 28B: 2018 No Build Condition Projected Turning Movement Counts

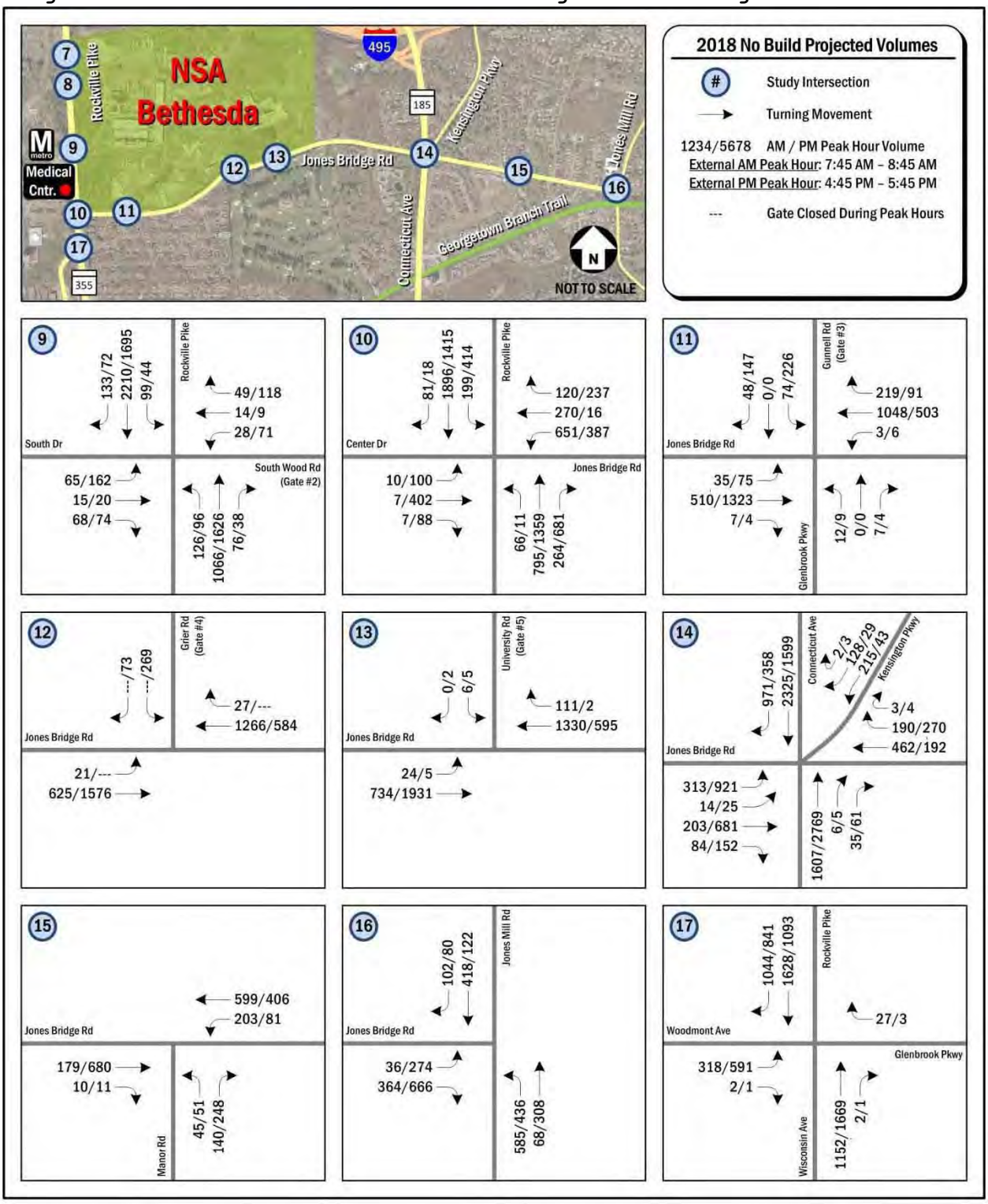


Figure 28C: 2018 No Build Condition Projected Turning Movement Counts

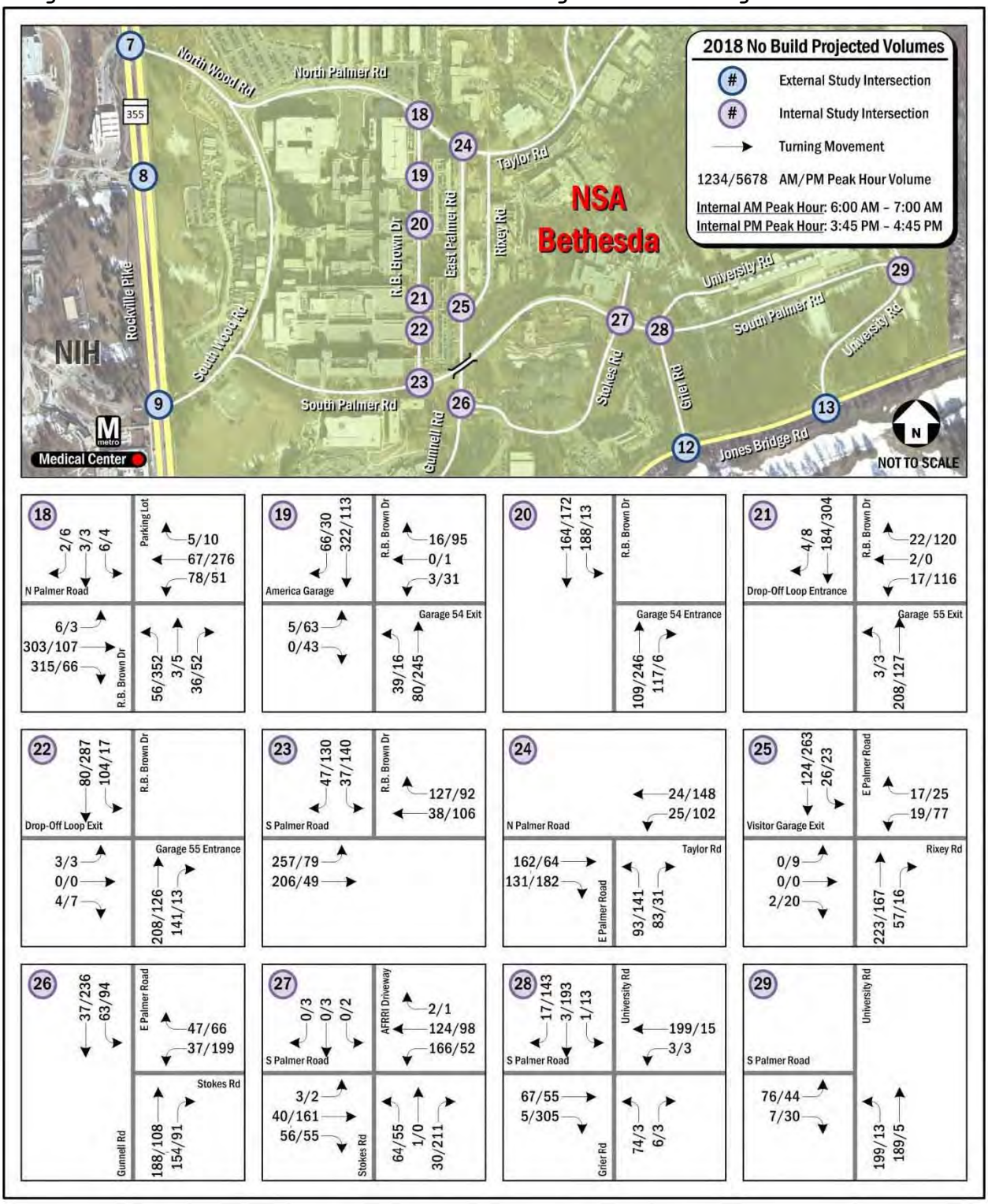


Figure 29A: 2018 No Build Condition Lane Geometry and Traffic Control

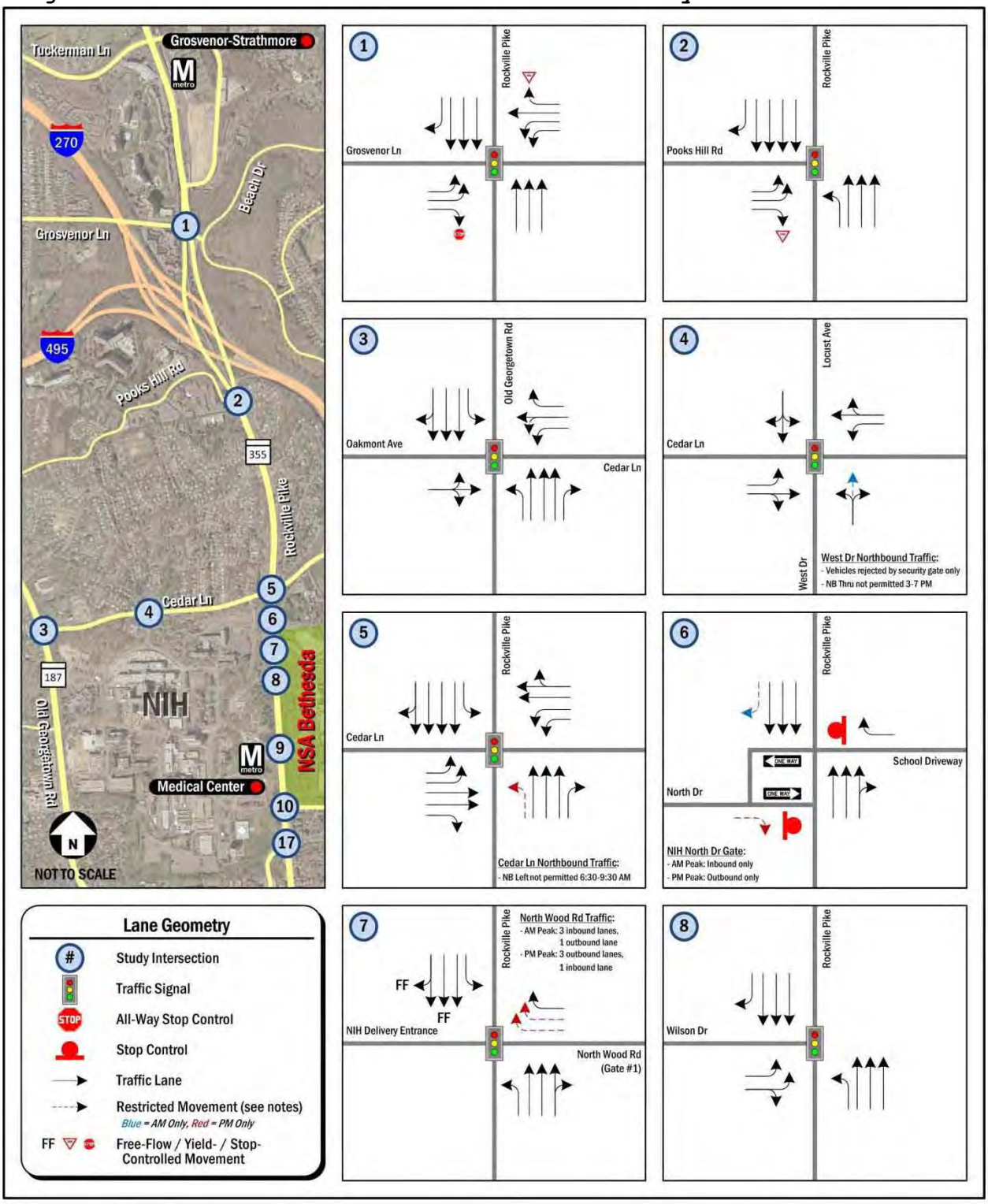


Figure 29B: 2018 No Build Condition Lane Geometry and Traffic Control

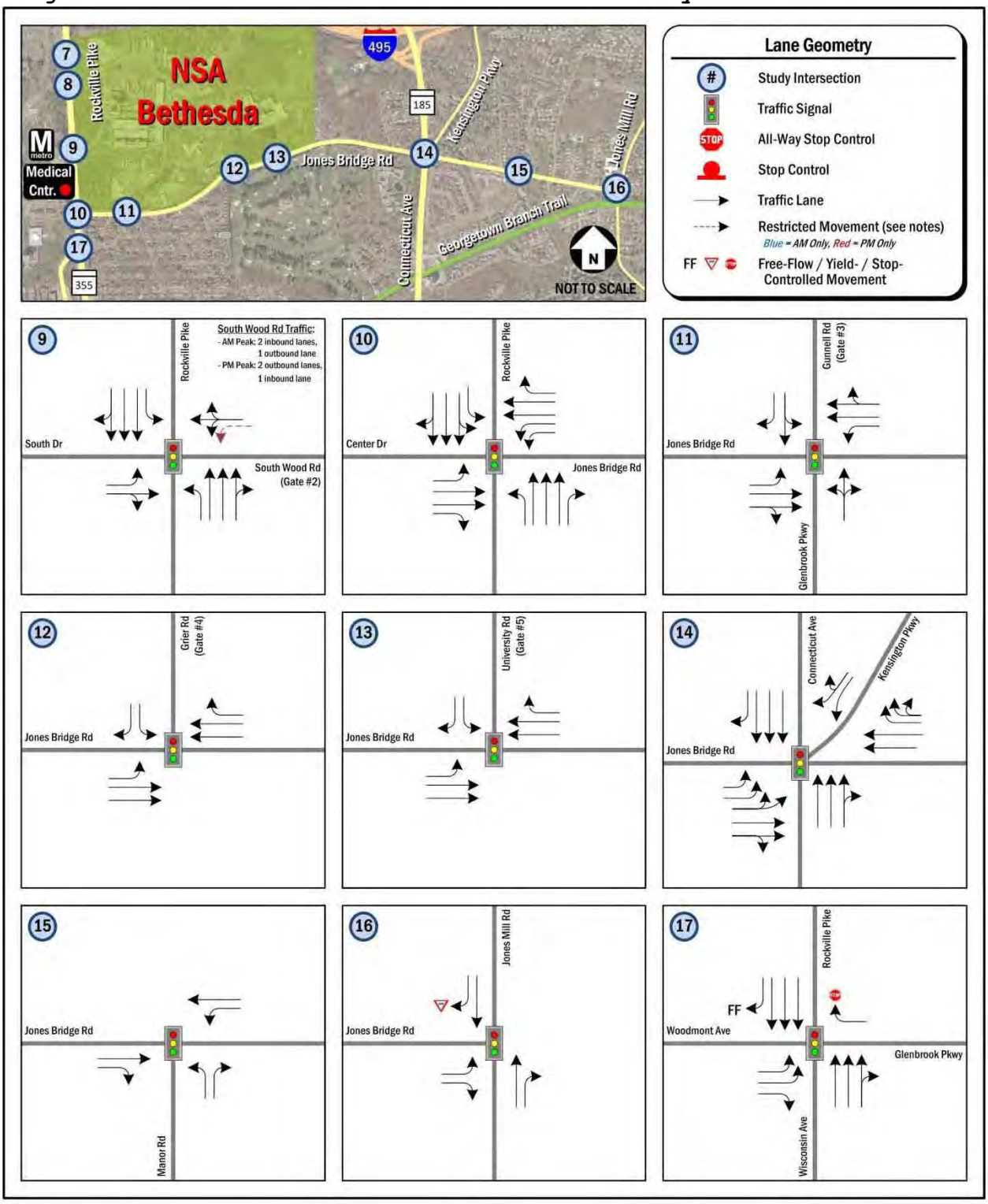
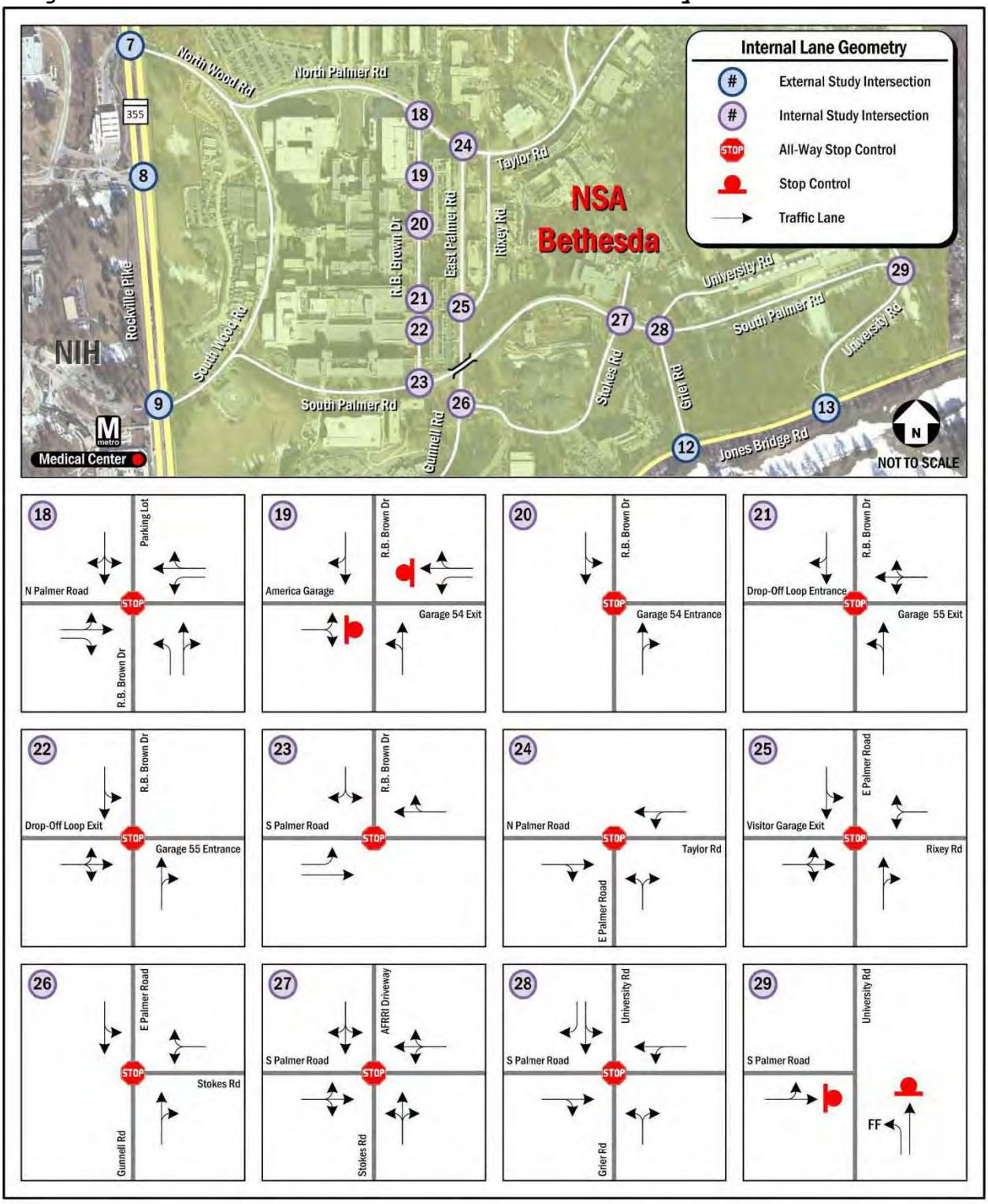


Figure 29C: 2018 No Build Condition Lane Geometry and Traffic Control



Critical Lane Volume Analysis

As required by M-NCPPC's LATR and MSHA, the CLV analysis was conducted for the No Build condition, which is based on calculating the total conflicting traffic volume to determine the CLV LOS (letter grade A through F). The analysis identified two intersections that would operate at a LOS of E or F, failing grades. Specifically, during the AM peak hour, #5 Rockville Pike at West Cedar Lane and #14 Connecticut Avenue at Jones Bridge Road would both operate at a LOS of E. During the PM peak hour, #3 Old Georgetown Road at West Cedar Lane would operate at a LOS of E and #14 Connecticut Avenue at Jones Bridge Road would operate at a LOS of F. The remaining intersections would operate at a LOS of D or better for the 2018 No Build condition. Table 20 shows the 2018 No Build condition CLV analysis for the external intersection. Figures 30A and 30B show the 2018 No Build condition CLV intersection LOS.

Table 20: 2018 No Build Condition CLV Analysis for the External Intersections

		CLV Analysis			
		AM Peak Hour		*PM Peak Hour*	
		CLV	LOS	CLV	LOS
1.	Rockville Pike & Grosvenor Lane	**1,373**	**D**	**1,336**	**D**
2.	Rockville Pike & Pooks Hill Road	**1,343**	**D**	**1,379**	**D**
3.	Old Georgetown Road & Oakmont Avenue/Cedar Lane	**1,437**	**D**	**1,536**	**E**
4.	Locust Avenue/West Drive & Cedar Lane	**489**	**A**	**939**	**A**
5.	Rockville Pike & Cedar Lane	**1,529**	**E**	**1,236**	**C**
6.	Rockville Pike & North Drive/School Driveway	*un-signalized*		*un-signalized*	
7.	Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	**843**	**A**	**1,033**	**B**
8.	Rockville Pike & Wilson Drive	**958**	**A**	**948**	**A**
9.	Rockville Pike & South Drive/South Wood Road (Gate #2)	**1,121**	**B**	**1,039**	**B**
10.	Rockville Pike & Center Drive/Jones Bridge Road	**715**	**A**	**808**	**A**
11.	Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road	**801**	**A**	**1,024**	**B**
12.	Grier Road (Gate #4) & Jones Bridge Road	**692**	**A**	**1,104**	**B**
13.	University Road (Gate #5) & Jones Bridge Road	729	A	1,023	B
14.	Connecticut Avenue & Jones Bridge Road & Kensington Parkway	**1,490**	**E**	**1,735**	**F**
15.	Manor Road & Jones Bridge Road	**739**	**A**	**1,009**	**B**
16.	Jones Bridge Road & Jones Mill Road	**1,039**	**B**	**1,062**	**B**
17.	Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	**771**	**A**	**938**	**A**

Figure 30A: 2018 AM Peak Hour No Build Condition CLV Intersection LOS

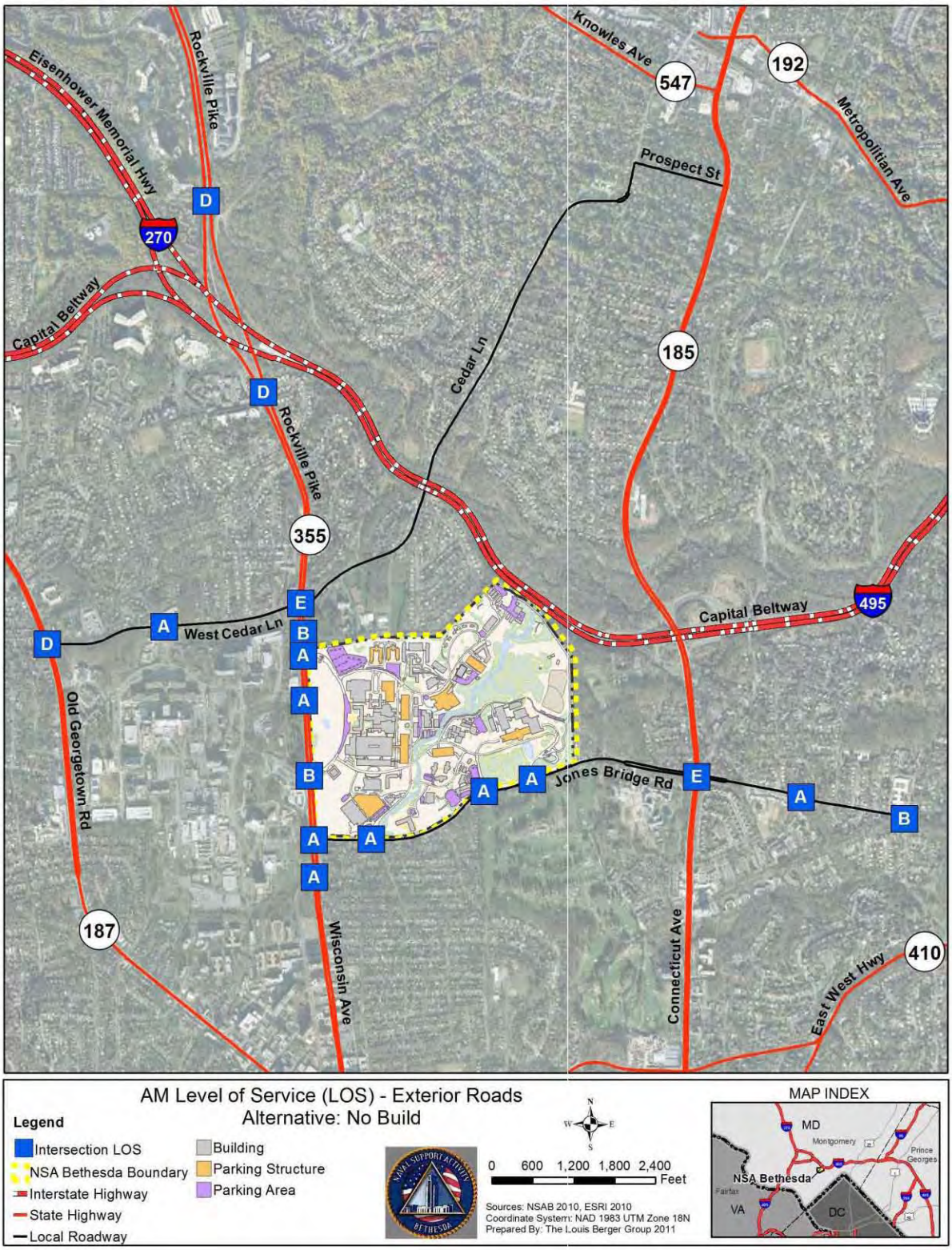
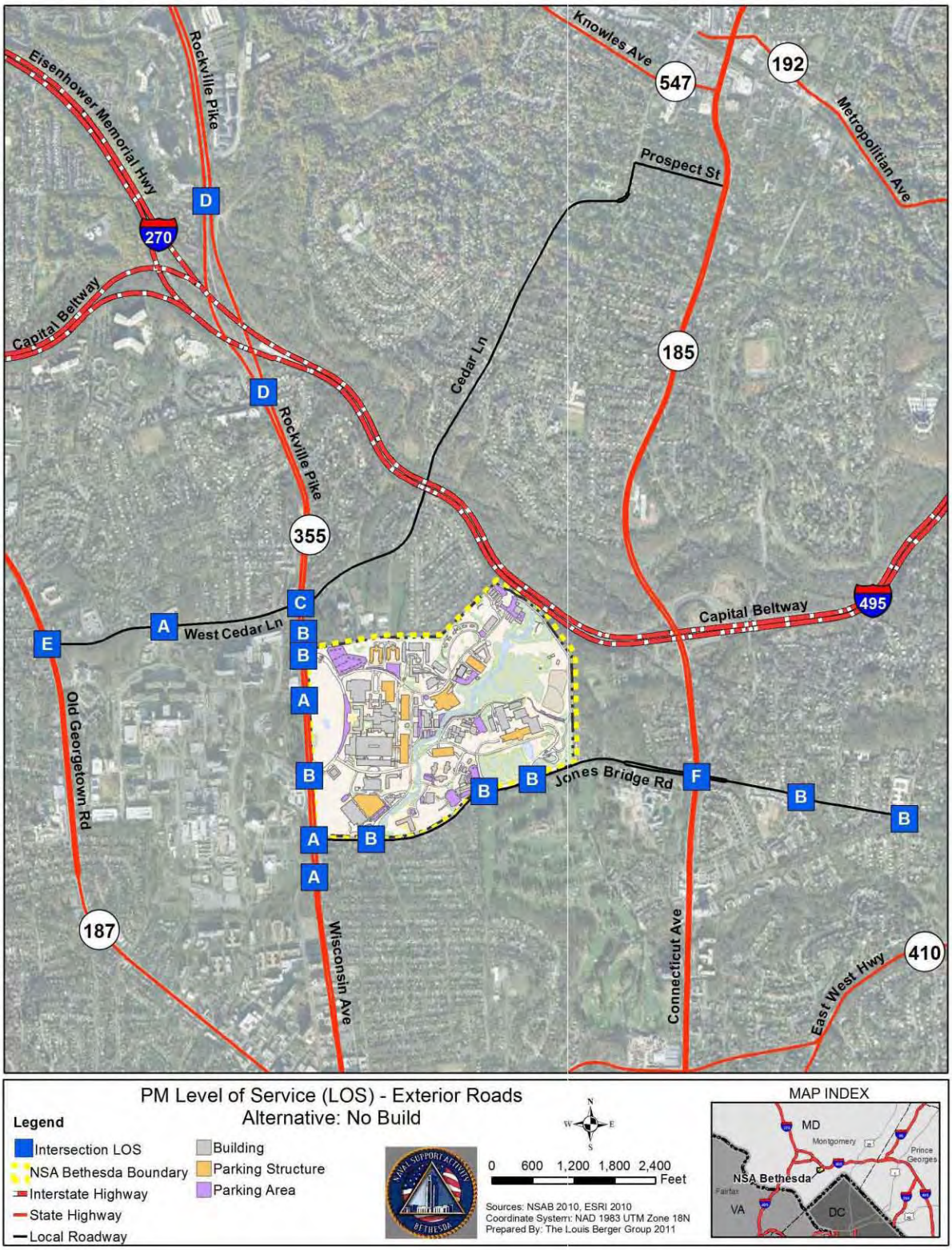


Figure 30B: 2018 PM Peak Hour No Build Condition CLV Intersection LOS



Highway Capacity Manual Intersection Analysis

The HCM was used to provide a secondary analysis using the Synchro Traffic Analysis software to determine the intersection operation. For each intersection movement and entire approach, the delay was calculated using vehicles per second and vehicle density was calculated using the volume to capacity. Also calculated was the HCM LOS for each movement, the entire approach, and overall intersection.

The delay would provide the number of seconds for each vehicle to travel through each study intersection. The density would provide a measure of the ratio between the number of vehicles per hour and the capacity; while, the LOS provides an overall operational rating (A through F) for each approach and intersection, based on vehicle delay.

Based on the HCM analysis, the #2 intersection of Rockville Pike at Pooks Hill Road would operate with a LOS of F during the AM peak hour. During the PM peak hour, #1 intersection of Rockville Pike at Grosvenor Lane, #10 Rockville Pike at Jones Bridge Road, and #14 Connecticut Avenue at Jones Bridge Road would all operate with a LOS of E. All other intersections would operate with a LOS of D or better during both peak periods. Table 21 shows the 2018 No Build condition HCM analysis for the external intersections.

Arterial Analysis

As required by M-NCPPC's Policy Area Mobility Review (PAMR), the No Build condition and Build Alternatives must be compared using arterial analysis to determine if the Build Alternative's travel time is 30 percent greater than the No Build condition travel time for the main travel corridors. To satisfy this requirement, the traffic study conducted an arterial analysis along the three main corridors covered in the study area: Rockville Pike, Jones Bridge Road, and West Cedar Lane. The study calculated the arterial speed, travel times, and LOS following the HCM arterial analysis process. The arterial LOS is a grade from A through F, based upon the total travel time between Grosvenor Lane and Woodmont Avenue along Rockville Pike, between Rockville Pike and Jones Mill Road along Jones Bridge Road, and between Old Georgetown Road and Rockville Pike along West Cedar Lane.

The travel times were longer and speeds slower when traveling in the northbound direction during the AM peak hour along Rockville Pike, reflecting the signals timed to keep the southbound traffic moving. Jones Bridge Road travel times and speeds would be faster during the AM peak hour, while West Cedar Lane would have slower speeds and longer travel times in the eastbound direction during the PM peak hour. Tables 22 and 23 show the 2018 No Build condition AM and PM peak hour arterial analyses.

Table 21: 2018 No Build Condition HCM Analysis for the External Intersections

	HCM Analysis						
		AM Peak Hour			*PM Peak Hour*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	45.6	1.02	D	58.9	1.01	E
	Eastbound	69.8		E	48.4		D
	Westbound	70.3		E	88.7		F
	Northbound	15.4		B	30.3		C
	Southbound	43.2		D	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	219.9	1.63	F	33.1	0.99	C
	Eastbound	83.4		F	65.4		E
	Northbound	335.9		F	35.7		D
	Southbound	21.3		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.1	0.83	B
	Eastbound	23.9		C	31.9		C
	Westbound	37.4		D	37.3		D
	Northbound	14.1		B	20.2		C
	Southbound	18.5		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.2	0.39	B	30.2	0.73	C
	Eastbound	19.6		B	39.5		D
	Westbound	11.8		B	7.5		A
	Northbound	14.7		B	24.8		C
	Southbound	15.1		B	26.7		C
5. Rockville Pike & Cedar Lane	Overall	41.8	0.98	D	36.4	0.97	D
	Eastbound	82.1		F	57.4		E
	Westbound	61.1		E	63.5		E
	Northbound	14.4		B	26.5		C
	Southbound	39.3		D	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.7		B	11.0		B
	Westbound	9.8		A	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	7.8	0.62	A	8.6	0.70	A
	Westbound	21.2		C	39.9		D
	Northbound	18.3		B	9.9		A
	Southbound	3.2		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	2.1	0.59	A	12.3	0.63	B
	Eastbound	60.9		E	44.6		D
	Northbound	1.9		A	4.8		A
	Southbound	0.8		A	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	12.7	0.76	B	18.7	0.72	B
	Eastbound	63.5		E	52.8		D
	Westbound	52.1		D	35.8		D
	Northbound	13.2		B	13.5		B
	Southbound	6.6		A	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	32.3	0.84	C	59.9	0.94	E
	Eastbound	54.3		D	58.2		E
	Westbound	97.3		F	42.8		D
	Northbound	18.0		B	78.3		E
	Southbound	6.9		A	45.4		D

Table 21: 2018 No Build Condition HCM Analysis for the External Intersections (continued)

		HCM Analysis						
			AM Peak Hour			*PM Peak Hour*		
		Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11.	**Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road**	**Overall**	12.3	0.63	B	14.0	0.75	B
		Eastbound	3.3		A	11.2		B
		Westbound	14.7		B	12.9		B
		Northbound	22.0		C	13.8		B
		Southbound	24.5		C	23.9		C
12.	**Grier Road (Gate #4) & Jones Bridge Road**	**Overall**	3.8	0.51	A	13.6	0.79	B
		Eastbound	2.1		A	12.1		B
		Westbound	4.7		A	5.2		A
		Southbound	0.0		A	32.7		C
13.	**University Road (Gate #5) & Jones Bridge Road**	Overall	6.4	0.51	A	10.7	0.67	B
		Eastbound	4.5		A	11.2		B
		Westbound	7.1		A	9.3		A
		Southbound	24.6		C	21.0		C
14.	**Connecticut Avenue & Jones Bridge Road & Kensington Parkway**	**Overall**	49.4	1.01	D	68.7	1.10	E
		Eastbound	55.7		E	92.8		F
		Westbound	42.2		D	119.7		F
		Northbound	24.0		C	76.1		E
		Southbound	58.9		E	18.9		B
		Southwestbound	82.6		F	126.1		F
15.	**Manor Road & Jones Bridge Road**	**Overall**	15.1	0.56	B	19.7	0.71	B
		Eastbound	18.0		B	28.9		C
		Westbound	15.3		B	3.7		A
		Northbound	10.8		B	21.9		C
16.	**Jones Bridge Road & Jones Mill Road**	**Overall**	42.3	0.76	D	23.5	0.71	C
		Eastbound	30.2		C	13.0		B
		Northbound	46.8		D	38.5		D
		Southbound	46.5		D	20.0		C
17.	**Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway**	**Overall**	19.5	0.71	B	12.6	0.69	B
		Eastbound	48.7		D	12.8		B
		Westbound	41.2		D	9.2		A
		Northbound	5.4		A	18.1		B
		Southbound	3.3		C	7.8		A

Note: Intersections with only two-way stops have no Overall LOS identified.

Table 22: 2018 No Build Condition AM Peak Hour Arterial Analysis

AM Peak Hour				
Arterial	**Direction**	**Speed**	**Time**	**LOS**
Rockville Pike	Northbound	11.5	11:25	E
	Southbound	21.1	6:22	C
Jones Bridge Road	Eastbound	20.7	4:59	C
	Westbound	17.1	6:01	D
West Cedar Lane	Eastbound	15.4	2:49	D
	Westbound	16.9	2:34	D

Table 23: 2018 No Build Condition PM Peak Hour Arterial Analysis

PM Peak Hour				
Arterial	**Direction**	**Speed**	**Time**	**LOS**
Rockville Pike	Northbound	16.0	8:11	D
	Southbound	17.7	7:36	D
Jones Bridge Road	Eastbound	17.1	6:02	D
	Westbound	16.7	6:12	D
West Cedar Lane	Eastbound	12.8	3:23	E
	Westbound	17.4	2:30	D

3.2.2.2 Internal Intersection Analysis

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal 12 intersections. According to the HCM analysis, all intersections would operate at a LOS of C or better. As was the case for the existing conditions, the #19 R.B. Brown Drive intersection with Building 63 (America Garage) has a very high pedestrian volume, resulting in the HCM reporting a LOS of F. This operation does not reflect the actual intersection operation, which would be more in line with the AM peak hour operating at a LOS of C or better. Table 24 shows the 2018 No Build condition internal intersection analysis and Figures 31A and 31B show the 2018 internal intersection LOS.

Table 24: 2018 No Build Condition Internal Intersection Analysis

	Approach	AM Peak Hour Approach Delay (s/veh)	AM Peak Hour LOS	PM Peak Hour Approach Delay (s/veh)	PM Peak Hour LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	10.3	B	16.5	C
	Eastbound	10.9	B	9.7	A
	Westbound	8.7	A	15.6	C
	Northbound	9.0	A	20.5	C
	Southbound	9.6	A	10.0	B
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	17.6	C	*	F
	Westbound	12.8	B	*	F
	NB left	3.1	A	0.6	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	10.5	B	8.8	A
	Northbound	9.2	A	9.0	A
	Southbound	11.5	B	8.5	A
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	9.1	A	11.3	B
	Westbound	8.1	A	10.9	B
	Northbound	9.4	A	9.5	A
	Southbound	8.8	A	12.3	B
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	9.7	A	9.4	A
	Eastbound	8.1	A	7.8	A
	Northbound	10.1	B	8.3	A
	Southbound	9.0	A	10.0	B
23. R.B. Brown Drive & South Palmer Road	Overall	9.8	A	10.6	B
	Eastbound	10.3	B	8.9	A
	Westbound	8.7	A	10.7	B
	Southbound	9.1	A	11.4	B
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	9.6	A	10.7	B
	Eastbound	10.0	A	10.0	B
	Westbound	8.6	A	11.4	B
	Northbound	9.5	A	10.7	B
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	9.0	A	10.2	B
	Eastbound	7.5	A	8.4	A
	Westbound	8.1	A	9.8	A
	Northbound	9.4	A	9.7	A
	Southbound	8.7	A	11.0	B
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	9.5	A	15.0	B
	Westbound	8.6	A	16.0	C
	Northbound	10.1	B	11.5	B
	Southbound	8.9	A	16.2	C
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	9.5	A	10.7	B
	Eastbound	8.1	A	10.3	B
	Westbound	10.4	B	11.0	B
	Northbound	8.9	A	10.8	B
	Southbound	0.0	A	8.6	A
28. University Road/Grier Road & South Palmer Road	Overall	8.7	A	12.5	B
	Eastbound	8.4	A	13.7	B
	Westbound	9.1	A	9.2	A
	Northbound	9.0	A	8.9	A
	Southbound	6.9	A	11.9	B
29. University Road & South Palmer Road	Westbound	8.0	A	7.1	A
	Northbound	7.9	A	7.1	A

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no overall LOS identified.

Figure 31A: 2018 AM Peak Hour No Build Condition HCM Intersection LOS

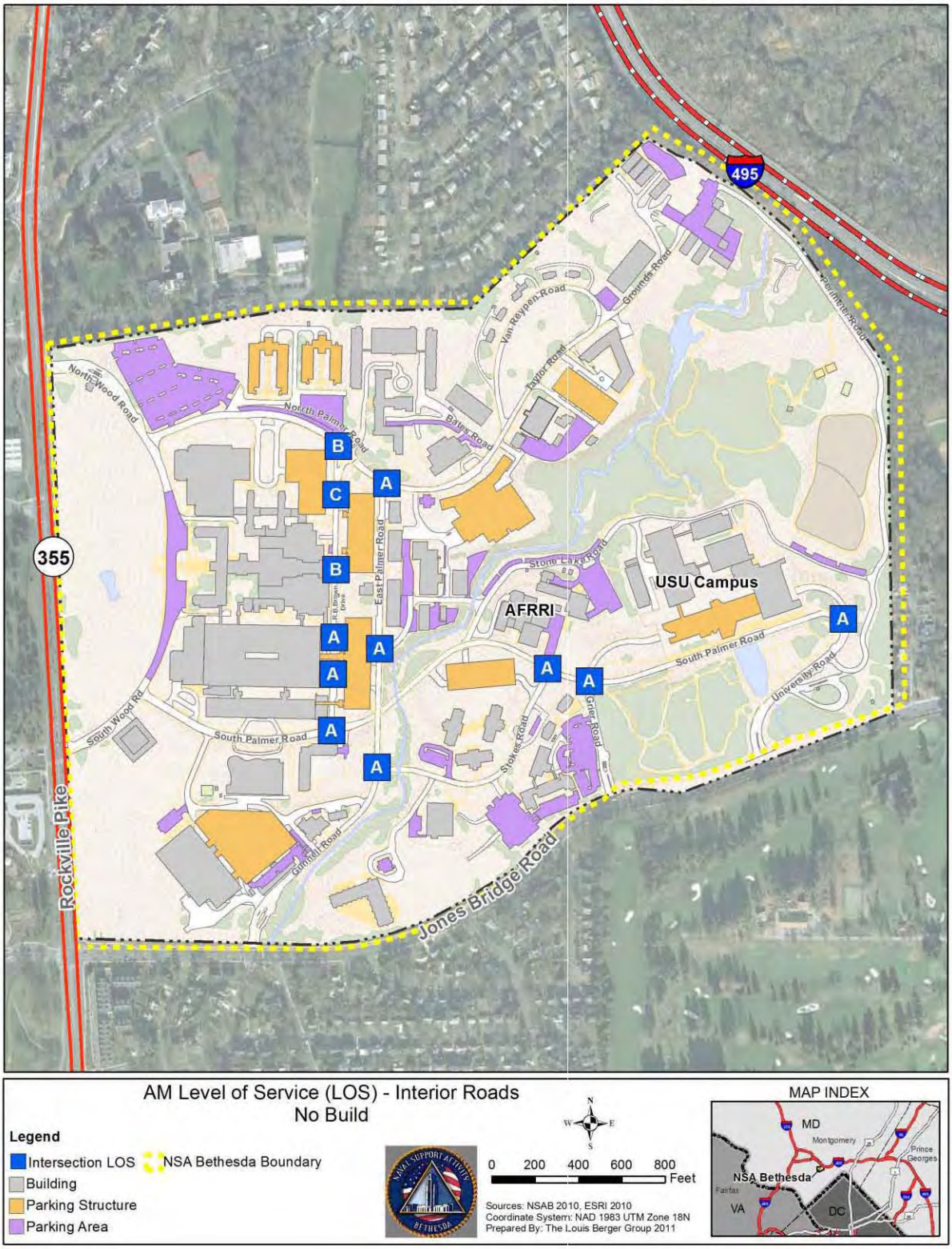
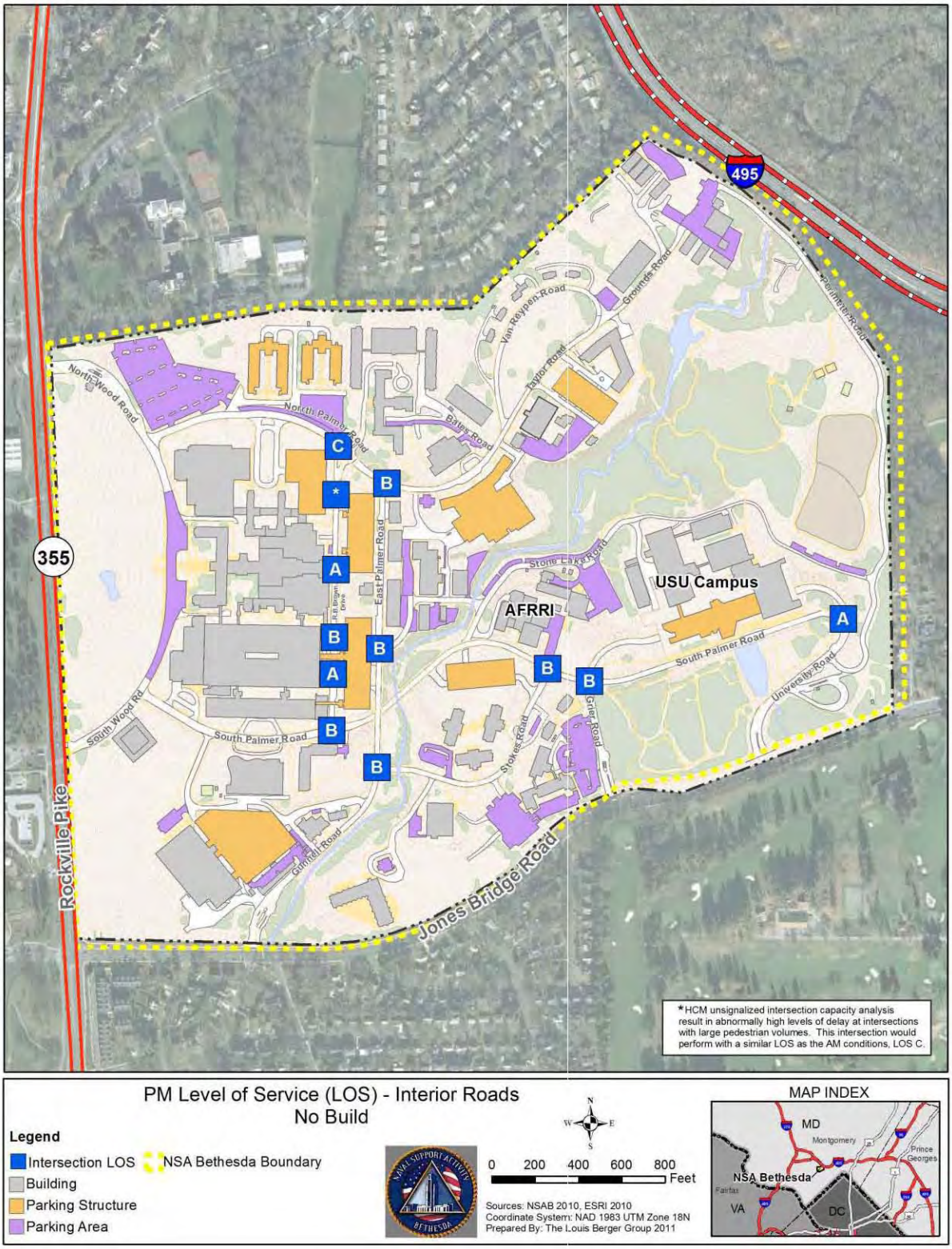


Figure 31B: 2018 PM Peak Hour No Build Condition HCM Intersection LOS



3.2.3 *2018 Build Alternative Introduction*

The 2018 Build Alternatives would be developed based on new parking facilities to serve the Medical Facilities Development (Building C)" and the University Expansion (Building F). Table 25 lists the proposed parking facilities and the building complexes served. Figure 32 shows the locations of the proposed parking facilities.

Table 25: Proposed Parking Facilities

Option Letter	Parking Facility	Building Complex Served
A	new underground parking garage with its entrance located at the North Palmer Road intersection with North Wood Road and exit located at the South Palmer Road intersection with South Wood Road	Medical facility
B	new underground parking garage with its entrance and exit located at North Palmer Road (G-Lot)	Medical facility
C	new parking garage in the industrial/warehouse area accessed from Grounds Road	Medical facility
D	new parking garage accessed from Stokes Road (H-Lot)	Medical facility
E	new parking garage accessed from Taylor Road adjacent to the proposed Wounded Warrior Transition Lodge	Medical facility
F	new parking garage accessed from Stone Lake Road (USU Alternative 2)	USU
G	new parking facility along South Palmer Road between Gates #4 and #5 (USU Alternative 1)	USU

The traffic study Build Alternatives will be a combination of one medical facility parking option and one USU parking facility alternative option. Since there are five medical facility proposed parking options and two USU parking options, the total number of alternatives will be ten (5 Medical Facilities Development X 2 University Expansion). Table 26 lists the ten 2018 traffic study Build Alternatives and the 2018 No Build condition.

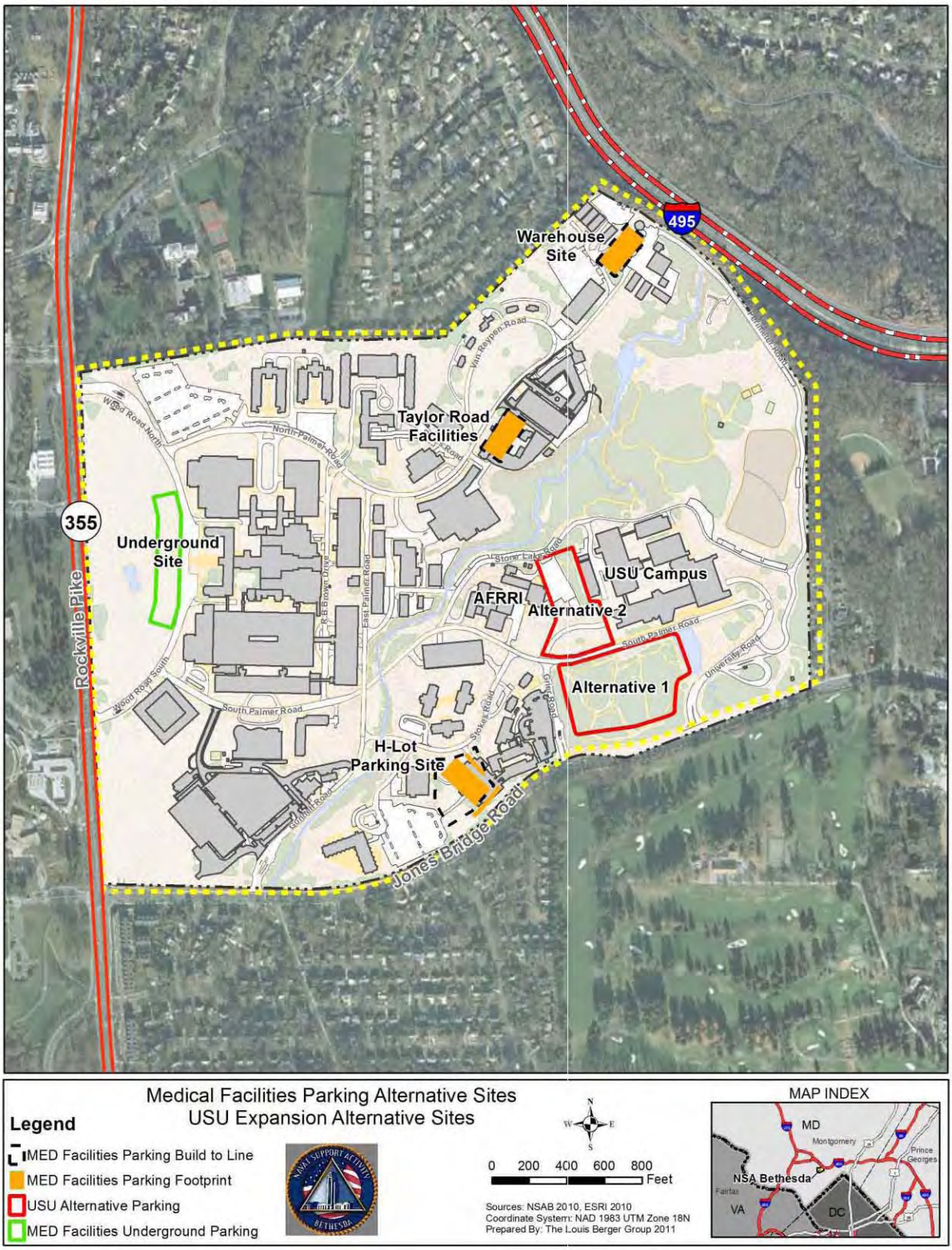
Each Build Alternative will be analyzed based on the new vehicle trips added to the roadway system and the shifted trips already represented in the No Build condition turning movement counts. The new vehicle trips will be based on the 270 new employees expected at NSA Bethesda by 2018; however, if the capacity of the new parking facility would not accommodate all 270 employees (maximum trip generation), the trip generation was reduced to equal the new parking facility capacity.

The shifted trips represent new trips added to the roadway system connecting to a new parking facility and existing trips subtracted from the roadway system connecting to the existing parking facility.

Table 26: List of 2018 Traffic Study Build Alternatives

Alternative	Combination of Proposed Parking Facilities from Table A
No Build Condition	Use of parking facilities expected to be in place based upon the addition of eight internal installation facilities (not including Buildings C or F)
1	Option A: new underground parking garage with its entrance located at the North Palmer Road intersection with North Wood Road and exit located at the South Palmer Road intersection with South Wood Road Option F: new parking garage accessed from Stone Lake Road (USU Alternative 2)
2	Option B: new underground parking garage with its entrance and exit located along North Palmer Road (G-Lot) Option F: new parking garage accessed from Stone Lake Road (USU Alternative 2)
3	Option C: new parking garage in the industrial/warehouse area accessed from Grounds Road Option F: new parking garage accessed from Stone Lake Road (USU Alternative 2)
4	Option D: new parking garage accessed from Stokes Road (H-Lot) Option F: new parking garage accessed from Stone Lake Road (USU Alternative 2)
5	Option E: new parking garage accessed from Taylor Road adjacent to the proposed Wounded Warrior Barracks Option F: new parking garage accessed from Stone Lake Road (USU Alternative 2)
6	Option A: new underground parking garage with its entrance located at the North Palmer Road intersection with North Wood Road and exit located at the South Palmer Road intersection with South Wood Road Option G: new parking facility along South Palmer Road between gates 4 and 5 (USU Alternative 1)
7	Option B: new underground parking garage with its entrance and exit located along North Palmer Road (G-Lot) Option G: new parking facility along South Palmer Road between gates 4 and 5 (USU Alternative 1)
8	Option C: new parking garage in the industrial/warehouse area accessed from Grounds Road Option G: new parking facility along South Palmer Road between gates 4 and 5 (USU Alternative 1)
9	Option D: new parking garage accessed from Stokes Road (H-Lot) Option G: new parking facility along South Palmer Road between gates 4 and 5 (USU Alternative 1)
10	Option E: new parking garage accessed from Taylor Road adjacent to the proposed Wounded Warrior Barracks Option G: new parking facility along South Palmer Road between gates 4 and 5 (USU Alternative 1)

Figure 32: Proposed Parking Facility Locations



3.2.4 ***Build Alternative 1***

This alternative would include the construction of a new underground 500-space parking structure to serve Building C and the construction of a 400-space parking structure known as USU Alternative 2. The 500-space underground parking structure would be located between North and South Wood Roads, with the entrance located at the North Wood Road and North Palmer Road intersection and exit located at the South Wood Road and South Palmer Road intersection. Appendix D4 contains the proposed concept for this facility.

The USU Alternative 2 parking structure would replace the existing N-Lot, with the entrance located on Stone Lake Road and two exits, one serving Stone Lake Road and the other connecting to the South Palmer Road and Grier Road intersection.

3.2.4.1 Trip Generation

The trips generated for this alternative would be the same for Alternatives 3,5,6,7,8, and 10 based on the increase in staff for Building C (50 employees) and Building F (220 employees) and the assumption that the new USU Alternative 2 parking structure would accommodate these new employees. Using the latest ITE Trip Generation Manual, the total number of trips was calculated based upon the number of employees in each facility.

NCPC maintains a parking policy of one parking space for every three employees. There is expected to be 12,611 staff employed at NSA Bethesda in 2018. Based upon the 2018 No Build condition parking matrix (Table 18), 3,484 staff parking spaces (includes a 100-space shift from staff to government vehicles to accommodate construction) will be available, which equates to a 1:3.54 parking ratio, lower than the 1:3 ratio. Adding the new 270 employees to staff parking would result in a ratio of 1:3.36, still less than 1:3. Given this result, the trip generation will include all 270 employees. Table 27 shows the 2018 Build Alternative 1, 3, 5, 6, 7, 8, 9 and 10 trip generation.

Table 27: 2018 Build Alternatives 1, 3, 5, 6, 7, 8, 9 and 10 Trip Generation

	Facility Name	Employees	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
1	Medical Facilities Development	50#	12	5	17	5	11	16
2	University Expansion	220*	132	29	161	56	137	193
	Total	270	144	34	178	61	148	209

#ITE Land Use Code 610: Hospital
*ITE Land Use Code 550: University

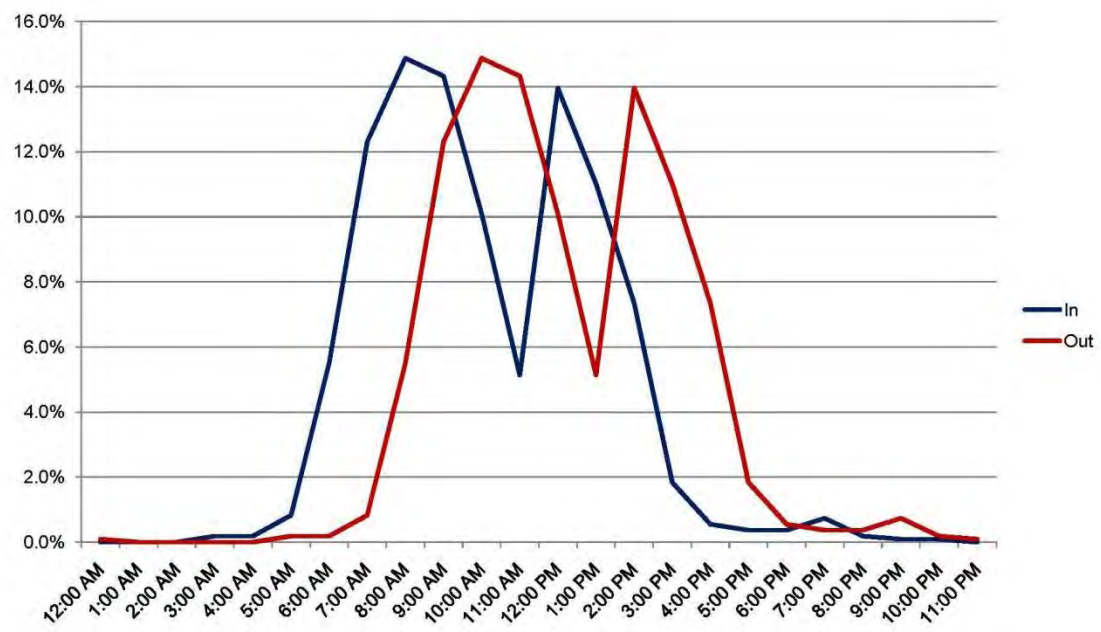
3.2.4.2 Trip Distribution

The trip distribution would differ by alternative as vehicles would be assigned different paths along the internal and to a lesser degree, the external network, depending on where the new garage facility was

situated. While the actual shift in spaces would be very difficult to predict, this study will estimate the traffic effects for this alternative based on several assumptions. It is assumed that the new underground parking structure serving Building C would shift peak hour patient trips originating from north of NSA Bethesda using Rockville Pike, as these trips would pass the new facility before reaching the existing parking structures and patients might choose this parking facility since it would be completely protected from the elements.

Patient temporal distribution (Figure 33) is based on the 2009 total patient appointments by time of day. According to the 2008 NNMC Transportation Study, 1,862 patients enter and leave the installation each day. Using the temporal table, approximately 15 percent of patients (279 patients) arrive during the external network AM peak hour and 6 percent or 112 patients leave.

Figure 33: 2009 Patient Temporal Distribution



Based on the following assumptions, 126 would enter and 50 would exit the new underground parking structure during the AM peak hour:

- 45 percent of patients originate or are destined to points north using Rockville Pike (based upon 2008 NNMC Transportation Study trip distribution shown in Figure 26)

- Building 55 offers 37 percent of patient parking, while Building 63 offers 63 percent, based on a total of 1,457 total spaces in both facilities.

- 47 patients arriving at Building 55 (37 percent of 126) and 79 patients (63 percent of 126) arriving at Building 63 would be shifted to the new underground parking structure.

- 19 patients departing from Building 55 (37 percent of 50) and 31 patients (63 percent of 50) departing from Building 63 would be shifted to depart from the new underground parking structure.

Using the temporal table for the PM peak hour, approximately 0.5 percent of patients (9 patients) arrive during the external PM peak hour and 4 percent (74 patients) leave. Using the same assumptions as above, 4 patients would enter and 33 patients would exit the new underground parking structure during the PM peak hour.

The Alternative 1 trip distribution would consist of combining the shift in patients from Buildings 55 and 63 to the new underground parking structure and the trips generated from the 270 new employee trips. It is assumed that the existing 62-spaces in N-Lot would be relocated into the new USU Alternative 2 parking structure, resulting in a shift of 18 (30 percent of N-Lot – same peak hour exiting percentage as adjacent USU parking facility) PM peak hour exiting trips from Stone Lake Road to the new ramp connecting to the South Palmer Road at Grier Road intersection. For the purposes of evaluating the Build Alternatives, the study assumes that all 270 new employee trips would be destined to/from the new USU Alternative 2 parking facility.

The distribution patterns for the shifted patient trips from Buildings 55 and 63 would continue to enter Gate #1 from Rockville Pike and proceed directly to the new underground parking facility. Patients leaving the new underground parking facility would exit through Gate #2 and turn right onto Rockville Pike northbound. The result of these new distribution patterns would remove trips from R.B. Brown Drive and North Palmer Road.

NSA Bethesda generated or shifted trips follow the updated trip distribution pattern based upon the 2008 NNMC Transportation Study (Figure 26). During the AM peak hour, the new staff trips would follow the following paths:

- From the north: Turn left onto North Wood Road, enter through Gate #1, turn left onto North Palmer Road, turn right onto East Palmer Road, turn left onto Rixey Road, and turn left onto Stone Lake Road.

- To the north: Turn right onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Rixey Road, and turn left onto Stone Lake Road.

- To the south: Turn left onto Stone Lake Road, turn right onto Rixey Road, turn left onto East Palmer Road, follow to Gunnell Road and exit through Gate #3, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and turn left onto Stone Lake Road.

- To the east: Turn left onto South Palmer Road, turn right onto University Road and exit though Gate #5, and turn left onto Jones Bridge Road.

During the PM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto North Wood Road, enter through Gate #1, turn left onto North Palmer Road, turn right onto East Palmer Road, turn left onto Rixey Road, and turn left onto Stone Lake Road.

- To the north: Turn right onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Rixey Road, and turn left onto Stone Lake Road.

- To the south: Go straight onto Grier Road and exit through Gate #4, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and turn left onto Stone Lake Road.

- To the east: Go straight onto Grier Road and exit through Gate #4, and turn left onto Jones Bridge Road.

Figures 34A, 34B, and 34C show the 2018 Alternative 1 trip distribution.

Figure 34A: 2018 Alternative 1 Trip Distribution

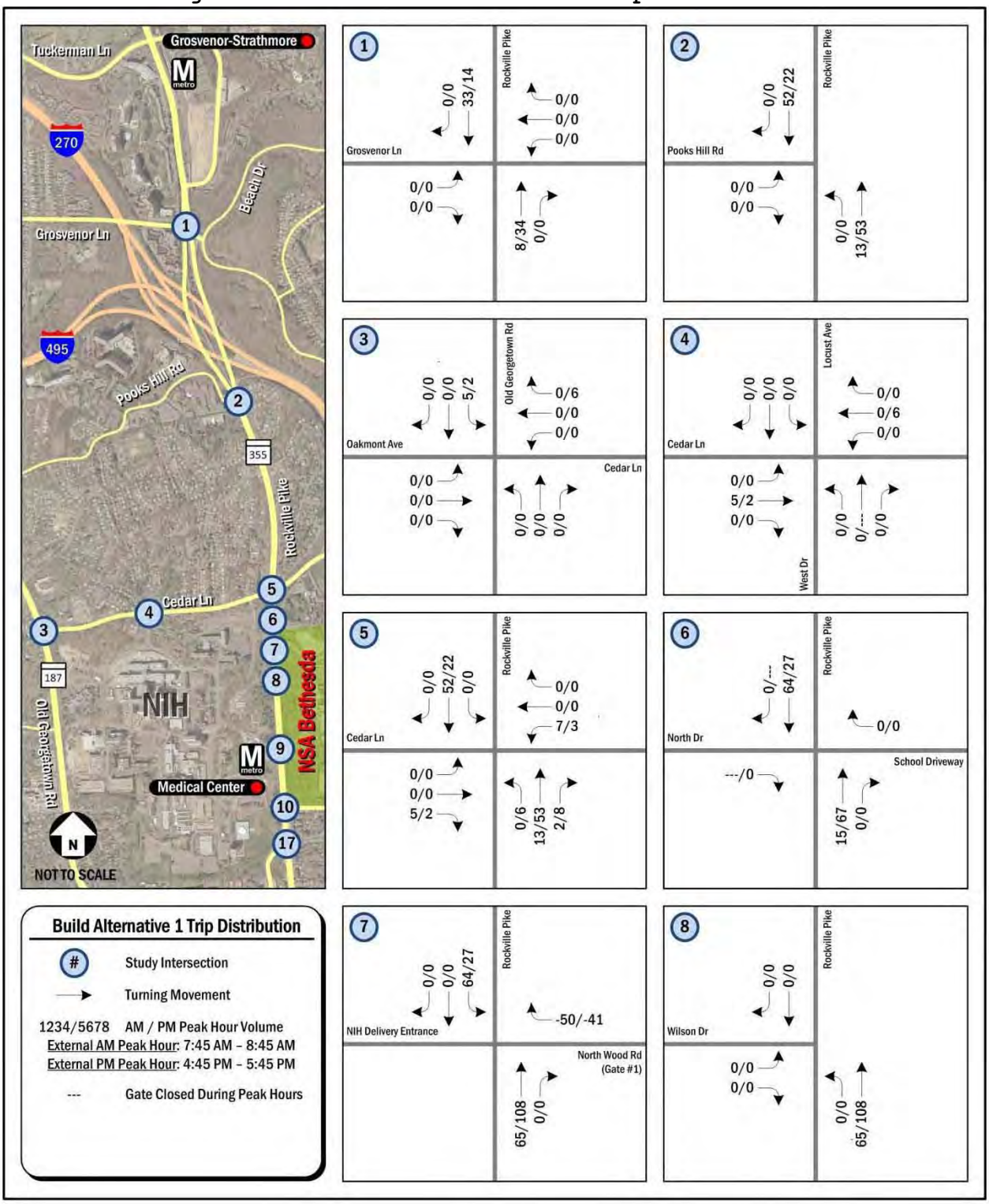


Figure 34B: 2018 Alternative 1 Trip Distribution

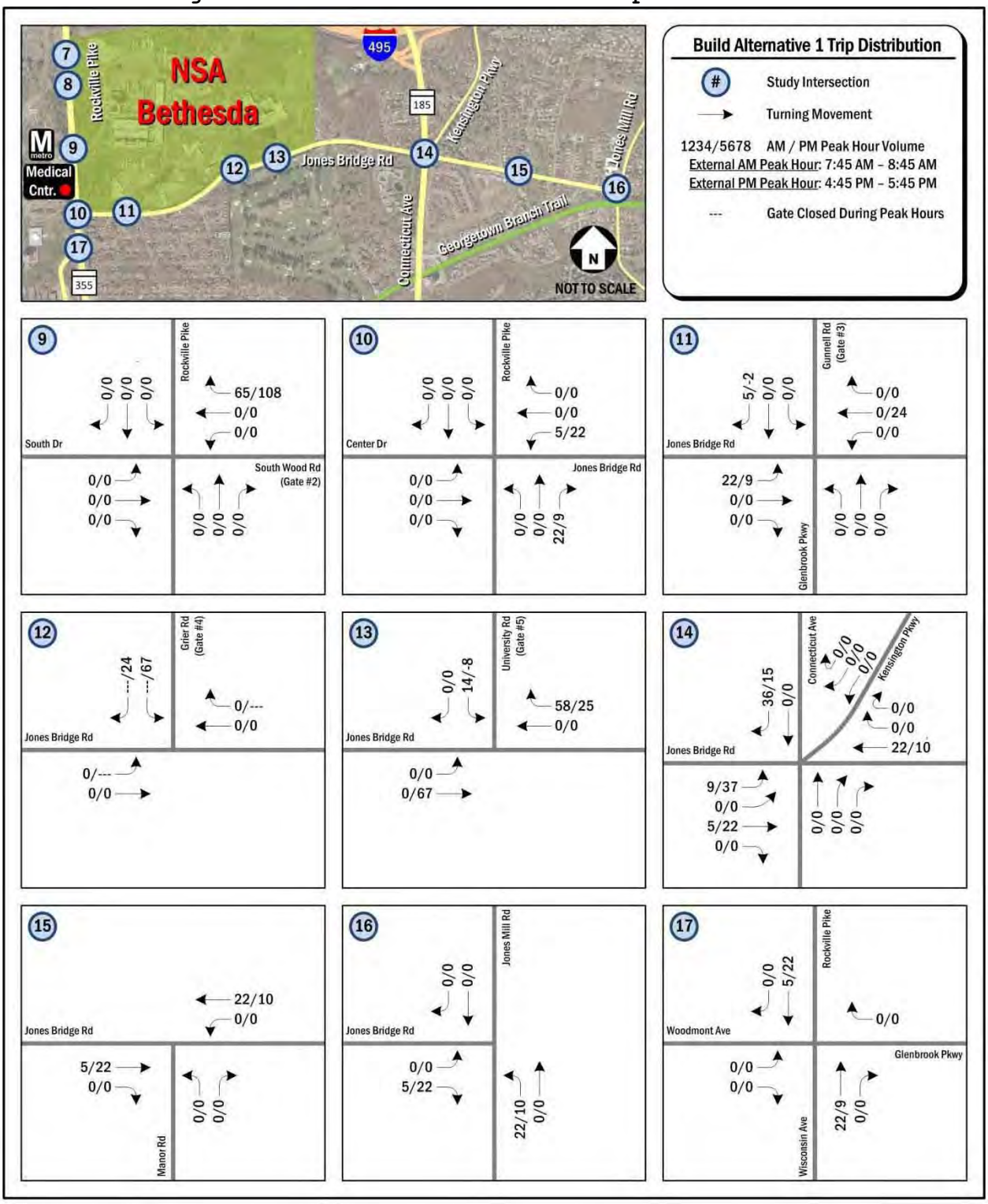
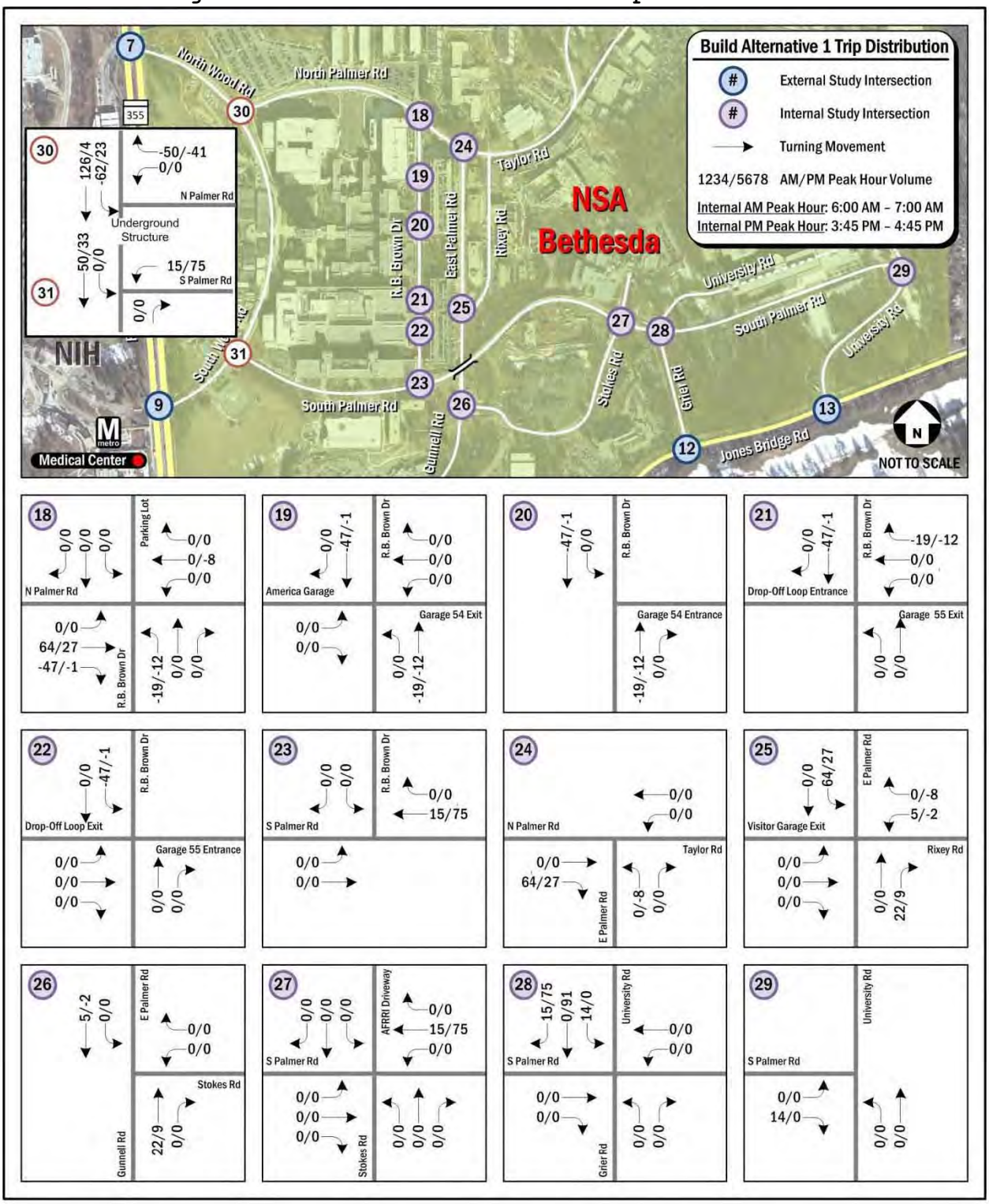


Figure 34C: 2018 Alternative 1 Trip Distribution



3.2.4.3 External Intersection Analysis

The 2018 Build Alternative 1 includes all projects listed in the No Build condition with no other changes along the external network.

Critical Lane Volume Analysis

As required by the MSHA and M-NCPPC's LATR, the CLV analysis was conducted for the 16 external signalized intersections to compare to the No Build condition. During the AM peak hour, the #9 Rockville Pike at South Wood Road (Gate #2) intersection would change from a LOS of B to C. During the PM peak hour, the #12 Jones Bridge Road at Grier Road (Gate #4) intersection would change from a LOS B to C. Based on these results, the external signalized intersections would have no significant traffic impacts from implementing Alternative 1. Table 28 shows the 2018 Build Alternative 1 CLV analysis for the external intersection. Figures 35A and 35B show the 2018 Build Alternative 1 CLV intersection LOS.

Table 28: 2018 Build Alternative 1 CLV External Intersection Analysis

		Build Alternative 1				No Build Condition			
		AM Peak Hr.		*PM Peak Hr.*		*AM Peak Hr.*		*PM Peak Hr.*	
		CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS
1.	Rockville Pike & Grosvenor Lane	1,385	D	1,341	D	1,373	D	1,336	D
2.	Rockville Pike & Pooks Hill Road	1,359	D	1,399	D	1,343	D	1,379	D
3.	Old Georgetown Road & Oakmont Avenue/Cedar Lane	1,437	D	1,538	E	1,437	D	1,536	E
4.	Locust Avenue/West Drive & Cedar Lane	465	A	941	A	489	A	939	A
5.	Rockville Pike & Cedar Lane	1,554	E	1,242	C	1,529	E	1,236	C
6.	Rockville Pike & North Drive/School Driveway	*un-signalized*		*un-signalized*		*un-signalized*		*un-signalized*	
7.	Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	931	A	1,058	B	843	A	1,033	B
8.	Rockville Pike & Wilson Drive	958	A	984	A	958	A	948	A
9.	Rockville Pike & South Drive/South Wood Road (Gate #2)	1,186	C	1,147	B	1,121	B	1,039	B
10.	Rockville Pike & Center Drive/Jones Bridge Road	718	A	820	A	715	A	808	A
11.	Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road	823	A	1,051	B	801	A	1,024	B
12.	Grier Road (Gate #4) & Jones Bridge Road	692	A	1,171	C	692	A	1,104	B
13.	University Road (Gate #5) & Jones Bridge Road	749	A	1,059	B	729	A	1,023	B
14.	Connecticut Avenue & Jones Bridge Road & Kensington Parkway	1,507	E	1,755	F	1,490	E	1,735	F
15.	Manor Road & Jones Bridge Road	761	A	1,031	B	739	A	1,009	B
16.	Jones Bridge Road & Jones Mill Road	1,061	B	1,084	B	1,039	B	1,062	B
17.	Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	773	A	942	A	771	A	938	A

Figure 35A: 2018 AM Peak Hour Build Alternative 1 CLV Intersection LOS

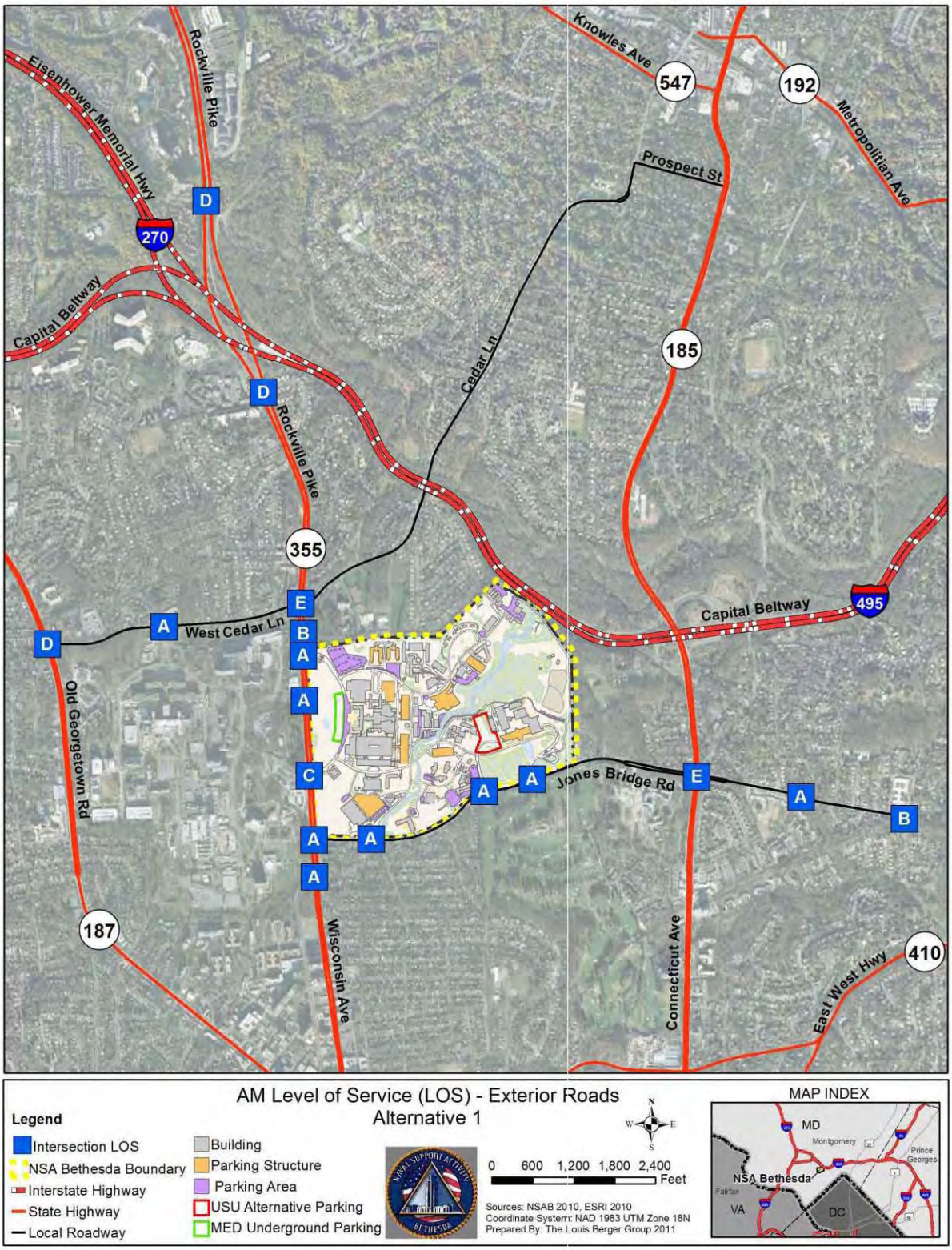
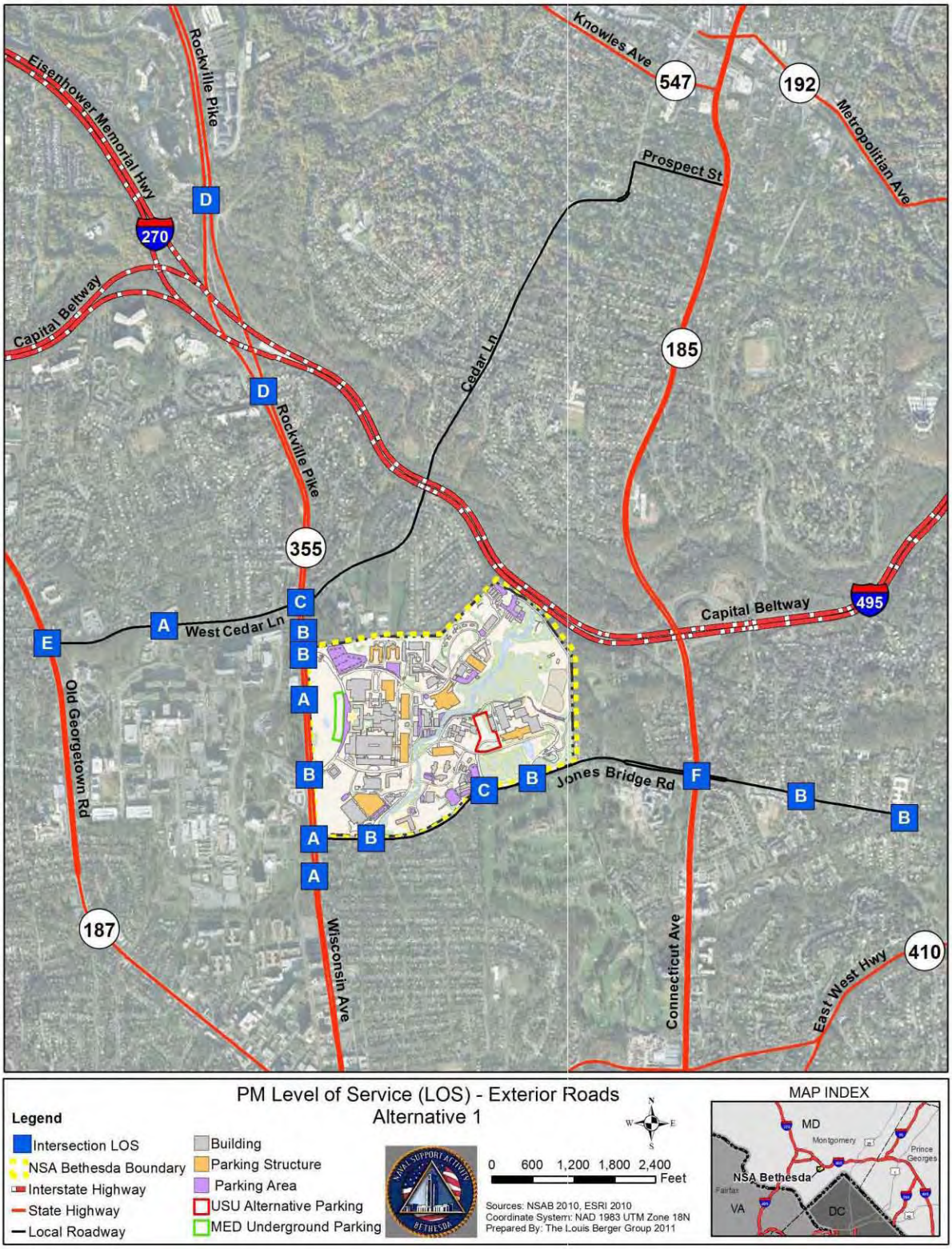


Figure 35B: 2018 PM Peak Hour Build Alternative 1 CLV Intersection LOS



Highway Capacity Manual Intersection Analysis

The HCM analysis was conducted as a secondary comparison to the CLV analysis between the No Build condition and Build Alternatives for the external intersections and to provide a measure of vehicle delay and density. When comparing Build Alternative 1 with the No Build condition, the AM peak hour did not experience any change in LOS. For the PM Peak hour, intersection #2 Rockville Pike at Pooks Hill Road would change from a LOS of C to D, intersection #9 Rockville Pike at South Wood Road would change from a LOS B to C, and intersection #15 Jones Bridge Road at Manor Road would change from a LOS B to C. Since the CLV process was not used to evaluate unsignalized intersections, HCM analysis was used to provide a No Build condition comparison for intersection #6 Rockville Pike at North Drive/School Driveway, which showed no significant impacts. Tables 29A and 29B show the 2018 Build Alternative 1 HCM external AM and PM analysis.

3.2.4.4 Arterial Analysis

Arterial analysis was performed for the same three arterials as the No Build condition (Rockville Pike, West Cedar Lane, and Jones Bridge Road). The Montgomery County Policy Area Mobility Review-Relative Arterial Mobility (PAMR-RAM) requires a comparison of travel speeds between the No Build condition and alternatives to determine the percent change. For the Bethesda area, the percent change must be more than 30 percent before mitigation would be required.

When comparing the travel speeds between the No Build condition and Build Alternative 1, the greatest change was 3 percent during the PM peak hour along northbound Rockville Pike and eastbound Jones Bridge Road. Based upon this analysis, Alternative 1 would not require PAMR-RAM external intersection mitigation. Tables 30 and 31 show the 2018 Build Alternative 1 arterial analyses.

Table 29A: 2018 AM Peak Hour Build Alternative 1 HCM External Analysis

	HCM Analysis	AM Peak Hour					
		Alternative 1			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	45.0	1.03	D	45.6	1.02	D
	Eastbound	69.8		E	69.8		E
	Westbound	70.4		E	70.3		E
	Northbound	20.7		C	15.4		B
	Southbound	46.6		D	43.2		D
2. Rockville Pike & Pooks Hill Road	Overall	223.2	1.64	F	219.9	1.63	F
	Eastbound	83.4		F	83.4		F
	Northbound	341.6		F	335.9		F
	Southbound	22.0		C	21.3		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.5	0.89	B
	Eastbound	23.9		C	23.9		C
	Westbound	37.4		D	37.4		D
	Northbound	14.1		B	14.1		B
	Southbound	18.5		B	18.5		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.3	0.40	B	15.2	0.39	B
	Eastbound	19.8		B	19.6		B
	Westbound	11.8		B	11.8		B
	Northbound	14.7		B	14.7		B
	Southbound	15.1		B	15.1		B
5. Rockville Pike & Cedar Lane	Overall	43.8	1.00	D	41.8	0.98	D
	Eastbound	86.5		F	82.1		F
	Westbound	62.7		E	61.1		E
	Northbound	13.3		B	14.4		B
	Southbound	42.4		D	39.3		D
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.8		B	11.7		B
	Westbound	9.9		A	9.8		A
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.6	0.62	A	7.8	0.62	A
	Westbound	20.3		C	21.2		C
	Northbound	19.9		B	18.3		B
	Southbound	3.9		A	3.2		A
8. Rockville Pike & Wilson Drive	Overall	2.1	0.59	A	2.1	0.59	A
	Eastbound	60.9		E	60.9		E
	Northbound	1.9		A	1.9		A
	Southbound	0.8		A	0.8		A
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	16.2	0.83	B	12.7	0.76	B
	Eastbound	115.4		F	63.5		E
	Westbound	56.7		E	52.1		D
	Northbound	13.2		B	13.2		B
	Southbound	6.5		A	6.6		A
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	32.7	0.85	C	32.3	0.84	C
	Eastbound	54.3		D	54.3		D
	Westbound	99.6		F	97.3		F
	Northbound	17.8		B	18.0		B
	Southbound	6.8		A	6.9		A

Table 29A: 2018 AM Peak Hour Build Alternative 1 HCM External Analysis (continued)

	HCM Analysis	AM Peak Hour					
		Alternative 1			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	12.8	0.64	B	12.3	0.63	B
	Eastbound	3.5		A	3.3		A
	Westbound	15.4		B	14.7		B
	Northbound	22.0		C	22.0		C
	Southbound	24.5		C	24.5		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	4.7	0.53	A	3.8	0.51	A
	Eastbound	2.5		A	2.1		A
	Westbound	5.9		A	4.7		A
	Southbound	0.0		A	0.0		A
13. University Road (Gate #5) & Jones Bridge Road	Overall	7.7	0.55	A	6.4	0.51	A
	Eastbound	5.1		A	4.5		A
	Westbound	8.2		A	7.1		A
	Southbound	24.3		C	24.6		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	52.1	1.04	D	49.4	1.01	D
	Eastbound	59.4		E	55.7		E
	Westbound	44.7		D	42.2		D
	Northbound	24.0		C	24.0		C
	Southbound	63.1		E	58.9		E
	Southwestbound	82.6		F	82.6		F
15. Manor Road & Jones Bridge Road	Overall	15.6	0.57	B	15.1	0.56	B
	Eastbound	18.1		B	18.0		B
	Westbound	16.1		B	15.3		B
	Northbound	10.8		B	10.8		B
16. Jones Bridge Road & Jones Mill Road	Overall	45.4	0.77	D	42.3	0.76	D
	Eastbound	30.5		C	30.2		C
	Northbound	53.8		D	46.8		D
	Southbound	46.5		D	46.5		D
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	19.3	0.71	B	19.5	0.71	B
	Eastbound	48.7		D	48.7		D
	Westbound	41.2		D	41.2		D
	Northbound	5.5		A	5.4		A
	Southbound	3.3		C	3.3		C

Note: Intersections with only two-way stops have no overall LOS identified.

Table 29B: 2018 PM Peak Hour Build Alternative 1 HCM External Analysis

	HCM Analysis	PM Peak Hour					
		Alternative 1			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density (Veh/ hr)	LOS
1. Rockville Pike & Grosvenor Lane	Overall	60.1	1.01	E	58.9	1.01	E
	Eastbound	48.4		D	48.4		D
	Westbound	88.7		F	88.7		F
	Northbound	30.9		C	30.3		C
	Southbound	72.2		E	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	35.8	1.01	D	33.1	0.99	C
	Eastbound	65.4		E	65.4		E
	Northbound	40.7		D	35.7		D
	Southbound	23.7		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.2	0.84	B	19.1	0.83	B
	Eastbound	31.9		C	31.9		C
	Westbound	37.2		D	37.3		D
	Northbound	20.2		C	20.2		C
	Southbound	13.3		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	30.4	0.73	C	30.2	0.73	C
	Eastbound	39.9		D	39.5		D
	Westbound	7.5		A	7.5		A
	Northbound	24.8		C	24.8		C
	Southbound	26.7		C	26.7		C
5. Rockville Pike & Cedar Lane	Overall	38.3	0.97	D	36.4	0.97	D
	Eastbound	57.4		E	57.4		E
	Westbound	65.5		E	63.5		E
	Northbound	30.7		C	26.5		C
	Southbound	31.9		C	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.1		B	11.0		B
	Westbound	10.8		B	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.1	0.72	A	8.6	0.70	A
	Westbound	38.6		D	39.9		D
	Northbound	9.6		A	9.9		A
	Southbound	1.1		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	12.3	0.64	B	12.3	0.63	B
	Eastbound	44.6		D	44.6		D
	Northbound	5.3		A	4.8		A
	Southbound	10.4		B	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	24.1	0.82	C	18.7	0.72	B
	Eastbound	70.4		E	52.8		D
	Westbound	32.9		C	35.8		D
	Northbound	17.8		B	13.5		B
	Southbound	21.2		C	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	60.4	0.95	E	59.9	0.94	E
	Eastbound	58.1		E	58.2		E
	Westbound	43.2		D	42.8		D
	Northbound	78.3		E	78.3		E
	Southbound	46.7		D	45.4		D

Table 29B: 2018 PM Peak Hour Build Alternative 1 HCM External Analysis (continued)

	HCM Analysis	PM Peak Hour					
		Alternative 1			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density (Veh/ hr)	LOS	Delay	Density (Veh/ hr)	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.2	0.75	B	14.0	0.75	B
	Eastbound	11.2		B	11.2		B
	Westbound	13.8		B	12.9		B
	Northbound	13.8		B	13.8		B
	Southbound	23.9		C	23.9		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	18.0	0.84	B	13.6	0.79	B
	Eastbound	13.3		B	12.1		B
	Westbound	5.4		A	5.2		A
	Southbound	48.5		D	32.7		C
13. University Road (Gate #5) & Jones Bridge Road	Overall	14.3	0.69	B	10.7	0.67	B
	Eastbound	15.9		B	11.2		B
	Westbound	9.3		A	9.3		A
	Southbound	20.1		C	21.0		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	70.7	1.10	E	68.7	1.10	E
	Eastbound	100.6		F	92.8		F
	Westbound	118.7		F	119.7		F
	Northbound	76.1		E	76.1		E
	Southbound	18.8		B	18.9		B
	Southwestbound	126.1		F	126.1		F
15. Manor Road & Jones Bridge Road	Overall	21.4	0.73	C	19.7	0.71	B
	Eastbound	32.0		C	28.9		C
	Westbound	4.1		A	3.7		A
	Northbound	21.9		C	21.9		C
16. Jones Bridge Road & Jones Mill Road	Overall	24.4	0.73	C	23.5	0.71	C
	Eastbound	12.9		B	13.0		B
	Northbound	41.2		D	38.5		D
	Southbound	20.0		C	20.0		C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	12.7	0.70	B	12.6	0.69	B
	Eastbound	12.8		B	12.8		B
	Westbound	9.2		A	9.2		A
	Northbound	18.3		B	18.1		B
	Southbound	7.9		A	7.8		A

Note: Intersections with only two-way stops have no overall LOS identified.

Table 30: 2018 AM Peak Hour Build Alternative 1 Arterial Analysis

		AM Peak Hour						
		Alt 1			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	11.3	11:36	E	11.5	11:25	E	2%
	Southbound	20.7	6:30	C	21.1	6:22	C	2%
Jones Bridge Road	Eastbound	20.6	5:1	C	20.7	4:59	C	0%
	Westbound	16.7	6:10	D	17.1	6:1	D	2%
West Cedar Lane	Eastbound	15.4	2:49	D	15.4	2:49	D	0%
	Westbound	16.9	2:34	D	16.9	2:34	D	0%

Table 31: 2018 PM Peak Hour Build Alternative 1 Arterial Analysis

		PM Peak Hour						
		Alt 1			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	15.5	8:25	D	16.0	8:11	D	3%
	Southbound	17.6	7:39	D	17.7	7:36	D	1%
Jones Bridge Road	Eastbound	16.6	6:12	D	17.1	6:2	D	3%
	Westbound	16.6	6:14	D	16.7	6:12	D	1%
West Cedar Lane	Eastbound	12.8	3:24	E	12.8	3:23	E	0%
	Westbound	17.4	2:30	D	17.4	2:30	D	0%

3.2.4.5 Internal Intersection Analysis

This alternative includes the addition of a new entrance ramp connecting from the North Wood Road/North Palmer Road intersection and the addition of a new exit ramp connecting to the South Wood Road/South Palmer Road intersection. The addition of a new exit ramp from the New USU Alternative 2 parking structure in N-Lot would add more trips to the existing ramp connecting to South Palmer Road at Grier Road intersection. Figure 36 shows the lane geometry and traffic control for Alternative 1.

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal intersections. The only notable change between Alternative 1 and the No Build condition would be the #26 East Palmer Road at Stokes Road and #28 South Palmer Road at Grier Road intersections changing from a LOS B to C. The #28 intersection change would be the result of the new trips exiting the new USU Alternative 2 parking structure. The #26 intersection change was due to the No Build condition vehicle delay calculated at the highest delay before placing the LOS into the C range. Based on this analysis, there would be no significant impact to the internal roadway intersections for this alternative. Tables 32A and 32B show the 2018 Build Alternative 1 internal intersection analysis; while Figures 37A and 37B show the 2018 Build Alternative 1 internal intersection LOS.

Figure 36: Alternative 1 Lane Geometry and Traffic Control

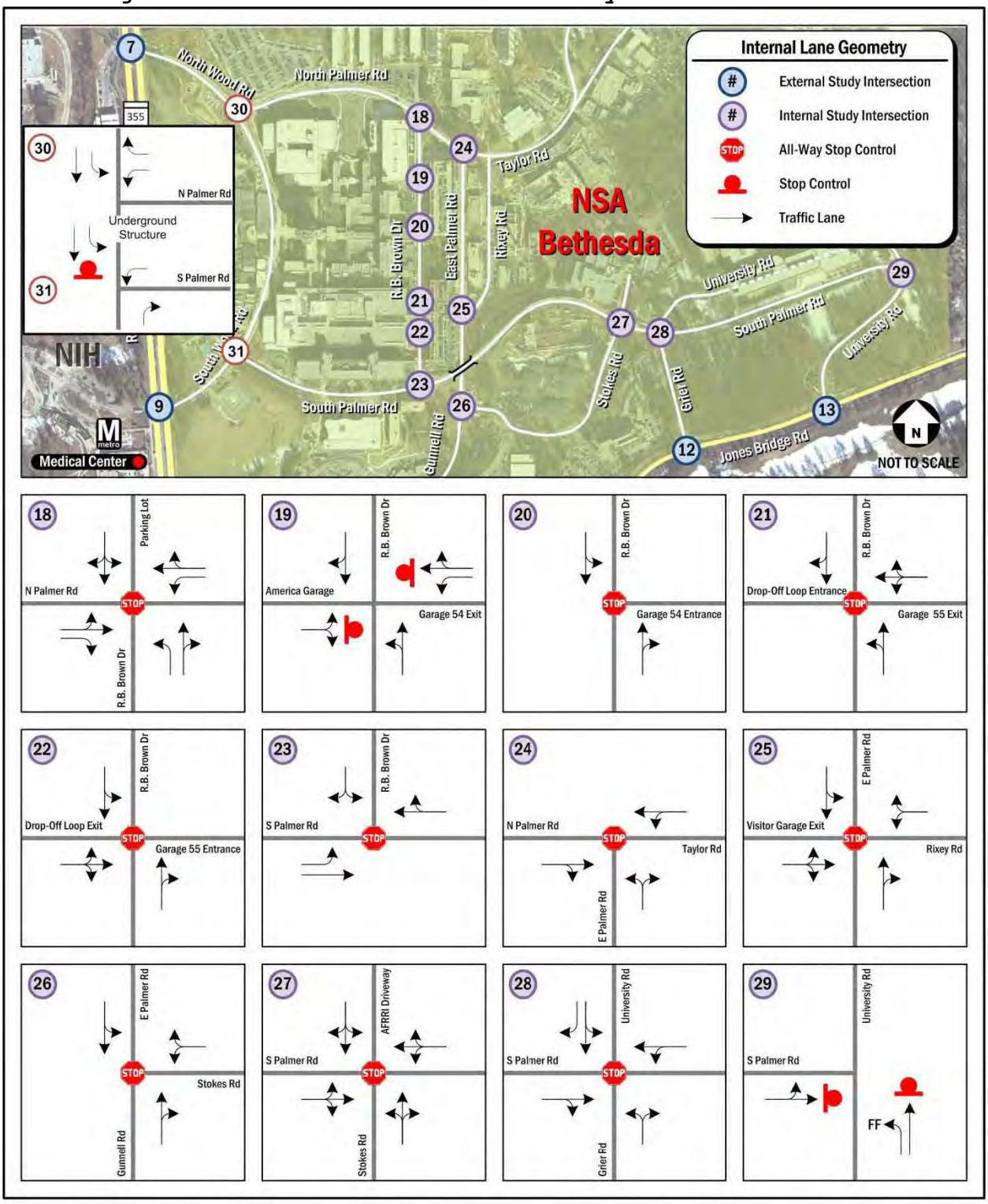


Table 32A: 2018 Build Alternative 1 Internal Intersection Analysis

		AM Peak Hour				
			Build Alt. 1		*No Build Condition*	
		Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18.	**Parking Lot/R.B. Brown Drive & North Palmer Road**	Overall	11.0	B	10.3	B
		Eastbound	11.9	B	10.9	B
		Westbound	8.6	A	8.7	A
		Northbound	8.7	A	9.0	A
		Southbound	9.6	A	9.6	A
19.	**R.B. Brown Drive & America Garage/Garage 54 Exit**	Eastbound	16.1	C	17.6	C
		Westbound	12.3	B	12.8	B
		Northbound Left	3.5	A	3.1	A
20.	**R.B. Brown Drive & Garage 54 Entrance**	Overall	9.7	A	10.5	B
		Northbound	8.7	A	9.2	A
		Southbound	10.5	B	11.5	B
21.	**R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit**	Overall	8.8	A	9.1	A
		Westbound	8.2	A	8.1	A
		Northbound	9.2	A	9.4	A
		Southbound	8.2	A	8.8	A
22.	**R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance**	Overall	9.5	A	9.7	A
		Eastbound	7.9	A	8.1	A
		Northbound	9.9	A	10.1	B
		Southbound	8.5	A	9.0	A
23.	**R.B. Brown Drive & South Palmer Road**	Overall	9.8	A	9.8	A
		Eastbound	10.3	B	10.3	B
		Westbound	8.9	A	8.7	A
		Southbound	9.2	A	9.1	A
24.	**East Palmer Road & North Palmer Road/Taylor Road**	Overall	10.3	B	9.6	A
		Eastbound	10.9	B	10.0	A
		Westbound	8.7	A	8.6	A
		Northbound	9.8	A	9.5	A
25.	**East Palmer Road & Visitor Garage Exit/Rixey Road**	Overall	9.7	A	9.0	A
		Eastbound	7.7	A	7.5	A
		Westbound	8.5	A	8.1	A
		Northbound	9.8	A	9.4	A
		Southbound	9.7	A	8.7	A
26.	**East Palmer Road/Gunnell Road & Stokes Road**	Overall	9.8	A	9.5	A
		Westbound	8.7	A	8.6	A
		Northbound	10.5	B	10.1	B
		Southbound	9.0	A	8.9	A
27.	**AFRRI Driveway/Stokes Road & South Palmer Road**	Overall	9.7	A	9.5	A
		Eastbound	8.1	A	8.1	A
		Westbound	10.6	B	10.4	B
		Northbound	8.9	A	8.9	A
		Southbound	0.0	A	0.0	A
28.	**University Road/Grier Road & South Palmer Road**	Overall	8.8	A	8.7	A
		Eastbound	8.6	A	8.4	A
		Westbound	9.3	A	9.1	A
		Northbound	9.1	A	9.0	A
		Southbound	7.3	A	6.9	A
29.	**University Road & South Palmer Road**	Westbound	8.0	A	8.0	A
		Northbound	8.0	A	7.9	A
31.	**South Wood Road & South Palmer Road**	Southbound	9.2	A	---	---

Table 32B: 2018 Build Alternative 1 Internal Intersection Analysis

		PM Peak Hour				
			Build Alt. 1		*No Build Condition*	
		Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18.	**Parking Lot/R.B. Brown Drive & North Palmer Road**	Overall	15.9	C	16.5	C
		Eastbound	9.6	A	9.7	A
		Westbound	15.4	C	15.6	C
		Northbound	19.3	C	20.5	C
		Southbound	10.0	A	10.0	B
19.	**R.B. Brown Drive & America Garage/Garage 54 Exit**	Eastbound	*	F	*	F
		Westbound	*	F	*	F
		Northbound Left	0.6	A	0.6	A
20.	**R.B. Brown Drive & Garage 54 Entrance**	Overall	8.7	A	8.8	A
		Northbound	8.9	A	9.0	A
		Southbound	8.5	A	8.5	A
21.	**R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit**	Overall	11.1	B	11.3	B
		Westbound	10.7	B	10.9	B
		Northbound	9.4	A	9.5	A
		Southbound	12.1	B	12.3	B
22.	**R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance**	Overall	9.4	A	9.4	A
		Eastbound	7.8	A	7.8	A
		Northbound	8.2	A	8.3	A
		Southbound	10.0	A	10.0	B
23.	**R.B. Brown Drive & South Palmer Road**	Overall	12.2	B	10.6	B
		Eastbound	9.2	A	8.9	A
		Westbound	13.6	B	10.7	B
		Southbound	12.3	B	11.4	B
24.	**East Palmer Road & North Palmer Road/Taylor Road**	Overall	10.8	B	10.7	B
		Eastbound	10.4	B	10.0	B
		Westbound	11.4	B	11.4	B
		Northbound	10.7	B	10.7	B
25.	**East Palmer Road & Visitor Garage Exit/Rixey Road**	Overall	10.5	B	10.2	B
		Eastbound	8.5	A	8.4	A
		Westbound	9.9	A	9.8	A
		Northbound	9.8	A	9.7	A
		Southbound	11.5	B	11.0	B
26.	**East Palmer Road/Gunnell Road & Stokes Road**	Overall	15.1	C	15.0	B
		Westbound	16.1	C	16.0	C
		Northbound	11.8	B	11.5	B
		Southbound	16.3	C	16.2	C
27.	**AFRRI Driveway/Stokes Road & South Palmer Road**	Overall	12.5	B	10.7	B
		Eastbound	10.9	B	10.3	B
		Westbound	14.1	B	11.0	B
		Northbound	11.8	B	10.8	B
		Southbound	9.1	A	8.6	A
28.	**University Road/Grier Road & South Palmer Road**	Overall	17.9	C	12.5	B
		Eastbound	15.9	C	13.7	B
		Westbound	9.7	A	9.2	A
		Northbound	9.2	A	8.9	A
		Southbound	19.3	C	11.9	B
29.	**University Road & South Palmer Road**	Westbound	7.1	A	7.1	A
		Northbound	7.1	A	7.1	A
31.	**South Wood Road & South Palmer Road**	Southbound	10.2	B	---	---

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no Overall LOS identified.

Figure 37A: 2018 AM Peak Hour Build Alternative 1 Internal Intersection LOS

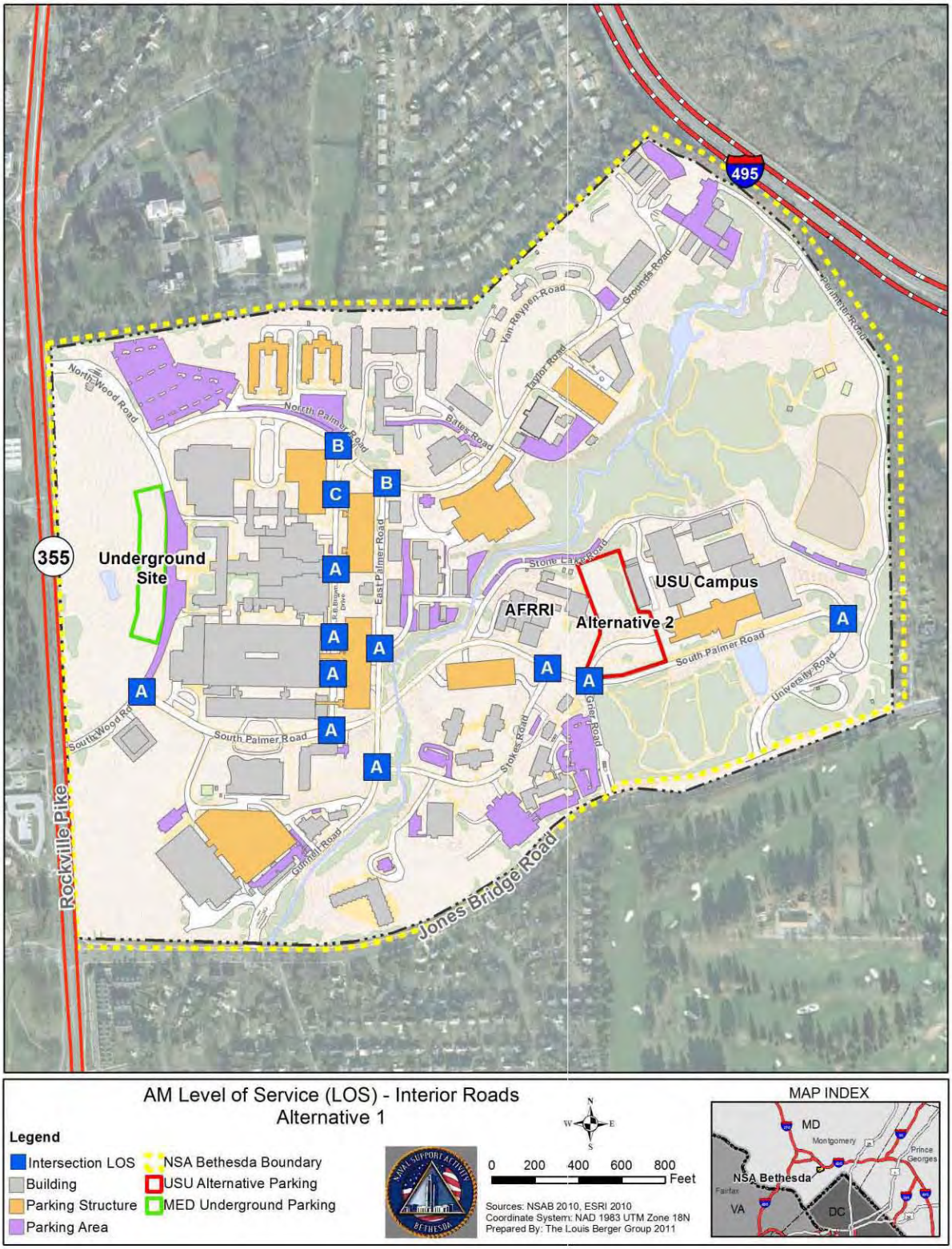
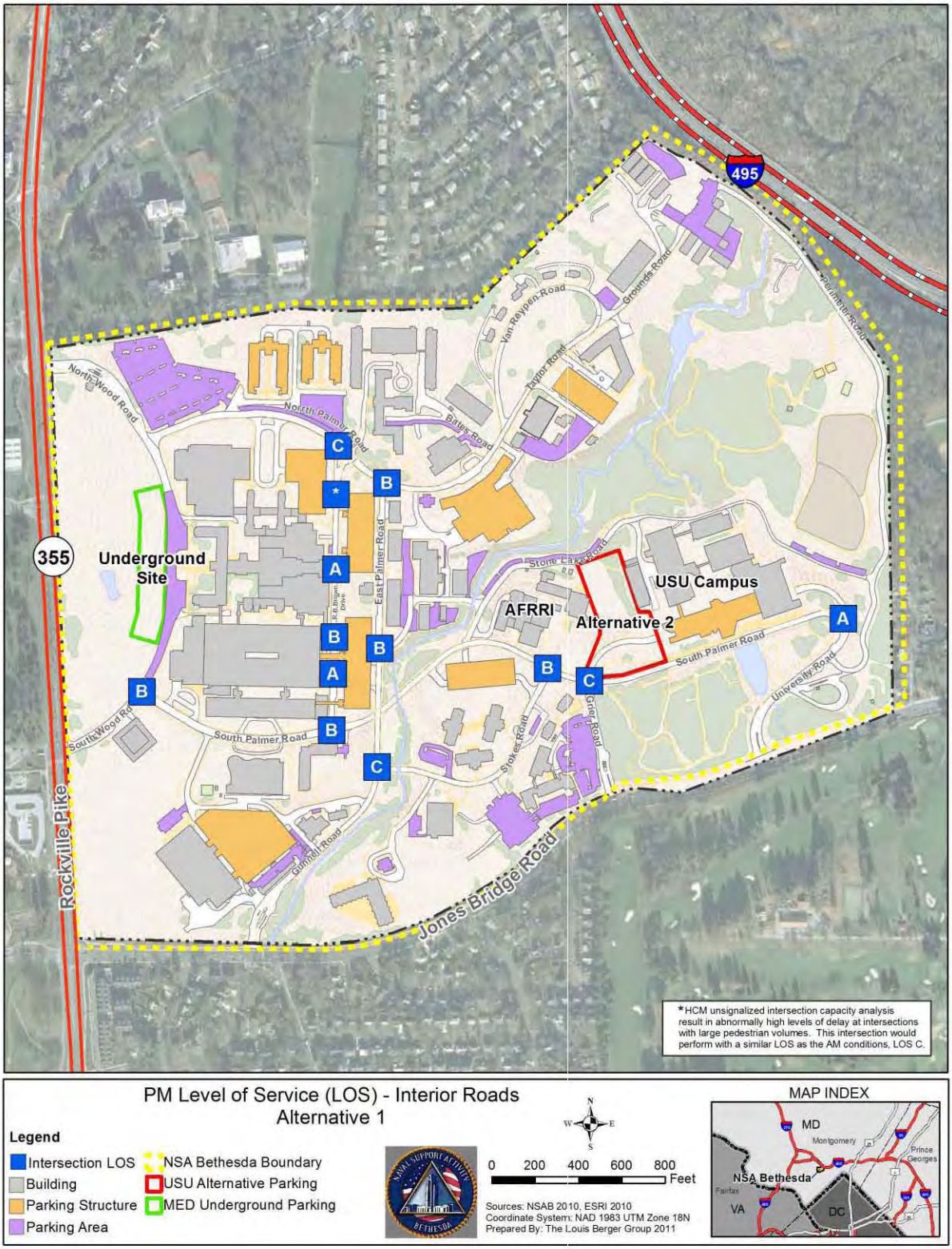


Figure 37B: 2018 PM Peak Hour Build Alternative 1 Internal Intersection LOS



3.2.4.6 Bicycle and Pedestrian Impacts

This alternative would include the placement of two new parking structures, resulting in increased pedestrian activity between the parking structures and destination buildings. The new underground parking structure would be located next to the main Medical Building with no significant impacts expected as pedestrians would be able to walk directly into Building 1 without crossing any roadways.

The new USU Alternative 2 parking structure would be placed next to the USU Campus; therefore, the only new pedestrian activity that would cross roadways would be the Medical Building Development trips (50 new employees) crossing two intersections, the South Palmer Road at Stokes Road and South Palmer Road at R.B. Brown Drive. This would result in 17 new pedestrian trips during the AM peak hour and 16 new pedestrian trips during the PM peak hour (see Table 27). These pedestrian trips are included in the internal HCM analysis in Tables 32A and 32B.

Existing 5-foot plus sidewalks connect the new parking structure serving Building F with the Medical Buildings via South Palmer Road. Based on the 270 new employees included in the trip generation, adequate existing sidewalks serving these pedestrian trips, and no significant vehicle LOS impacts due to the increased pedestrians, this alternative would have no pedestrian or bicycle significant impacts. Figure 38 shows the 2018 Build Alternative 1 sidewalk connections.

3.2.5 ***Build Alternative 2***

This alternative would include the construction of a new underground 500-space parking structure to serve Building C and the construction of a 400-space parking structure known as USU Alternative 2. The 500-space underground parking structure would be located between North and South Wood Roads, with the entrance and exit located in the existing G-Lot, which would result in a permanent loss of spaces, all access would be provided from North Palmer Road. Appendix D4 contains the proposed concept for this facility.

The new USU Alternative 2 parking structure would replace the existing N-Lot, with the entrance located on Stone Lake Road and two exits, one serving Stone Lake Road and the other connecting to the South Palmer Road and Grier Road intersection.

3.2.5.1 Trip Generation

The trips generated for this alternative would differ from Alternative 1 as the staff spaces lost in G-Lot would be relocated to the new USU Alternative 2 parking structure, thus reducing the net number of available spaces in this structure to 256, the result of 62 spaces transferred from N-Lot and 82 spaces from G-lot. Table 33 shows the 2018 Build Alternative 2 trip generation.

Figure 38: 2018 Build Alternative 1 Sidewalk Connections

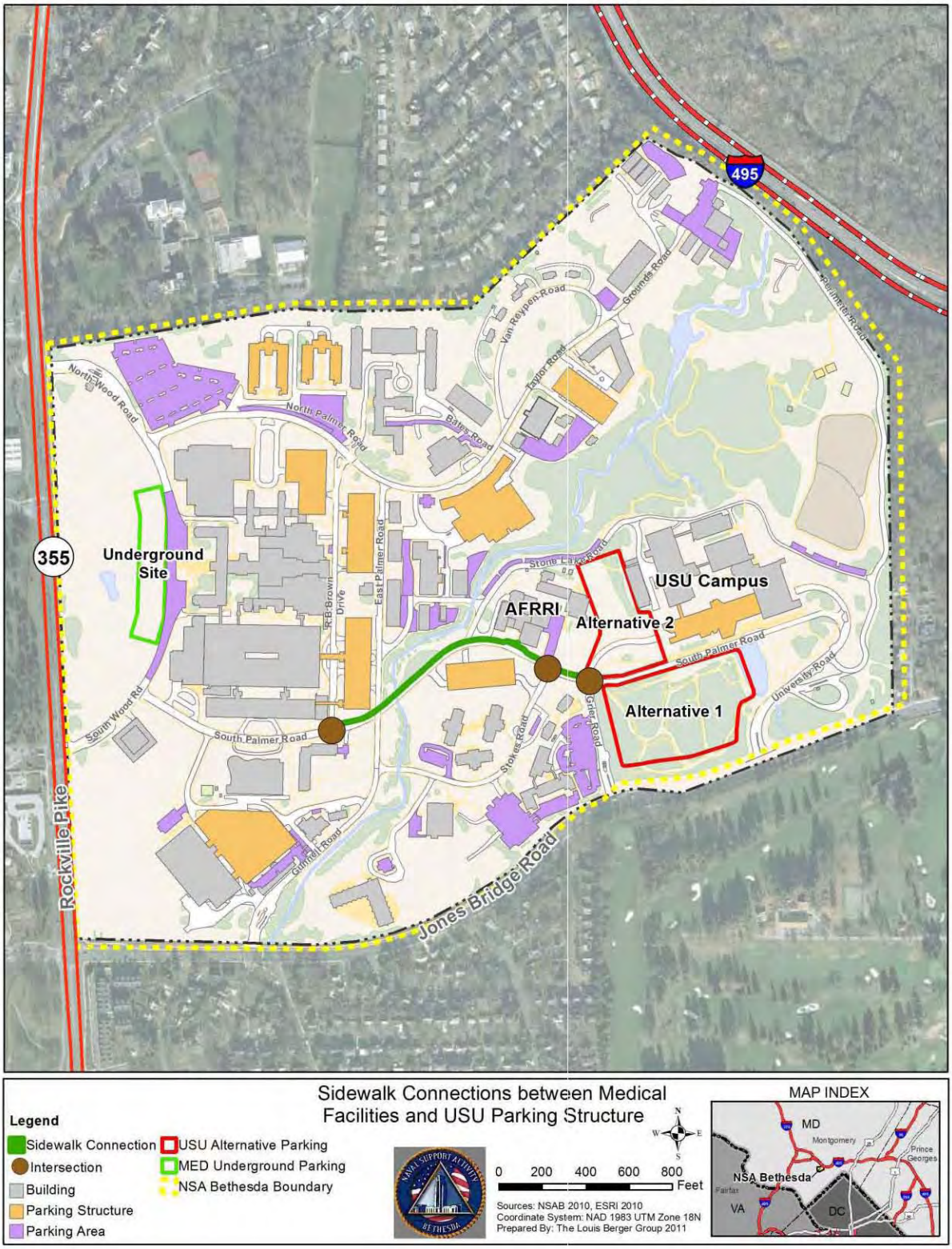


Table 33: 2018 Build Alternative 2 Trip Generation

	Facility Name	Employees	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
1	Medical Facilities Development	47#	11	4	15	5	11	16
2	University Expansion	209*	125	27	152	53	131	184
	Total	256	136	31	167	58	142	200

#ITE Land Use Code 610: Hospital
*ITE Land Use Code 550: University

3.2.5.2 Trip Distribution

The same assumptions from Alternative 1 would apply regarding the shift in existing patient trips from Buildings 55 and 63 to the new underground parking structure. Additionally, the same assumptions would apply for all new staff trips destined for the new USU Alternative 2 parking structure.

This alternative would include an additional shift over Alternative 1: the relocation of 82 staff spaces from G-Lot to the new USU Alternative 2 parking structure to make room for the new entrance and exit ramps serving the new underground parking facility. To determine this additional staff shift, the following assumptions were used:

- All existing staff spaces lost in G-Lot will be placed in another facility at the installation.
- Based on the proximity of G-Lot to Gate #1, all G-Lot users originate from the north along Rockville Pike.
- Building 54 houses just under double the number of parking spaces as G-Lot.
- Entering and exiting peak hour volumes from Building 54 would provide a reasonable starting point to calculate G-Lot peak hour use.
- G-Lot would lose 20 percent of its spaces

Based upon these assumptions, 305 staff enters Building 54 during the AM peak hour. Reducing that number by half or 153 and then further reducing that number by 80 percent, results in 31 inbound AM peak hour trips to relocate to the new 400-space parking facility. Following the same process, there would be 2 outbound trips also during the AM peak hour. For the PM peak hour, there would be 2 inbound and 13 outbound trips.

The Build Alternative 2 trip distribution would consist of combining the shift in patients from Buildings 55 and 63 to the new underground parking structure, the shift in staff trips from G-Lot to the new USU Alternative 2 parking structure, and the trips generated from the 256 new employee trips.

As is the case in Alternative 1, it is assumed that the existing 62-space N-Lot would be relocated into the new USU Alternative 2 parking structure, resulting in a shift of 18 (30 percent of N-Lot – same peak hour exiting percentage as adjacent USU parking facility) PM peak hour exiting trips from Stone Lake Road to the new ramp connecting to the South Palmer Road at Grier Road intersection.

The internal installation generated or shifted trips follow the updated trip distribution pattern based upon the 2008 NNMC Transportation Study (Figure 26). The distribution patterns for the shifted patient trips from Buildings 55 and 63 would continue to enter Gate #1 from Rockville Pike and proceed directly to the new underground parking facility through G-Lot. Patients leaving the new underground parking facility would exit through G-Lot, turn right onto North Palmer Road, turn right onto North Wood Road, exit through Gate #1, and turn right onto Rockville Pike. The result of these new distribution patterns would remove trips from R.B. Brown Drive and North Palmer Road, east of G-Lot.

During the AM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto North Wood Road, enter through Gate #1, turn left onto North Palmer Road, turn right onto East Palmer Road, turn left onto Rixey Road, and turn left onto Stone Lake Road.

- To the north: Turn right onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Rixey Road, and turn left onto Stone Lake Road.

- To the south: Turn left onto Stone Lake Road, turn right onto Rixey Road, turn left onto East Palmer Road, follow to Gunnell Road and exit through Gate #3, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and turn left onto Stone Lake Road.

- To the east: Turn left onto South Palmer Road, turn right onto University Road and exit though Gate #5, and turn left onto Jones Bridge Road.

During the PM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto North Wood Road, enter through Gate #1, turn left onto North Palmer Road, turn right onto East Palmer Road, turn left onto Rixey Road, and turn left onto Stone Lake Road.

- To the north: Turn right onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Rixey Road, and turn left onto Stone Lake Road.

- To the south: Go straight onto Grier Road and exit through Gate #4, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and turn left onto Stone Lake Road.

- To the east: Go straight onto Grier Road and exit through Gate #4, and turn left onto Jones Bridge Road.

Figures 39A, 39B, and 39C show the 2018 Build Alternative 2 trip distribution.

Figure 39A: 2018 Alternative 2 Trip Distribution

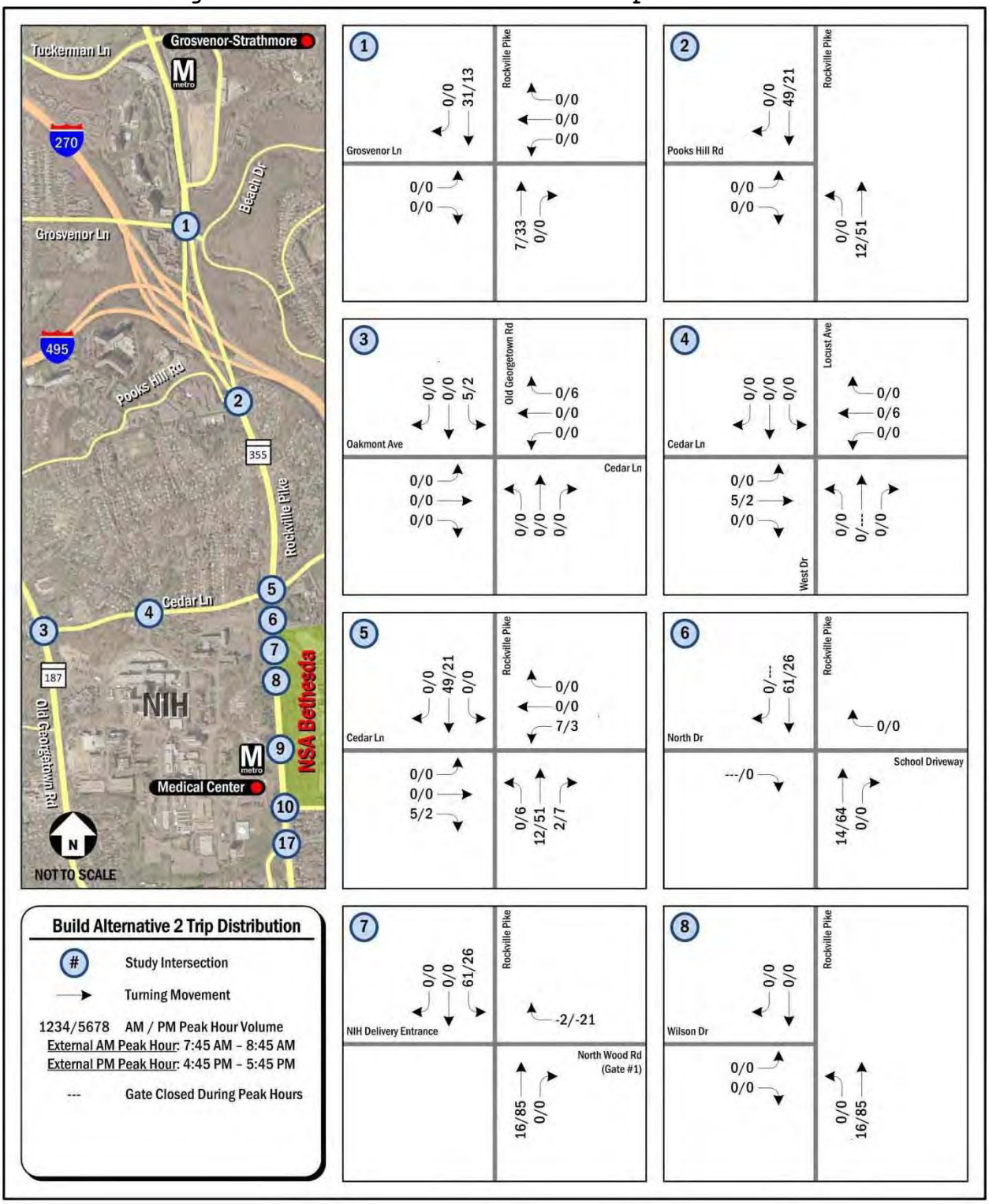


Figure 39B: 2018 Alternative 2 Trip Distribution

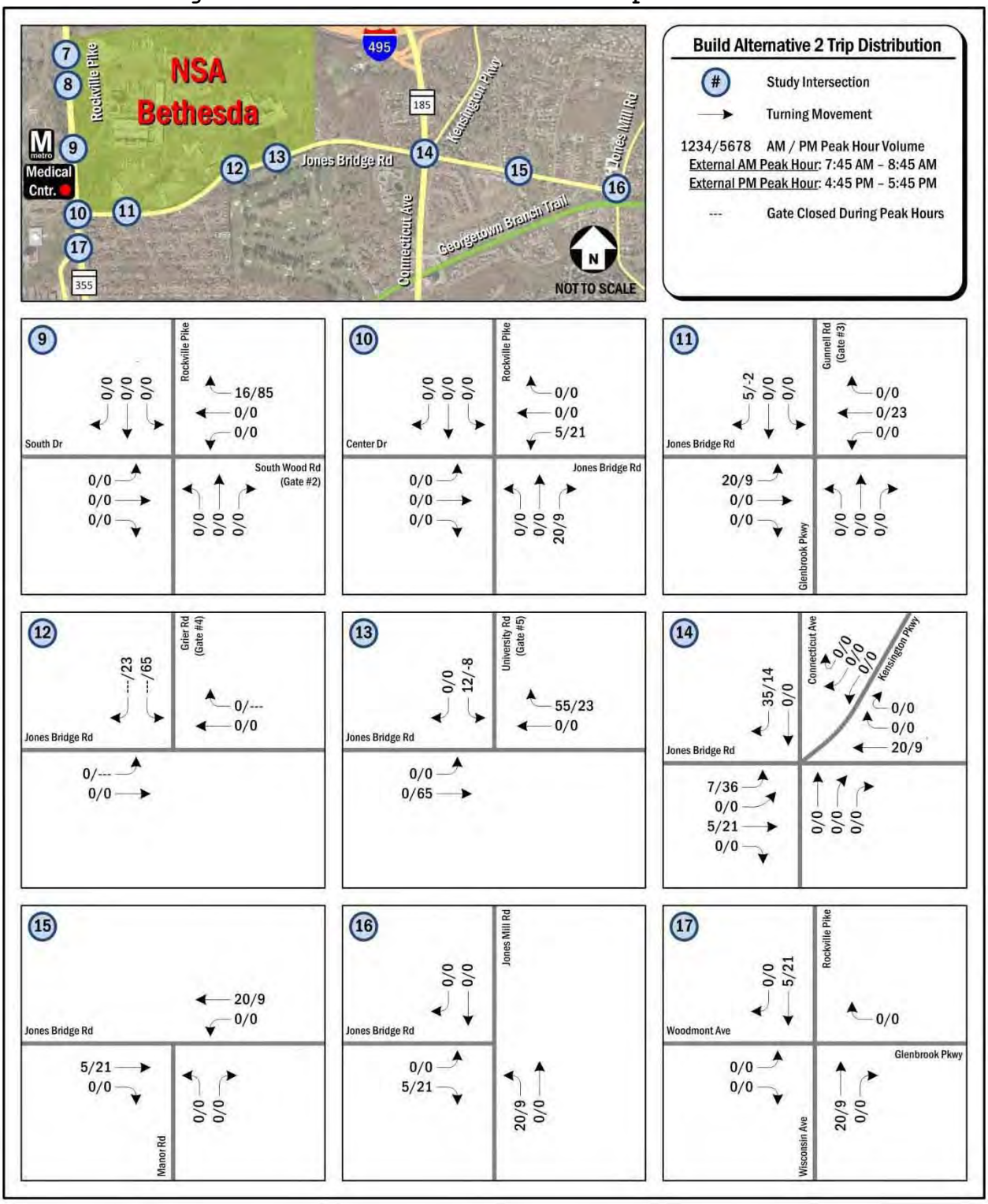
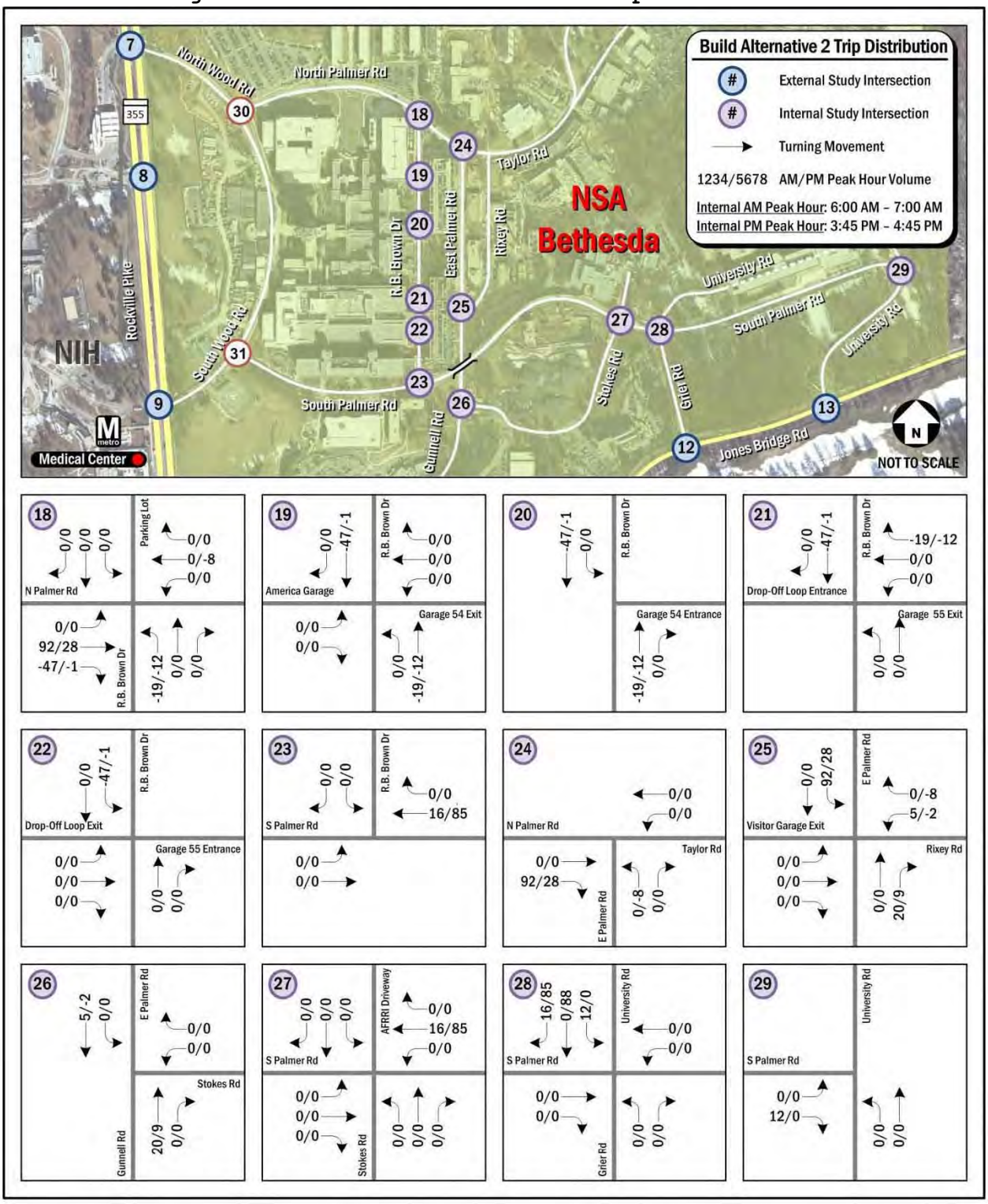


Figure 39C: 2018 Alternative 2 Trip Distribution



3.2.5.3 ***External Intersection Analysis***

The 2018 Build Alternative 2 includes all projects listed in the No Build condition, plus the addition of a new entrance and exit ramp

connecting from G-Lot to the new underground parking facility. The new exit ramp from the new USU Alternative 2 parking structure in N-Lot would add more trips to the existing ramp connecting to South Palmer Road at Grier Road intersection.

Critical Lane Volume Analysis

The CLV analysis was conducted for the 16 external signalized intersections to compare to the No Build condition. According to the analysis, the #12 Jones Bridge Road at Grier Road (Gate #4) intersection would change from a LOS of B to C during the PM peak hour. Based upon these results, the external signalized intersections would have no significant traffic impacts from implementing Alternative 2. Table 34 shows the 2018 Build Alternative 2 CLV external analysis. Figures 40A and 40B show the 2018 Build Alternative 2 CLV intersection LOS.

Table 34: 2018 Build Alternative 2 CLV External Intersection Analysis

		Build Alternative 2				No Build Condition			
		AM Peak Hr.		*PM Peak Hr.*		*AM Peak Hr.*		*PM Peak Hr.*	
		CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS
1.	**Rockville Pike & Grosvenor Lane**	1,385	D	1,340	D	1,373	D	1,336	D
2.	**Rockville Pike & Pooks Hill Road**	1,358	D	1,398	D	1,343	D	1,379	D
3.	**Old Georgetown Road & Oakmont Avenue/Cedar Lane**	1,437	D	1,538	E	1,437	D	1,536	E
4.	**Locust Avenue/West Drive & Cedar Lane**	465	A	941	A	489	A	939	A
5.	**Rockville Pike & Cedar Lane**	1,553	E	1,242	C	1,529	E	1,236	C
6.	**Rockville Pike & North Drive/School Driveway**	*un-signalized*		*un-signalized*		*un-signalized*		*un-signalized*	
7.	**Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)**	910	A	1,057	B	843	A	1,033	B
8.	**Rockville Pike & Wilson Drive**	958	A	975	A	958	A	948	A
9.	**Rockville Pike & South Drive/South Wood Road (Gate #2)**	1,137	B	1,124	B	1,121	B	1,039	B
10.	**Rockville Pike & Center Drive/Jones Bridge Road**	718	A	819	A	715	A	808	A
11.	**Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road**	821	A	1,051	B	801	A	1,024	B
12.	**Grier Road (Gate #4) & Jones Bridge Road**	692	A	1,169	C	692	A	1,104	B
13.	**University Road (Gate #5) & Jones Bridge Road**	747	A	1,058	B	729	A	1,023	B
14.	**Connecticut Avenue & Jones Bridge Road & Kensington Parkway**	1,504	E	1,754	F	1,490	E	1,735	F
15.	**Manor Road & Jones Bridge Road**	759	A	1,030	B	739	A	1,009	B
16.	**Jones Bridge Road & Jones Mill Road**	1,059	B	1,083	B	1,039	B	1,062	B
17.	**Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway**	773	A	942	A	771	A	938	A

Figure 40A: 2018 AM Peak Hour Build Alternative 2 CLV Intersection LOS

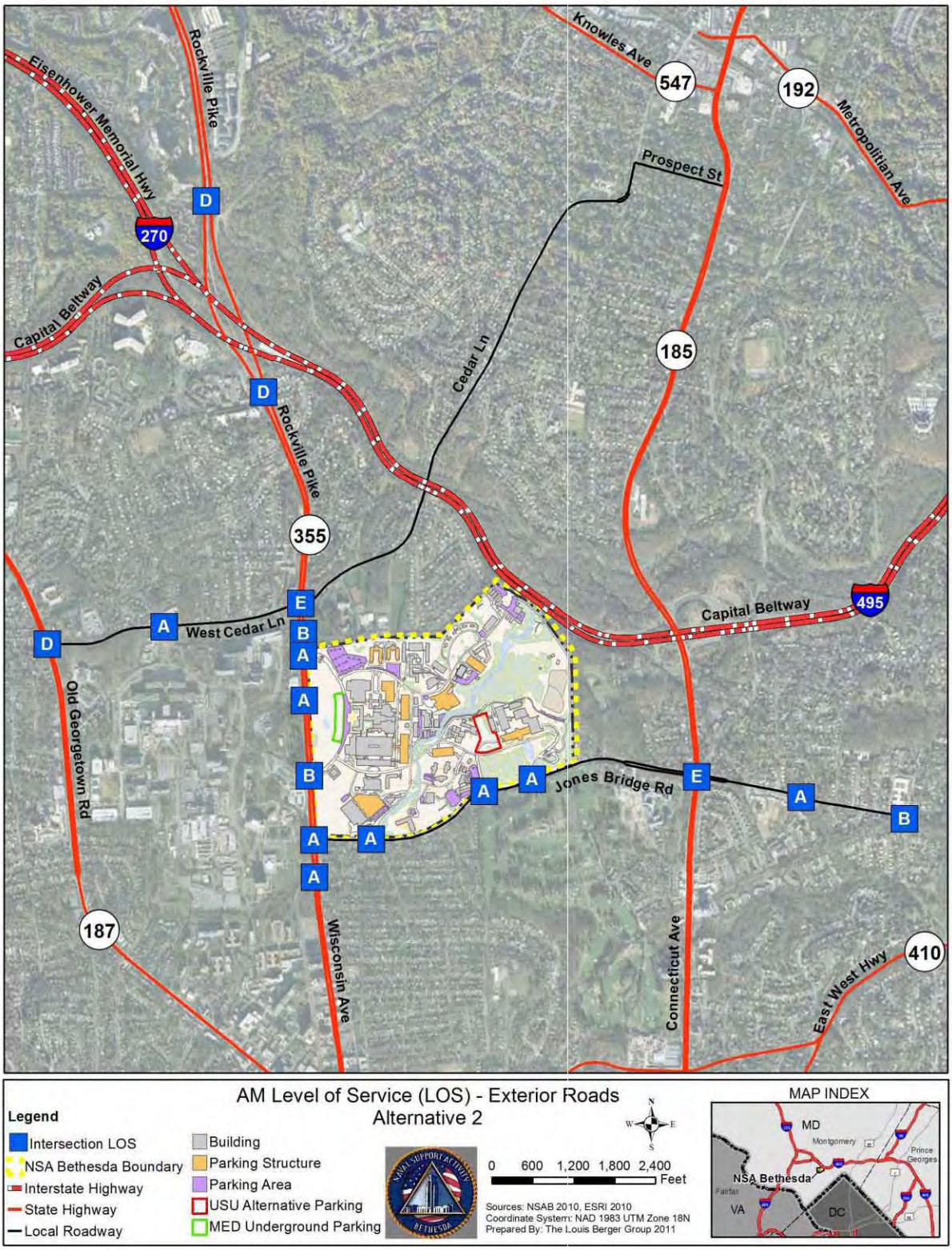
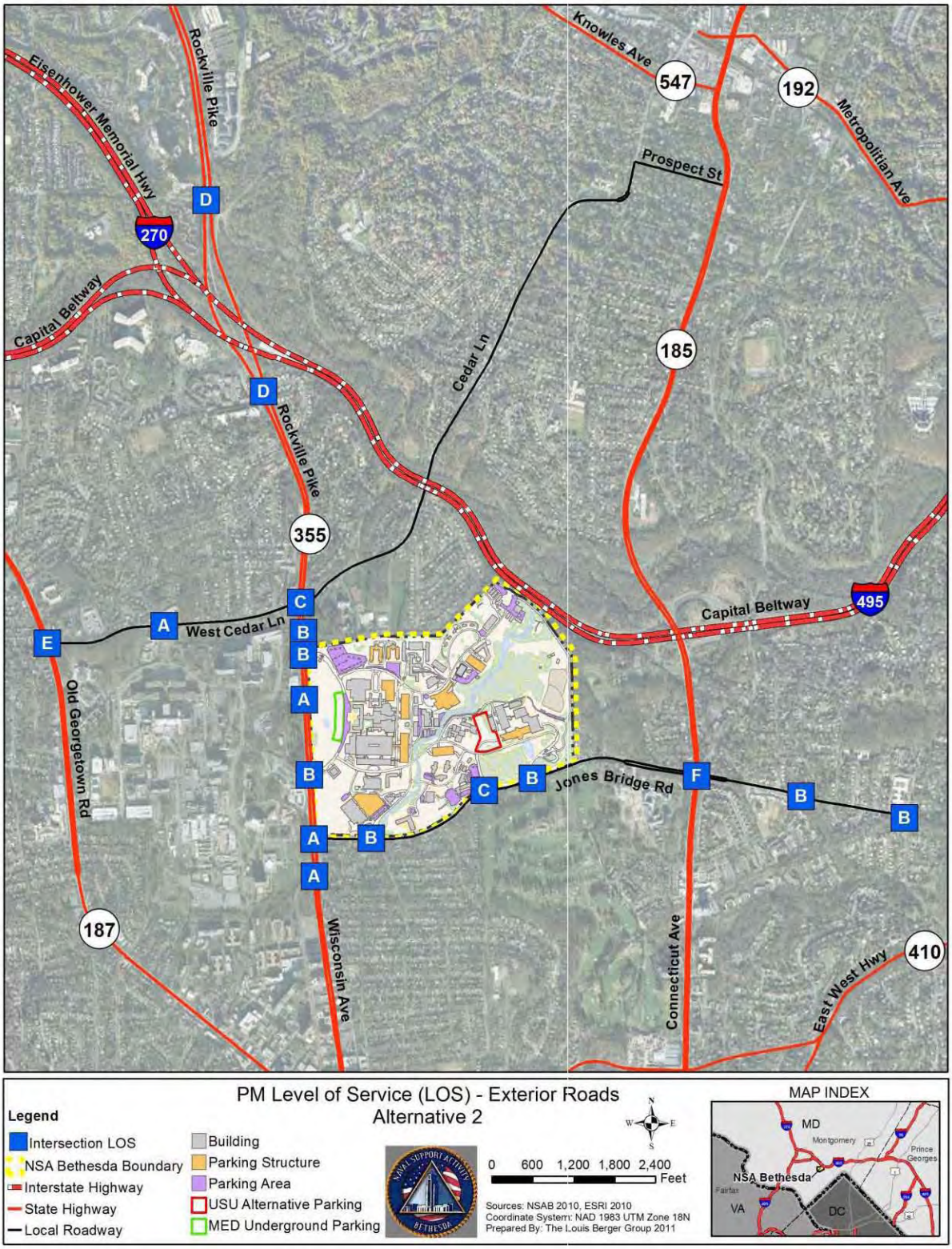


Figure 40B: 2018 PM Peak Hour Build Alternative 2 CLV Intersection LOS



Highway Capacity Manual Intersection Analysis

The HCM analysis was conducted as a secondary comparison to the CLV analysis between the No Build condition and Build Alternatives for the external intersections. When comparing Build Alternative 2 with the No Build condition, the AM peak hour did not experience any change in LOS. For the PM peak hour, LOS changes would occur at intersection #2 Rockville Pike at Pooks Hill Road (C to D), #9 Rockville Pike at South Wood Road (Gate #2) (B to C), and #15 Jones Bridge Road at Manor Road (B to C). Since the CLV process was not used to evaluate unsignalized intersections, HCM analysis was used to provide a No Build condition comparison for intersection #6 Rockville Pike at North Drive/School Driveway, which showed no significant impacts. Tables 35A and 35B show the 2018 Build Alternative 2 HCM external analysis.

3.2.5.4 Arterial Analysis

Arterial analysis was performed for Rockville Pike, West Cedar Lane, and Jones Bridge Road, comparing the alternative to the No Build condition. The greatest change between the No Build condition and Build Alternative 2 was a 3 percent increase along Rockville Pike northbound and Jones Bridge Road eastbound during the PM peak hour. Based upon this analysis, Alternative 2 would not require PAMR-RAM external intersection mitigation. Tables 36 and 37 show the 2018 Build arterial analyses.

Table 35A: 2018 AM Peak Hour Build Alternative 2 HCM External Analysis

	HCM Analysis	AM Peak Hour					
		Alternative 2			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	47.1	1.03	D	45.6	1.02	D
	Eastbound	69.8		E	69.8		E
	Westbound	70.3		E	70.3		E
	Northbound	15.4		B	15.4		B
	Southbound	46.4		D	43.2		D
2. Rockville Pike & Pooks Hill Road	Overall	223.0	1.64	F	219.9	1.63	F
	Eastbound	83.4		F	83.4		F
	Northbound	341.2		F	335.9		F
	Southbound	21.9		C	21.3		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.5	0.89	B
	Eastbound	23.9		C	23.9		C
	Westbound	37.4		D	37.4		D
	Northbound	14.1		B	14.1		B
	Southbound	18.5		B	18.5		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.3	0.40	B	15.2	0.39	B
	Eastbound	19.8		B	19.6		B
	Westbound	11.8		B	11.8		B
	Northbound	14.7		B	14.7		B
	Southbound	15.1		B	15.1		B
5. Rockville Pike & Cedar Lane	Overall	43.9	1.00	D	41.8	0.98	D
	Eastbound	86.5		F	82.1		F
	Westbound	62.7		E	61.1		E
	Northbound	14.5		B	14.4		B
	Southbound	42.2		D	39.3		D
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.8		B	11.7		B
	Westbound	9.8		A	9.8		A
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.3	0.62	A	7.8	0.62	A
	Westbound	21.1		C	21.2		C
	Northbound	18.7		B	18.3		B
	Southbound	3.8		A	3.2		A
8. Rockville Pike & Wilson Drive	Overall	2.1	0.59	A	2.1	0.59	A
	Eastbound	60.9		E	60.9		E
	Northbound	1.9		A	1.9		A
	Southbound	0.8		A	0.8		A
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	13.1	0.76	B	12.7	0.76	B
	Eastbound	67.1		E	63.5		E
	Westbound	52.7		D	52.1		D
	Northbound	13.2		B	13.2		B
	Southbound	6.5		A	6.6		A
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	32.8	0.85	C	32.3	0.84	C
	Eastbound	54.3		D	54.3		D
	Westbound	99.6		F	97.3		F
	Northbound	17.8		B	18.0		B
	Southbound	6.9		A	6.9		A

Table 35A: 2018 AM Peak Hour Build Alternative 2 HCM External Analysis (continued)

	HCM Analysis	AM Peak Hour					
		Alternative 2			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	12.8	0.64	B	12.3	0.63	B
	Eastbound	3.5		A	3.3		A
	Westbound	15.5		B	14.7		B
	Northbound	22.0		C	22.0		C
	Southbound	24.5		C	24.5		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	4.6	0.53	A	3.8	0.51	A
	Eastbound	2.5		A	2.1		A
	Westbound	5.7		A	4.7		A
	Southbound	0.0		A	0.0		A
13. University Road (Gate #5) & Jones Bridge Road	Overall	7.6	0.55	A	6.4	0.51	A
	Eastbound	5.1		A	4.5		A
	Westbound	8.1		A	7.1		A
	Southbound	24.3		C	24.6		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	51.9	1.04	D	49.4	1.01	D
	Eastbound	58.4		E	55.7		E
	Westbound	44.5		D	42.2		D
	Northbound	24.0		C	24.0		C
	Southbound	62.9		E	58.9		E
	Southwestbound	82.6		F	82.6		F
15. Manor Road & Jones Bridge Road	Overall	15.6	0.57	B	15.1	0.56	B
	Eastbound	18.1		B	18.0		B
	Westbound	16.0		B	15.3		B
	Northbound	10.8		B	10.8		B
16. Jones Bridge Road & Jones Mill Road	Overall	45.1	0.77	D	42.3	0.76	D
	Eastbound	30.5		C	30.2		C
	Northbound	53.2		D	46.8		D
	Southbound	46.5		D	46.5		D
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	19.3	0.71	B	19.5	0.71	B
	Eastbound	48.7		D	48.7		D
	Westbound	41.2		D	41.2		D
	Northbound	5.5		A	5.4		A
	Southbound	3.3		C	3.3		C

Note: Intersections with only two-way stops have no overall LOS identified.

Table 35B: 2018 PM Peak Hour Build Alternative 2 HCM External Analysis

	HCM Analysis	PM Peak Hour					
		Alternative 2			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density (Veh/ hr)	LOS
1. Rockville Pike & Grosvenor Lane	Overall	60.1	1.01	E	58.9	1.01	E
	Eastbound	48.4		D	48.4		D
	Westbound	88.7		F	88.7		F
	Northbound	30.9		C	30.3		C
	Southbound	72.0		E	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	35.7	1.01	D	33.1	0.99	C
	Eastbound	65.4		E	65.4		E
	Northbound	40.5		D	35.7		D
	Southbound	23.7		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.2	0.84	B	19.1	0.83	B
	Eastbound	31.9		C	31.9		C
	Westbound	37.2		D	37.3		D
	Northbound	20.2		C	20.2		C
	Southbound	13.3		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	30.4	0.73	C	30.2	0.73	C
	Eastbound	39.9		D	39.5		D
	Westbound	7.5		A	7.5		A
	Northbound	24.8		C	24.8		C
	Southbound	26.7		C	26.7		C
5. Rockville Pike & Cedar Lane	Overall	38.2	0.97	D	36.4	0.97	D
	Eastbound	57.4		E	57.4		E
	Westbound	65.5		E	63.5		E
	Northbound	30.4		C	26.5		C
	Southbound	31.9		C	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.1		B	11.0		B
	Westbound	10.7		B	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.5	0.72	A	8.6	0.70	A
	Westbound	39.3		D	39.9		D
	Northbound	10.1		B	9.9		A
	Southbound	1.0		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	12.8	0.63	B	12.3	0.63	B
	Eastbound	44.6		D	44.6		D
	Northbound	6.3		A	4.8		A
	Southbound	10.5		B	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	25.1	0.83	C	18.7	0.72	B
	Eastbound	134.4		F	52.8		D
	Westbound	37.5		D	35.8		D
	Northbound	14.0		B	13.5		B
	Southbound	16.7		B	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	60.4	0.95	E	59.9	0.94	E
	Eastbound	58.1		E	58.2		E
	Westbound	43.1		D	42.8		D
	Northbound	78.3		E	78.3		E
	Southbound	46.7		D	45.4		D

Table 35B: 2018 PM Peak Hour Build Alternative 2 HCM External Analysis (continued)

	HCM Analysis	PM Peak Hour					
		Alternative 2			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density (Veh/ hr)	LOS	Delay	Density (Veh/ hr)	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.3	0.75	B	14.0	0.75	B
	Eastbound	11.2		B	11.2		B
	Westbound	14.2		B	12.9		B
	Northbound	13.8		B	13.8		B
	Southbound	23.9		C	23.9		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	17.8	0.84	B	13.6	0.79	B
	Eastbound	13.3		B	12.1		B
	Westbound	5.3		A	5.2		A
	Southbound	47.8		D	32.7		C
13. University Road (Gate #5) & Jones Bridge Road	Overall	14.2	0.69	B	10.7	0.67	B
	Eastbound	15.8		B	11.2		B
	Westbound	9.3		A	9.3		A
	Southbound	20.1		C	21.0		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	70.6	1.10	E	68.7	1.10	E
	Eastbound	100.3		F	92.8		F
	Westbound	118.8		F	119.7		F
	Northbound	76.1		E	76.1		E
	Southbound	18.8		B	18.9		B
	Southwestbound	126.1		F	126.1		F
15. Manor Road & Jones Bridge Road	Overall	21.3	0.73	C	19.7	0.71	B
	Eastbound	31.8		C	28.9		C
	Westbound	4.1		A	3.7		A
	Northbound	21.9		C	21.9		C
16. Jones Bridge Road & Jones Mill Road	Overall	24.3	0.72	C	23.5	0.71	C
	Eastbound	12.9		B	13.0		B
	Northbound	40.9		D	38.5		D
	Southbound	20.0		C	20.0		C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	12.7	0.70	B	12.6	0.69	B
	Eastbound	12.8		B	12.8		B
	Westbound	9.2		A	9.2		A
	Northbound	18.3		B	18.1		B
	Southbound	7.9		A	7.8		A

Note: Intersections with only two-way stops have no overall LOS identified.

Table 36: 2018 AM Peak Hour Build Alternative 2 Arterial Analysis

		AM Peak Hour						
		Alt 2			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	11.4	11:30	E	11.5	11:25	E	1%
	Southbound	20.7	6:30	C	21.1	6:22	C	2%
Jones Bridge Road	Eastbound	20.6	5:0	C	20.7	4:59	C	0%
	Westbound	16.7	6:9	D	17.1	6:1	D	2%
West Cedar Lane	Eastbound	15.4	2:49	D	15.4	2:49	D	0%
	Westbound	16.9	2:34	D	16.9	2:34	D	0%

Table 37: 2018 PM Peak Hour Build Alternative 2 Arterial Analysis

		PM Peak Hour						
		Alt 2			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	15.6	8:24	D	16.0	8:11	D	3%
	Southbound	17.5	7:40	D	17.7	7:36	D	1%
Jones Bridge Road	Eastbound	16.6	6:12	D	17.1	6:2	D	3%
	Westbound	16.5	6:14	D	16.7	6:12	D	1%
West Cedar Lane	Eastbound	12.8	3:24	E	12.8	3:23	E	0%
	Westbound	17.4	2:30	D	17.4	2:30	D	0%

3.2.5.5 Internal Intersection Analysis

This alternative includes the addition of a new exit ramp from the New USU parking facility in N-Lot and would add more trips to the existing ramp connecting to South Palmer Road at Grier Road intersection.

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal intersections. Similar to Alternative 1, the #26 East Palmer Road at Stokes Road and #28 South Palmer Road at Grier Road intersections would change from a LOS B to C. The #28 intersection change would result from the new trips exiting the new USU Alternative 2 parking structure. The change at the #26 intersection would be due to the No Build condition vehicle delay calculated at the highest delay before placing the LOS into the C range. Based on this analysis, there would be no significant impact to the internal roadway intersections for this alternative. Tables 38A and 38B show the 2018 Build Alternative 2 internal intersection analysis and Figures 41A and 41B show the 2018 Build Alternative 2 internal intersection LOS.

Table 38A: 2018 Build Alternative 2 Internal Intersection Analysis

		AM Peak Hour			
		Build Alt. 2		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	11.8	B	10.3	B
	Eastbound	12.9	B	10.9	B
	Westbound	8.7	A	8.7	A
	Northbound	8.8	A	9.0	A
	Southbound	9.7	A	9.6	A
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	16.1	C	17.6	C
	Westbound	12.3	B	12.8	B
	Northbound Left	3.5	A	3.1	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	9.7	A	10.5	B
	Northbound	8.7	A	9.2	A
	Southbound	10.5	B	11.5	B
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	8.8	A	9.1	A
	Westbound	8.2	A	8.1	A
	Northbound	9.2	A	9.4	A
	Southbound	8.2	A	8.8	A
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	9.5	A	9.7	A
	Eastbound	7.9	A	8.1	A
	Northbound	9.9	A	10.1	B
	Southbound	8.5	A	9.0	A
23. R.B. Brown Drive & South Palmer Road	Overall	9.8	A	9.8	A
	Eastbound	10.3	B	10.3	B
	Westbound	8.9	A	8.7	A
	Southbound	9.2	A	9.1	A
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	10.7	B	9.6	A
	Eastbound	11.4	B	10.0	A
	Westbound	8.8	A	8.6	A
	Northbound	10.0	A	9.5	A
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	9.9	A	9.0	A
	Eastbound	7.8	A	7.5	A
	Westbound	8.6	A	8.1	A
	Northbound	9.9	A	9.4	A
	Southbound	10.2	B	8.7	A
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	9.8	A	9.5	A
	Westbound	8.7	A	8.6	A
	Northbound	10.4	B	10.1	B
	Southbound	9.0	A	8.9	A
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	9.7	A	9.5	A
	Eastbound	8.1	A	8.1	A
	Westbound	10.6	B	10.4	B
	Northbound	8.9	A	8.9	A
	Southbound	0.0	A	0.0	A
28. University Road/Grier Road & South Palmer Road	Overall	8.8	A	8.7	A
	Eastbound	8.6	A	8.4	A
	Westbound	9.3	A	9.1	A
	Northbound	9.1	A	9.0	A
	Southbound	7.3	A	6.9	A
29. University Road & South Palmer Road	Westbound	8.0	A	8.0	A
	Northbound	8.0	A	7.9	A

Table 38B: 2018 Build Alternative 2 Internal Intersection Analysis

		PM Peak Hour			
		Build Alt. 2		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	15.9	C	16.5	C
	Eastbound	10.1	B	9.7	A
	Westbound	15.2	C	15.6	C
	Northbound	19.7	C	20.5	C
	Southbound	10.1	B	10.0	B
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	*	F	*	F
	Westbound	*	F	*	F
	Northbound Left	0.6	A	0.6	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.7	A	8.8	A
	Northbound	8.9	A	9.0	A
	Southbound	8.5	A	8.5	A
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	11.1	B	11.3	B
	Westbound	10.7	B	10.9	B
	Northbound	9.4	A	9.5	A
	Southbound	12.1	B	12.3	B
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	9.4	A	9.4	A
	Eastbound	7.8	A	7.8	A
	Northbound	8.2	A	8.3	A
	Southbound	10.0	A	10.0	B
23. R.B. Brown Drive & South Palmer Road	Overall	12.5	B	10.6	B
	Eastbound	9.2	A	8.9	A
	Westbound	14.1	B	10.7	B
	Southbound	12.4	B	11.4	B
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	10.8	B	10.7	B
	Eastbound	10.4	B	10.0	B
	Westbound	11.4	B	11.4	B
	Northbound	10.7	B	10.7	B
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	10.5	B	10.2	B
	Eastbound	8.5	A	8.4	A
	Westbound	9.9	A	9.8	A
	Northbound	9.8	A	9.7	A
	Southbound	11.5	B	11.0	B
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	15.1	C	15.0	B
	Westbound	16.1	C	16.0	C
	Northbound	11.8	B	11.5	B
	Southbound	16.3	C	16.2	C
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	12.8	B	10.7	B
	Eastbound	10.9	B	10.3	B
	Westbound	14.8	B	11.0	B
	Northbound	11.9	B	10.8	B
	Southbound	9.1	A	8.6	A
28. University Road/Grier Road & South Palmer Road	Overall	17.7	C	12.5	B
	Eastbound	15.9	C	13.7	B
	Westbound	9.7	A	9.2	A
	Northbound	9.2	A	8.9	A
	Southbound	19.0	C	11.9	B
29. University Road & South Palmer Road	Westbound	7.1	A	7.1	A
	Northbound	7.1	A	7.1	A

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no Overall LOS identified.

Figure 41A: 2018 AM Peak Hour Build Alternative 2 Internal Intersection LOS

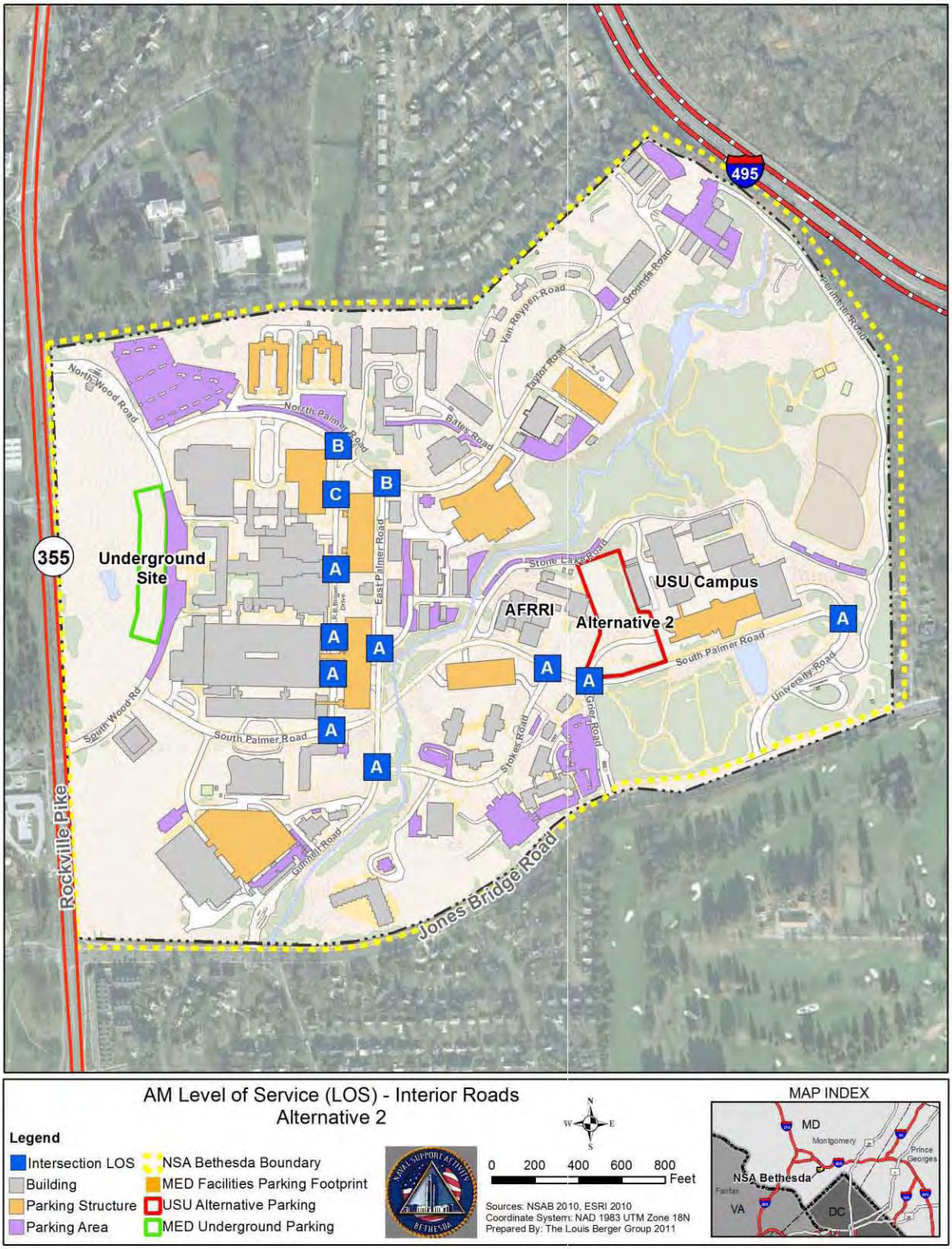
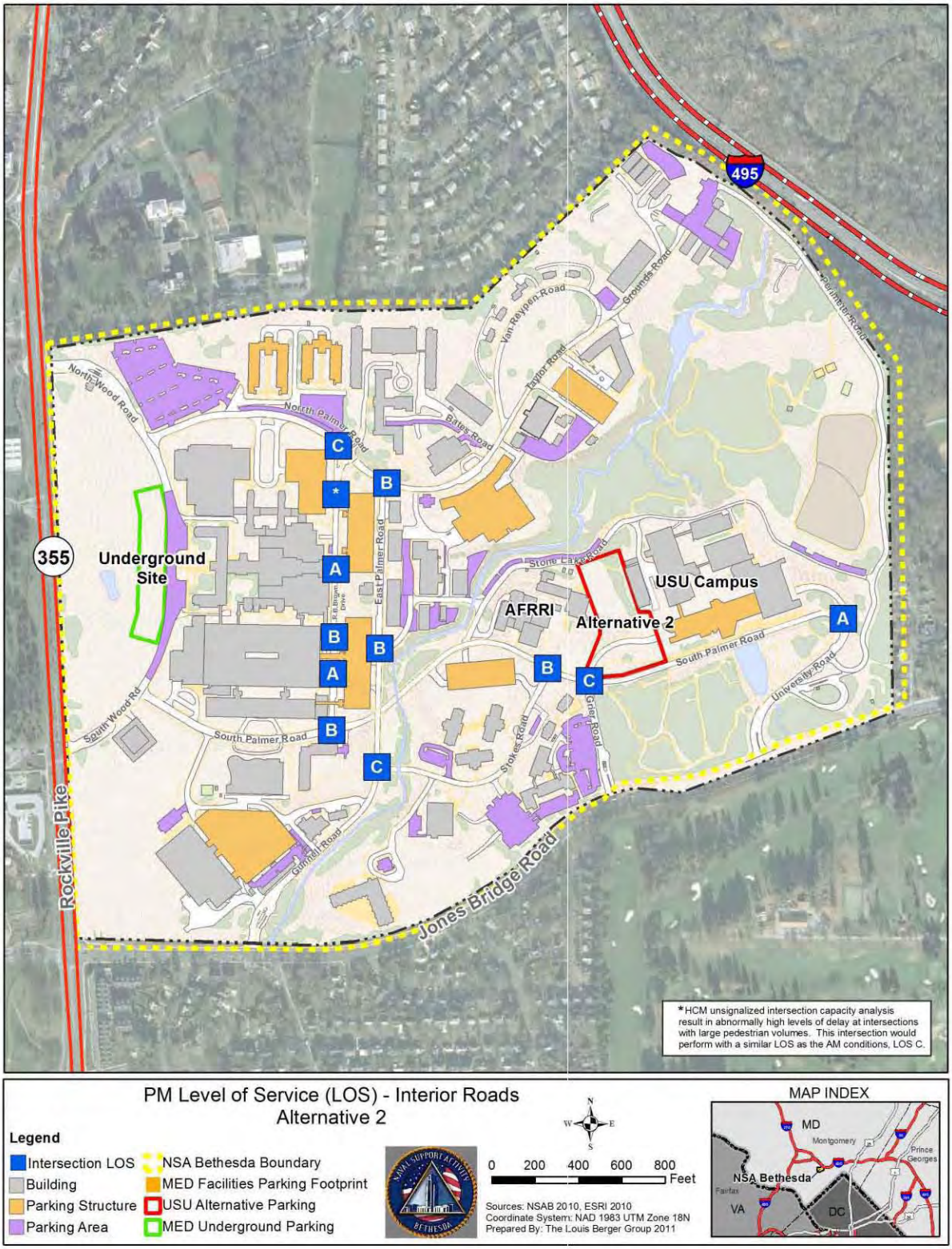


Figure 41B: 2018 PM Peak Hour Build Alternative 2 Internal Intersection LOS



3.2.5.6 Bicycle and Pedestrian Impacts

This alternative would include the placement of two new parking structures, resulting in increased pedestrian activity between the parking structures and destination buildings. The new underground parking structure would be located next to the main Medical Building with no significant impacts expected as pedestrians would be able to walk directly into the building without crossing any roadways.

The new USU Alternative 2 parking structure would be placed next to the USU Campus; therefore, the new pedestrian activity created from these trips would cross roadways en route to the Medical Building (47 new employees plus the G-Lot shifted staff) crossing two intersections, the South Palmer Road at Stokes Road and South Palmer Road at Brown Drive. This would result in 48 new pedestrian trips during the AM peak hour and 31 new pedestrian trips during the PM peak hour. These pedestrian trips are included in the internal HCM analysis in Tables 38A and 38B.

Existing 5-foot plus sidewalks connect the new parking structure serving Building F with the Medical Buildings via South Palmer Road. Any other new pedestrian or bicycle activity generated from the 14 employees not included in the original Alternative 2 trip generation would be able to use the new Metro tunnel connecting the Medical Center Metro station with the Gate #2 entrance or park their bicycle at any of the four bike storage racks serving the Medical Facility or two racks serving the USU. Based on the No Build condition, including the existing bicycle racks and sidewalks, this alternative would have no pedestrian or bicycle impacts. Figure 38 shows the sidewalk connections for this Build Alternative.

3.2.6 ***Build Alternative 3***

This alternative would include the construction of a new 500-space parking structure in the industrial/warehouse area to serve Building C and the construction of a 400-space parking structure known as USU Alternative 2. The 500-space parking structure would be located north of Grounds Road, adjacent to the existing New Lot-Z, with the entrance and exit ramps connecting to Grounds Road. Appendix D4 contains the proposed layout for this facility.

The new USU Alternative 2 parking structure would replace the existing N-Lot, with the entrance located on Stone Lake Road and two exits, one serving Stone Lake Road and the other connecting to the South Palmer Road and Grier Road intersection.

3.2.6.1 Trip Generation

The trips generated for this alternative would be the same as Alterative 1, see Section 3.2.4.1.

3.2.6.2 Trip Distribution

The new parking structure serving Building C would shift existing staff trips from Buildings 54 and 55 to the new parking structure in the industrial/warehouse area and the new USU Alternative 2 parking structure in N-Lot. The new staff trips generated from the Buildings C and F would be destined for the new USU Alternative 2 parking structure in N-Lot.

Since 500 new parking spaces must be made available for patients and 17 spaces from Z-lot would be shifted to the new warehouse facility, 483 staff spaces would be moved to the new warehouse facility (392 from Building 55 and 91 from Building 54), thus filling the facility to capacity (17 Z-Lot spaces plus 483 spaces). The remaining 17 staff spaces that must be relocated to provide 500 new patient spaces would come from Building 54 and would be moved to the new USU Alternative 2 parking structure in N-Lot.

To determine the number of staff trips that would be shifted to the new warehouse parking structure, the study uses the following assumptions:

- All existing staff spaces that are removed from one facility will be placed in another facility at the installation.

- Staff will continue to have set patterns and drive to the closest parking facility available, based upon their daily arrival time. If they arrive later in the morning, they would automatically drive to the warehouse parking facility.

- The percentage of spaces reassigned to patient parking in Building 54 would be 14 percent, the percentage of staff spaces (108) relocated compared to the total spaces housed in the structure (749).

- The number of AM and PM peak trips shifted would be 14 percent of the peak hour trips currently using the facility.

- Based on the patient temporal distribution (Figure 33), 15 percent of patients arrive during the AM peak hour and 6 percent leave during the same period, while 0.5 percent would arrive during the PM peak hour and 4 percent leave.

- The percentage of staff entering and exiting Building 55 during the peak hours would be the inverse of the patient percentages (85 percent/94 percent during the AM peak hour and 99.5 percent/96 percent during the PM peak hour).

- The 17 spaces lost in the Z-lot would be shifted to the new warehouse parking facility.

Based upon these assumptions, the number of trips shifted from Building 54 during the AM peak hour would be 43 staff (14 percent of 305) inbound and 3 staff (14 percent of 19) outbound. For the PM peak, 3 staff (14 percent of 19) inbound and 18 (14 percent of 126) would be shifted. In Building 55, the staff shifted would be based on the fifth bullet above, resulting in 208 (85 percent of 245) inbound and 40 outbound (94 percent of 43) during the AM peak hour and 30 (99.5 percent of 30) inbound and 254 (96 percent of 265) during the PM peak hour. Table 39 shows the trip distribution shift between Buildings 54 and 55 to the proposed warehouse parking structure.

Table 39: Trip Distribution shift between Buildings 54 and 55 to the Proposed Warehouse Parking Structure

	Facility Name	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
1	Building 54	43	3	46	3	18	21
2	Building 55	208	40	248	31	254	285
	Total	251	43	294	34	272	306

Based upon these assumptions, the split between the two new parking structures would be 3 percent of the trips from Buildings 54 and 55 headed to the USU Alternative 2 parking structure in N-Lot and 97 percent headed to the new parking structure in the warehouse area. Table 40 shows the trip distribution from both Buildings 54 and 55 to the proposed parking structures in the warehouse area and N-Lots.

Table 40: Trip Distribution from both Building 54 and 55 to the Proposed Parking Structures in the Warehouse Area and USU Alterntive 2

	Facility Name	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
1	Warehouse Structure	243	42	285	33	264	297
2	USU Alternative 2 Structure	8	1	9	1	8	9
	Total	251	43	294	34	272	306

The Build Alternative 3 trip distribution would consist of combining the shift in staff from Buildings 54 and 55 to both new parking structures, and the trips generated from the 270 new employee trips destined for the new USU Alternative 2 parking structure.

As assumed in the previous alternatives, the existing 62-space N-Lot would be relocated into the new USU Alternative 2 parking structure, resulting in a shift of 18 (30 percent of N-Lot – same peak hour exiting percentage as adjacent USU parking facility) PM peak hour exiting trips from Stone Lake Road to the new ramp connecting to the South Palmer Road at Grier Road intersection. In addition, the existing 17-spaces in Z-Lot would be relocated into the new warehouse facility, resulting in no additional trips added or removed.

The internal installation generated or shifted trips follow the updated trip distribution pattern based upon the 2008 NNMC

Transportation Study (Figure 26). The distribution patterns for the shifted staff trips from Buildings 54 and 55 would follow the following paths:

- From the north: Continue past R.B. Brown Drive on North Palmer Road, then continue onto Taylor Road/Grounds Road.
- To the north: Turn right into Grounds Road/Taylor Road, then continue straight on North Palmer Road past R.B. Brown Drive.
- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, and turn right onto Taylor Road/Grounds Road.
- To the south: Turn right onto Grounds Road/Taylor Road, then turn left onto East Palmer Road, follow to Gunnell Road and exit through Gate #3, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.
- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and follow through to Grounds Road.
- To the east: Turn left onto Grounds Road, Follow onto Perimeter Road, then turn left onto University Road, exit though Gate #5, and turn left onto Jones Bridge Road.

The result of these new distribution patterns would remove trips from R.B. Brown Drive and South Palmer Road, and Rockville Pike between South Wood Road and Jones Bridge Road.

During the AM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto North Wood Road, enter through Gate #1, turn left onto North Palmer Road, turn right onto East Palmer Road, turn left onto Rixey Road, and turn left onto Stone Lake Road.
- To the north: Turn right onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.
- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Rixey Road, and turn left onto Stone Lake Road.

- To the south: Turn left onto Stone Lake Road, turn right onto Rixey Road, turn left onto East Palmer Road, follow to Gunnell Road and exit through Gate #3, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and turn left onto Stone Lake Road.

- To the east: Turn left onto South Palmer Road, turn right onto University Road and exit though Gate #5, and turn left onto Jones Bridge Road.

During the PM peak hour, staff new trips would follow the following paths:

- From the north: Turn left onto North Wood Road, enter through Gate #1, turn left onto North Palmer Road, turn right onto East Palmer Road, turn left onto Rixey Road, and turn left onto Stone Lake Road.

- To the north: Turn right onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Rixey Road, and turn left onto Stone Lake Road.

- To the south: Go straight onto Grier Road and exit through Gate #4, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and turn left onto Stone Lake Road.

- To the east: Go straight onto Grier Road and exit through Gate #4, and turn left onto Jones Bridge Road.

Figures 42A, 42B, and 42C show the 2018 Build Alternative 3 trip distribution.

Figure 42A: 2018 Alternative 3 Trip Distribution

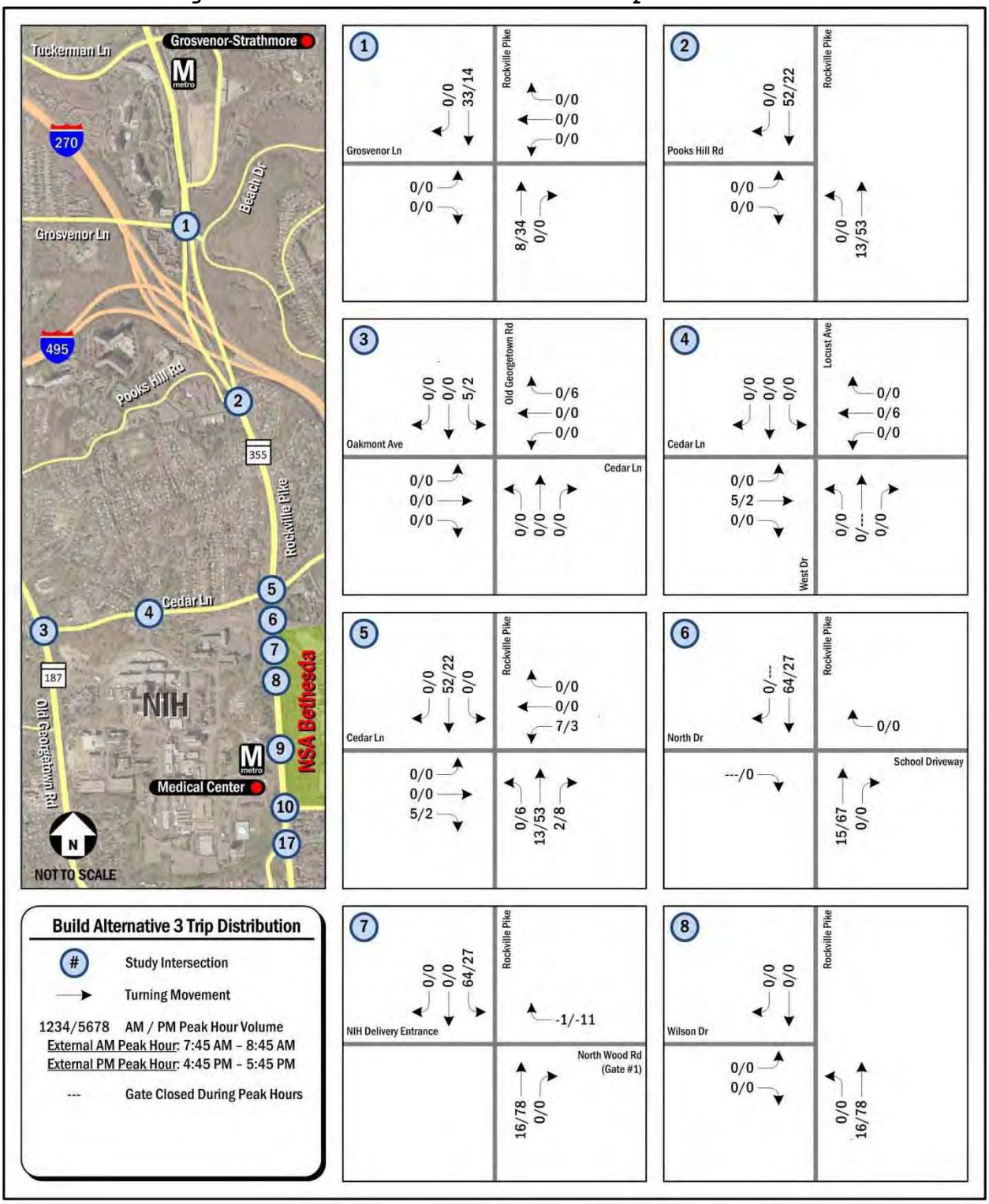


Figure 42B: 2018 Alternative 3 Trip Distribution

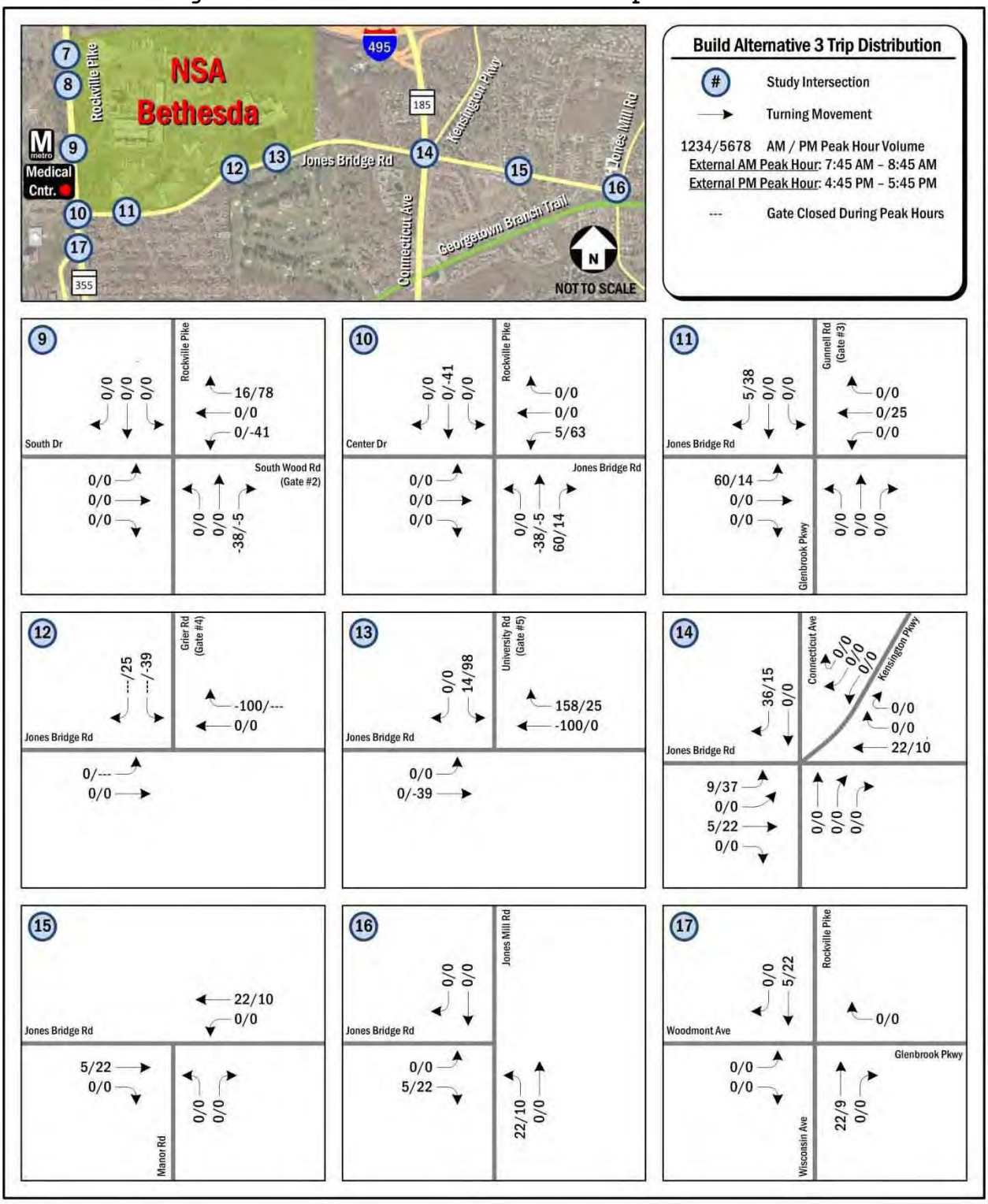
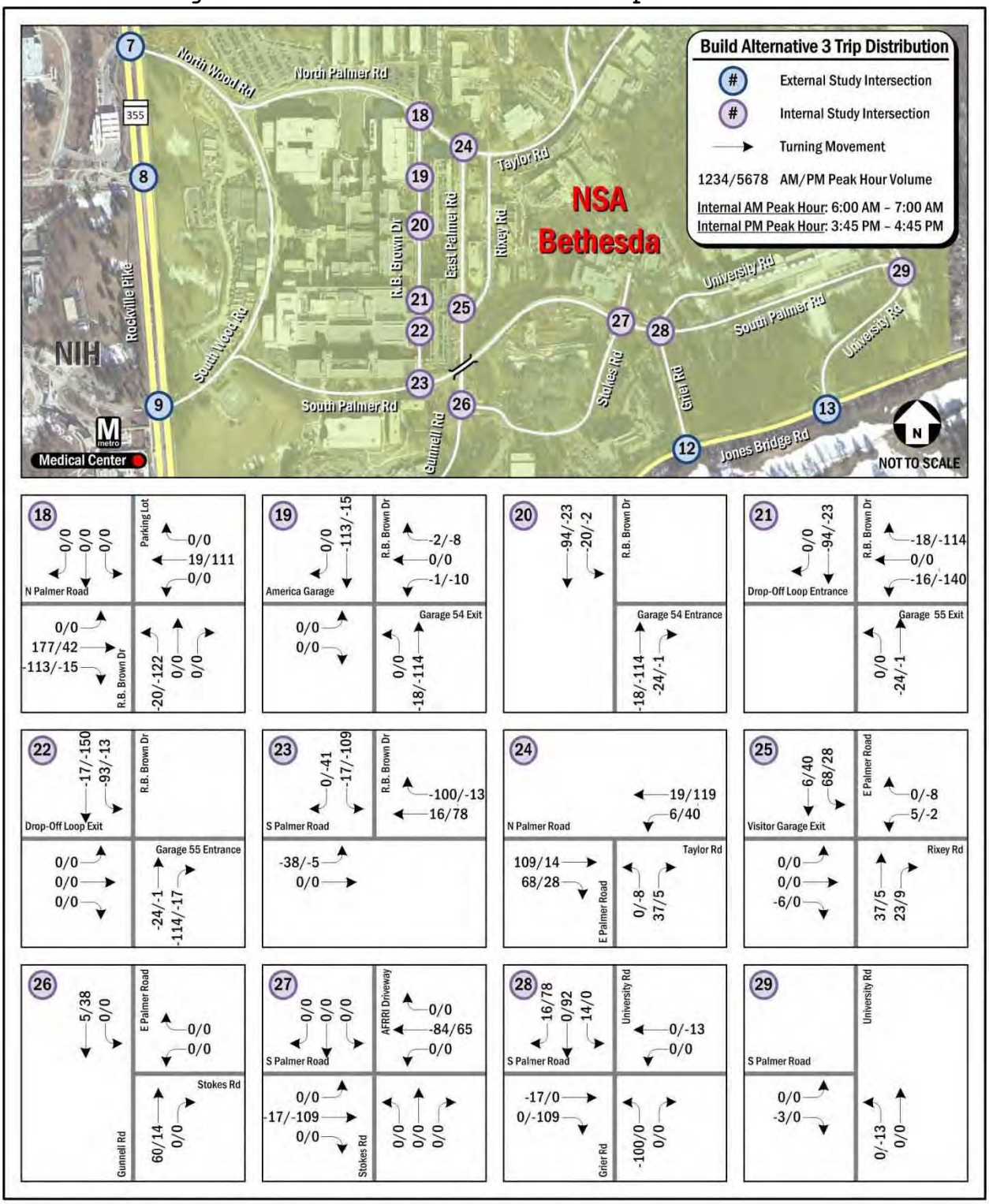


Figure 42C: 2018 Alternative 3 Trip Distribution



3.2.6.3 External Intersection Analysis

The 2018 Build Alternative 3 includes all projects listed in the No Build condition. The addition of a new exit ramp from the New USU Alternative 2 parking structure in N-Lot would add more trips to the existing ramp connecting to South Palmer Road at Grier Road intersection. Figure 29C shows the 2018 Build Alternatives 2 through 5 and 7 through 10 internal lane utilization and traffic control.

Critical Lane Volume Analysis

The CLV analysis was conducted for the 16 external signalized intersections to compare to the No Build condition. According to the analysis, there would no changes in LOS between the Alternative 3 and the No Build condition for either peak hour. Based upon these results, the external signalized intersections would have no significant traffic impacts from implementing Alternative 3. Table 41 shows the 2018 Build Alternative 3 CLV analysis for the external intersection compared to the No Build condition. Figures 43A and 43B show the 2018 Build Alternative 3 CLV intersection LOS.

Table 41: 2018 Build Alternative 3 CLV External Analysis

		Build Alternative 3				No Build Condition			
		AM Peak Hr.		*PM Peak Hr.*		*AM Peak Hr.*		*PM Peak Hr.*	
		CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS
1.	**Rockville Pike & Grosvenor Lane**	1,385	D	1,341	D	1,373	D	1,336	D
2.	**Rockville Pike & Pooks Hill Road**	1,359	D	1,399	D	1,343	D	1,379	D
3.	**Old Georgetown Road & Oakmont Avenue/Cedar Lane**	1,437	D	1,538	E	1,437	D	1,536	E
4.	**Locust Avenue/West Drive & Cedar Lane**	465	A	941	A	489	A	939	A
5.	**Rockville Pike & Cedar Lane**	1,554	E	1,242	C	1,529	E	1,236	C
6.	**Rockville Pike & North Drive/School Driveway**	*un-signalized*		*un-signalized*		*un-signalized*		*un-signalized*	
7.	**Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)**	913	A	1,058	B	843	A	1,033	B
8.	**Rockville Pike & Wilson Drive**	958	A	972	A	958	A	948	A
9.	**Rockville Pike & South Drive/South Wood Road (Gate #2)**	1,137	B	1,117	B	1,121	B	1,039	B
10.	**Rockville Pike & Center Drive/Jones Bridge Road**	704	A	840	A	715	A	808	A
11.	**Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road**	861	A	1,056	B	801	A	1,024	B
12.	**Grier Road (Gate #4) & Jones Bridge Road**	692	A	1,065	B	692	A	1,104	B
13.	**University Road (Gate #5) & Jones Bridge Road**	696	A	1,106	B	729	A	1,023	B
14.	**Connecticut Avenue & Jones Bridge Road & Kensington Parkway**	1,507	E	1,755	F	1,490	E	1,735	F
15.	**Manor Road & Jones Bridge Road**	761	A	1,031	B	739	A	1,009	B
16.	**Jones Bridge Road & Jones Mill Road**	1,061	B	1,084	B	1,039	B	1,062	B
17.	**Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway**	773	A	942	A	771	A	938	A

Highway Capacity Manual Intersection Analysis

The HCM analysis was conducted as a secondary comparison to the CLV analysis between the No Build condition and Build Alternatives for the external intersections. When comparing Build Alternative 3 with the No Build condition, the AM peak hour did not experience any change in LOS. For the PM peak hour, LOS changes would occur at intersection #2 Rockville Pike at Pooks Hill Road (C to D), #9 Rockville Pike at South Wood Road (Gate #2) (B to C), and #15 Jones Bridge Road at Manor Road (B to C). Since the CLV process was not used to evaluate unsignalized intersections, HCM analysis was used to provide a No Build condition comparison for intersection #6 Rockville Pike at North Drive/School Driveway, which showed no significant impacts. Tables 42A and 42B show the 2018 Build Alternative 3 HCM external analysis.

Figure 43A: 2018 AM Peak Hour Build Alternative 3 CLV Intersection LOS

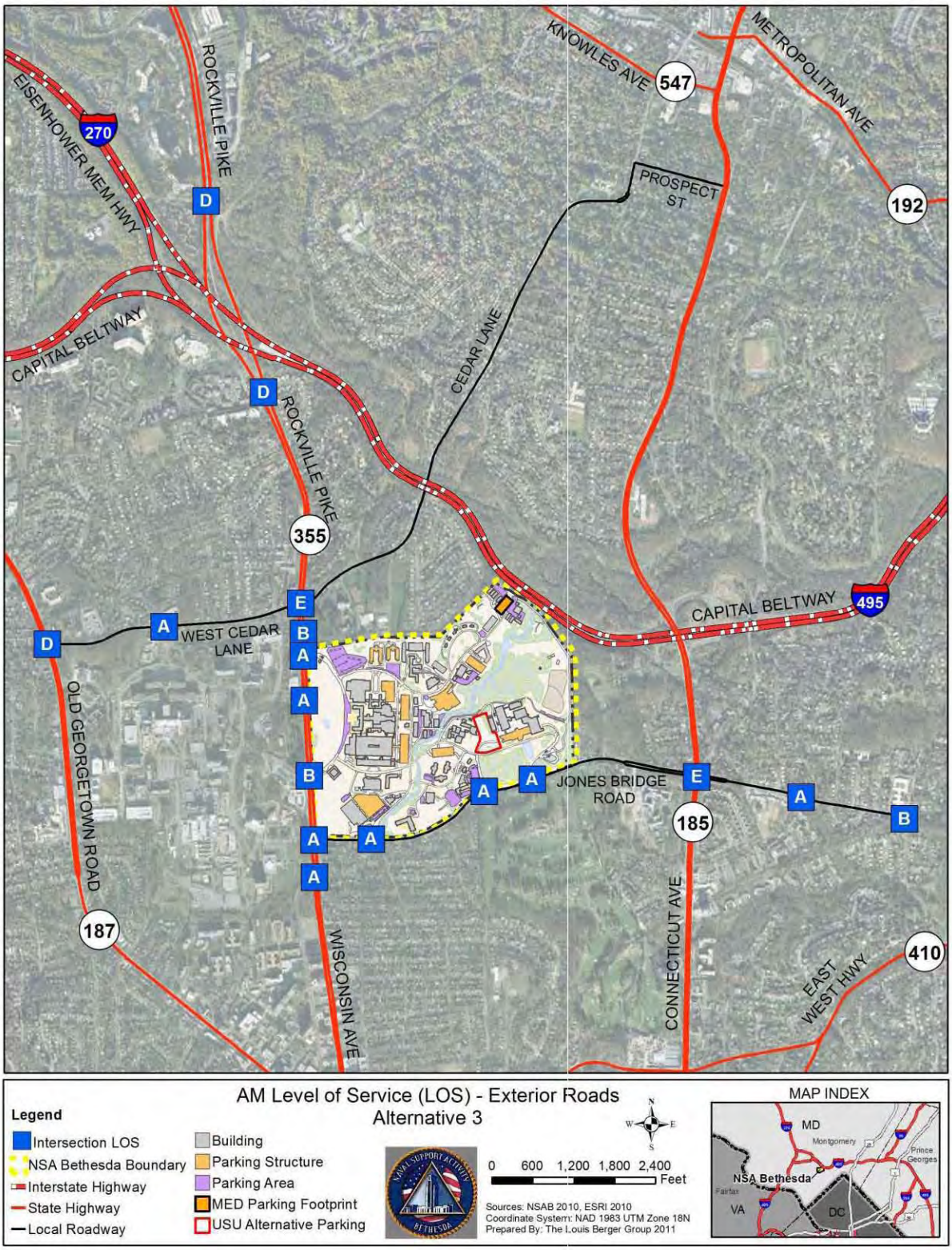


Figure 43B: 2018 PM Peak Hour Build Alternative 3 CLV Intersection LOS

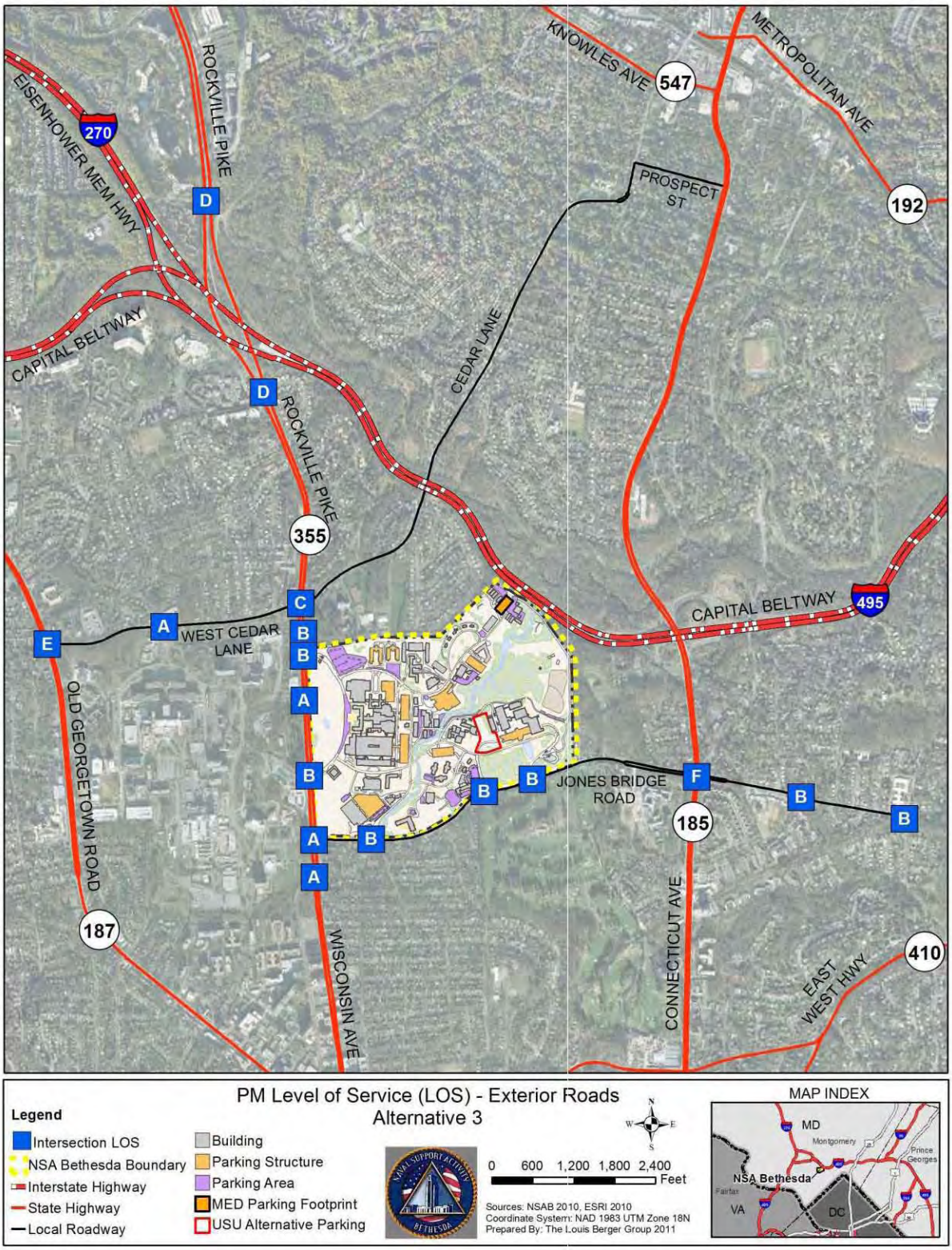


Table 42A: 2018 AM Peak Hour Build Alternative 3 HCM External Analysis

	HCM Analysis	AM Peak Hour					
		Alternative 3			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	47.2	1.03	D	45.6	1.02	D
	Eastbound	69.8		E	69.8		E
	Westbound	70.3		E	70.3		E
	Northbound	15.4		B	15.4		B
	Southbound	46.6		D	43.2		D
2. Rockville Pike & Pooks Hill Road	Overall	223.2	1.64	F	219.9	1.63	F
	Eastbound	83.4		F	83.4		F
	Northbound	341.6		F	335.9		F
	Southbound	22.0		C	21.3		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.5	0.89	B
	Eastbound	23.9		C	23.9		C
	Westbound	37.4		D	37.4		D
	Northbound	14.1		B	14.1		B
	Southbound	18.5		B	18.5		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.3	0.40	B	15.2	0.39	B
	Eastbound	19.8		B	19.6		B
	Westbound	11.8		B	11.8		B
	Northbound	14.7		B	14.7		B
	Southbound	15.1		B	15.1		B
5. Rockville Pike & Cedar Lane	Overall	44.1	1.00	D	41.8	0.98	D
	Eastbound	86.5		F	82.1		F
	Westbound	62.7		E	61.1		E
	Northbound	14.6		B	14.4		B
	Southbound	42.4		D	39.3		D
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.8		B	11.7		B
	Westbound	9.8		A	9.8		A
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.3	0.62	A	7.8	0.62	A
	Westbound	21.2		C	21.2		C
	Northbound	18.6		B	18.3		B
	Southbound	3.9		A	3.2		A
8. Rockville Pike & Wilson Drive	Overall	2.1	0.59	A	2.1	0.59	A
	Eastbound	60.9		E	60.9		E
	Northbound	1.9		A	1.9		A
	Southbound	0.8		A	0.8		A
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	13.0	0.76	B	12.7	0.76	B
	Eastbound	67.1		E	63.5		E
	Westbound	52.7		D	52.1		D
	Northbound	12.8		B	13.2		B
	Southbound	6.5		A	6.6		A
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	32.5	0.84	C	32.3	0.84	C
	Eastbound	54.3		D	54.3		D
	Westbound	99.6		F	97.3		F
	Northbound	17.4		B	18.0		B
	Southbound	6.6		A	6.9		A

Table 42A: 2018 AM Peak Hour Build Alternative 3 HCM External Analysis (continued)

	HCM Analysis	AM Peak Hour					
		Alternative 3			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.0	0.64	B	12.3	0.63	B
	Eastbound	3.8		A	3.3		A
	Westbound	17.5		B	14.7		B
	Northbound	22.0		C	22.0		C
	Southbound	24.5		C	24.5		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	4.5	0.53	A	3.8	0.51	A
	Eastbound	2.5		A	2.1		A
	Westbound	5.6		A	4.7		A
	Southbound	0.0		A	0.0		A
13. University Road (Gate #5) & Jones Bridge Road	Overall	7.3	0.52	A	6.4	0.51	A
	Eastbound	5.1		A	4.5		A
	Westbound	7.5		A	7.1		A
	Southbound	24.3		C	24.6		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	52.1	1.04	D	49.4	1.01	D
	Eastbound	59.4		E	55.7		E
	Westbound	44.7		D	42.2		D
	Northbound	24.0		C	24.0		C
	Southbound	63.1		E	58.9		E
	Southwestbound	82.6		F	82.6		F
15. Manor Road & Jones Bridge Road	Overall	15.6	0.57	B	15.1	0.56	B
	Eastbound	18.1		B	18.0		B
	Westbound	16.1		B	15.3		B
	Northbound	10.8		B	10.8		B
16. Jones Bridge Road & Jones Mill Road	Overall	45.4	0.77	D	42.3	0.76	D
	Eastbound	30.5		C	30.2		C
	Northbound	53.8		D	46.8		D
	Southbound	46.5		D	46.5		D
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	19.3	0.71	B	19.5	0.71	B
	Eastbound	48.7		D	48.7		D
	Westbound	41.2		D	41.2		D
	Northbound	5.5		A	5.4		A
	Southbound	3.3		C	3.3		C

Note: Intersections with only two-way stops have no overall LOS identified.

Table 42B: 2018 PM Peak Hour Build Alternative 3 HCM External Analysis

	HCM Analysis	PM Peak Hour					
		Alternative 3			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density (Veh/ hr)	LOS
1. Rockville Pike & Grosvenor Lane	Overall	60.1	1.01	E	58.9	1.01	E
	Eastbound	48.4		D	48.4		D
	Westbound	88.7		F	88.7		F
	Northbound	30.9		C	30.3		C
	Southbound	72.2		E	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	35.8	1.01	D	33.1	0.99	C
	Eastbound	65.4		E	65.4		E
	Northbound	40.7		D	35.7		D
	Southbound	23.7		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.2	0.84	B	19.1	0.83	B
	Eastbound	31.9		C	31.9		C
	Westbound	37.2		D	37.3		D
	Northbound	20.2		C	20.2		C
	Southbound	13.3		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	30.4	0.73	C	30.2	0.73	C
	Eastbound	39.9		D	39.5		D
	Westbound	7.5		A	7.5		A
	Northbound	24.8		C	24.8		C
	Southbound	26.7		C	26.7		C
5. Rockville Pike & Cedar Lane	Overall	38.4	0.97	D	36.4	0.97	D
	Eastbound	57.4		E	57.4		E
	Westbound	65.5		E	63.5		E
	Northbound	30.9		C	26.5		C
	Southbound	31.9		C	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.1		B	11.0		B
	Westbound	10.7		B	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.5	0.72	A	8.6	0.70	A
	Westbound	39.6		D	39.9		D
	Northbound	9.8		A	9.9		A
	Southbound	1.1		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	12.2	0.63	B	12.3	0.63	B
	Eastbound	44.6		D	44.6		D
	Northbound	5.1		A	4.8		A
	Southbound	10.4		B	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	22.2	0.79	C	18.7	0.72	B
	Eastbound	66.1		E	52.8		D
	Westbound	33.6		C	35.8		D
	Northbound	16.3		B	13.5		B
	Southbound	19.4		B	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	59.4	0.94	E	59.9	0.94	E
	Eastbound	58.2		E	58.2		E
	Westbound	44.2		D	42.8		D
	Northbound	77.5		E	78.3		E
	Southbound	44.5		D	45.4		D

Table 42B: 2018 PM Peak Hour Build Alternative 3 HCM External Analysis (continued)

	HCM Analysis	PM Peak Hour					
		Alternative 3			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density (Veh/ hr)	LOS	Delay	Density (Veh/ hr)	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.4	0.75	B	14.0	0.75	B
	Eastbound	11.1		B	11.2		B
	Westbound	14.2		B	12.9		B
	Northbound	13.8		B	13.8		B
	Southbound	23.1		C	23.9		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	12.2	0.76	B	13.6	0.79	B
	Eastbound	11.1		B	12.1		B
	Westbound	5.4		A	5.2		A
	Southbound	28.0		C	32.7		C
13. University Road (Gate #5) & Jones Bridge Road	Overall	9.9	0.73	A	10.7	0.67	B
	Eastbound	9.3		A	11.2		B
	Westbound	9.3		A	9.3		A
	Southbound	23.6		C	21.0		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	71.2	1.10	E	68.7	1.10	E
	Eastbound	102.5		F	92.8		F
	Westbound	118.7		F	119.7		F
	Northbound	76.1		E	76.1		E
	Southbound	18.8		B	18.9		B
	Southwestbound	126.1		F	126.1		F
15. Manor Road & Jones Bridge Road	Overall	21.4	0.73	C	19.7	0.71	B
	Eastbound	32.0		C	28.9		C
	Westbound	4.1		A	3.7		A
	Northbound	21.9		C	21.9		C
16. Jones Bridge Road & Jones Mill Road	Overall	24.4	0.73	C	23.5	0.71	C
	Eastbound	12.9		B	13.0		B
	Northbound	41.2		D	38.5		D
	Southbound	20.0		C	20.0		C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	12.7	0.70	B	12.6	0.69	B
	Eastbound	12.8		B	12.8		B
	Westbound	9.2		A	9.2		A
	Northbound	18.3		B	18.1		B
	Southbound	7.9		A	7.8		A

Note: Intersections with only two-way stops have no overall LOS identified.

3.2.6.4 Arterial Analysis

Arterial analysis was performed for Rockville Pike, West Cedar Lane, and Jones Bridge Road, comparing the alternative to the No Build condition. The greatest change between the No Build condition and Build Alternative 3 was a 3 percent increase along Jones Bridge Road westbound during the AM peak hour and Rockville Pike northbound during the PM peak hour. Based upon this analysis, Alternative 3 would not require PAMR-RAM external intersection mitigation. Tables 43 and 44 show the 2018 Build Alternative 3 arterial analyses.

Table 43: 2018 AM Peak Hour Build Alternative 3 Arterial Analysis

		AM Peak Hour						
		Alt 3			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	11.4	11:30	E	11.5	11:25	E	1%
	Southbound	20.7	6:30	C	21.1	6:22	C	2%
Jones Bridge Road	Eastbound	20.6	5:01	C	20.7	4:59	C	0%
	Westbound	16.6	6:12	D	17.1	6:01	D	3%
West Cedar Lane	Eastbound	15.4	2:49	D	15.4	2:49	D	0%
	Westbound	16.9	2:34	D	16.9	2:34	D	0%

Table 44: 2018 PM Peak Hour Build Alternative 3 Arterial Analysis

		PM Peak Hour						
		Alt 3			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	15.6	8:24	D	16.0	8:11	D	3%
	Southbound	17.5	7:41	D	17.7	7:36	D	1%
Jones Bridge Road	Eastbound	17.1	6:02	D	17.1	6:02	D	0%
	Westbound	16.5	6:14	D	16.7	6:12	D	1%
West Cedar Lane	Eastbound	12.8	3:24	E	12.8	3:23	E	0%
	Westbound	17.4	2:30	D	17.4	2:30	D	0%

3.2.6.5 Internal Intersection Analysis

This alternative includes the addition of a new exit ramp from the New USU parking facility in N-Lot and would add more trips to the existing ramp connecting to South Palmer Road at Grier Road intersection.

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal intersections. For this alternative, intersection #18 R.B. Brown Drive at North Palmer Road would change from a LOS of B to C during the AM peak hour, reflecting the increased trips headed to the warehouse facility from Gate #1 and #19 R.B. Brown Drive at America Garage approach would change from a LOS of C to D, reflecting the increase in pedestrian traffic crossing at this intersection, walking between the Medical Center and warehouse parking facility. During the PM peak hour, intersections #26 East Palmer Road at Stokes Road and #28 South Palmer Road at Grier Road would change from a LOS B to C. The change at the #28 intersection would be the result of new trips exiting the new USU Alternative 2 parking structure. The change at the #26 intersection would be due to increased trips from the warehouse facility heading to Gate #3. Based on this analysis, there would be no significant impact to the internal roadway intersections for this alternative. Tables 45A and 45B show the 2018 Build Alternative 3 internal intersection analysis compared to the No Build condition and

Figure 44A and 44B shows the 2018 Build Alternative 3 internal intersection LOS.

Table 45A: 2018 Build Alternative 3 Internal Intersection Analysis

			AM Peak Hour			
			Build Alt. 3		*No Build Condition*	
		Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18.	**Parking Lot/R.B. Brown Drive & North Palmer Road**	Overall	15.9	C	10.3	B
		Eastbound	18.7	C	10.9	B
		Westbound	8.8	A	8.7	A
		Northbound	8.9	A	9.0	A
		Southbound	9.8	A	9.6	A
19.	**R.B. Brown Drive & America Garage/Garage 54 Exit**	Eastbound	25.9	D	17.6	C
		Westbound	16.2	C	12.8	B
		Northbound Left	3.4	A	3.1	A
20.	**R.B. Brown Drive & Garage 54 Entrance**	Overall	8.9	A	10.5	B
		Northbound	8.4	A	9.2	A
		Southbound	9.4	A	11.5	B
21.	**R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit**	Overall	8.3	A	9.1	A
		Westbound	7.4	A	8.1	A
		Northbound	8.6	A	9.4	A
		Southbound	7.7	A	8.8	A
22.	**R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance**	Overall	8.2	A	9.7	A
		Eastbound	7.5	A	8.1	A
		Northbound	8.5	A	10.1	B
		Southbound	7.7	A	9.0	A
23.	**R.B. Brown Drive & South Palmer Road**	Overall	9.1	A	9.8	A
		Eastbound	9.4	A	10.3	B
		Westbound	8.1	A	8.7	A
		Southbound	8.4	A	9.1	A
24.	**East Palmer Road & North Palmer Road/Taylor Road**	Overall	13.8	B	9.6	A
		Eastbound	15.9	C	10.0	A
		Westbound	9.7	A	8.6	A
		Northbound	11.5	B	9.5	A
25.	**East Palmer Road & Visitor Garage Exit/Rixey Road**	Overall	10.1	B	9.0	A
		Eastbound	0.0	A	7.5	A
		Westbound	8.6	A	8.1	A
		Northbound	10.5	B	9.4	A
		Southbound	9.9	A	8.7	A
26.	**East Palmer Road/Gunnell Road & Stokes Road**	Overall	10.4	B	9.5	A
		Westbound	8.8	A	8.6	A
		Northbound	11.3	B	10.1	B
		Southbound	9.1	A	8.9	A
27.	**AFRRI Driveway/Stokes Road & South Palmer Road**	Overall	8.7	A	9.5	A
		Eastbound	7.7	A	8.1	A
		Westbound	9.2	A	10.4	B
		Northbound	8.5	A	8.9	A
		Southbound	0.0	A	0.0	A
28.	**University Road/Grier Road & South Palmer Road**	Overall	8.1	A	8.7	A
		Eastbound	7.9	A	8.4	A
		Westbound	8.7	A	9.1	A
		Northbound	7.3	A	9.0	A
		Southbound	7.0	A	6.9	A
29.	**University Road & South Palmer Road**	Westbound	8.0	A	8.0	A
		Northbound	7.9	A	7.9	A

Table 45B: 2018 Build Alternative 3 Internal Intersection Analysis

		PM Peak Hour			
		Build Alt. 3		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	17.5	C	16.5	C
	Eastbound	10.0	B	9.7	A
	Westbound	22.9	C	15.6	C
	Northbound	13.8	B	20.5	C
	Southbound	10.2	B	10.0	B
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	*	F	*	F
	Westbound	*	F	*	F
	Northbound Left	0.9	A	0.6	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.0	A	8.8	A
	Northbound	7.9	A	9.0	A
	Southbound	8.1	A	8.5	A
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	9.1	A	11.3	B
	Westbound	7.4	A	10.9	B
	Northbound	8.2	A	9.5	A
	Southbound	9.5	A	12.3	B
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	8.0	A	9.4	A
	Eastbound	7.3	A	7.8	A
	Northbound	7.9	A	8.3	A
	Southbound	8.1	A	10.0	B
23. R.B. Brown Drive & South Palmer Road	Overall	9.9	A	10.6	B
	Eastbound	8.2	A	8.9	A
	Westbound	11.1	B	10.7	B
	Southbound	8.8	A	11.4	B
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	15.1	C	10.7	B
	Eastbound	11.8	B	10.0	B
	Westbound	18.7	C	11.4	B
	Northbound	12.0	B	10.7	B
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	11.2	B	10.2	B
	Eastbound	8.7	A	8.4	A
	Westbound	10.1	B	9.8	A
	Northbound	10.0	B	9.7	A
	Southbound	12.6	B	11.0	B
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	16.7	C	15.0	B
	Westbound	16.9	C	16.0	C
	Northbound	12.2	B	11.5	B
	Southbound	19.2	C	16.2	C
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	11.3	B	10.7	B
	Eastbound	8.9	A	10.3	B
	Westbound	12.6	B	11.0	B
	Northbound	10.7	B	10.8	B
	Southbound	8.6	A	8.6	A
28. University Road/Grier Road & South Palmer Road	Overall	14.7	B	12.5	B
	Eastbound	11.7	B	13.7	B
	Westbound	9.3	A	9.2	A
	Northbound	8.6	A	8.9	A
	Southbound	15.9	C	11.9	B
29. University Road & South Palmer Road	Westbound	7.1	A	7.1	A
	Northbound	6.2	A	7.1	A

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no overall LOS identified.

Figure 44A: 2018 AM Peak Hour Build Alternative 3 Internal Intersection LOS

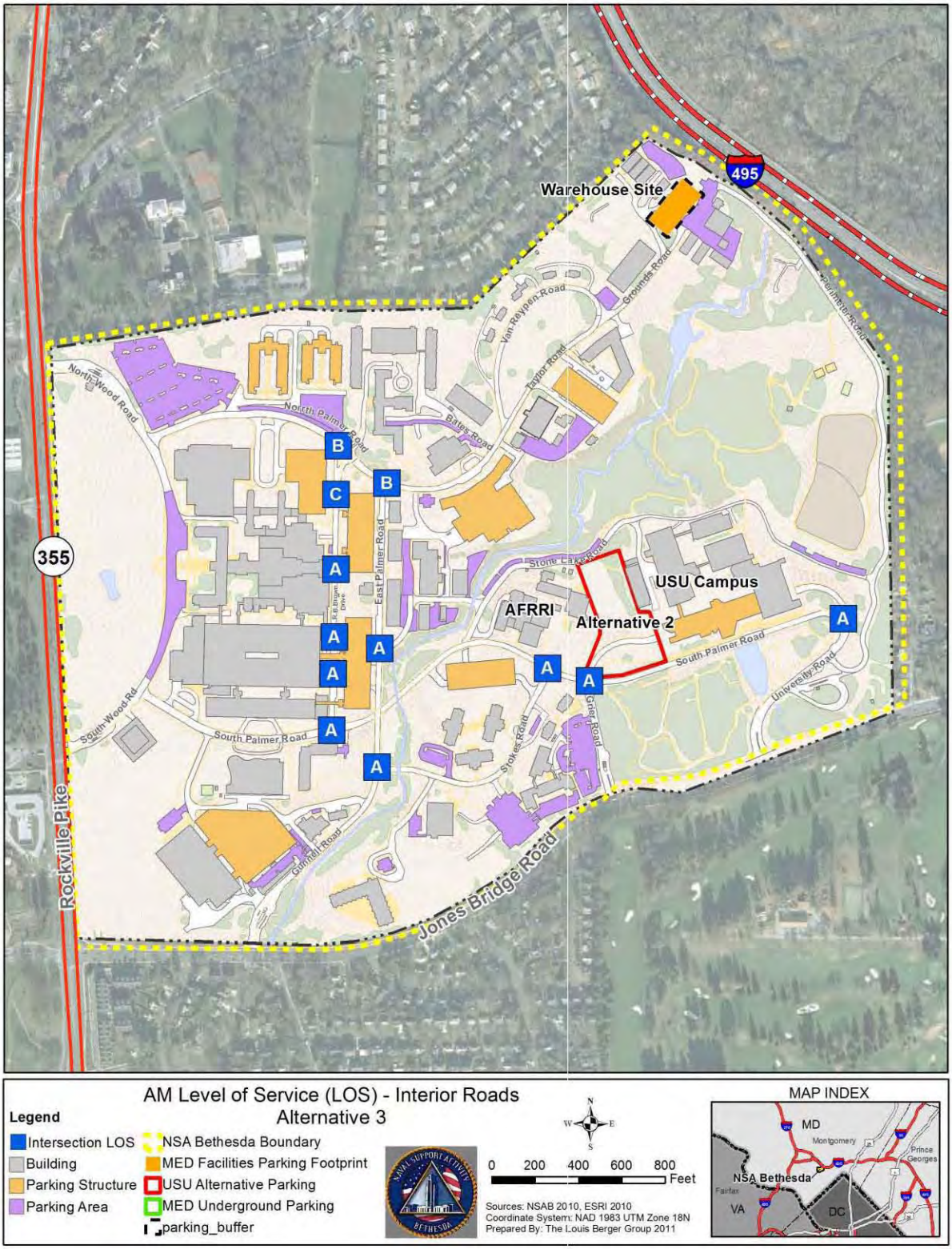
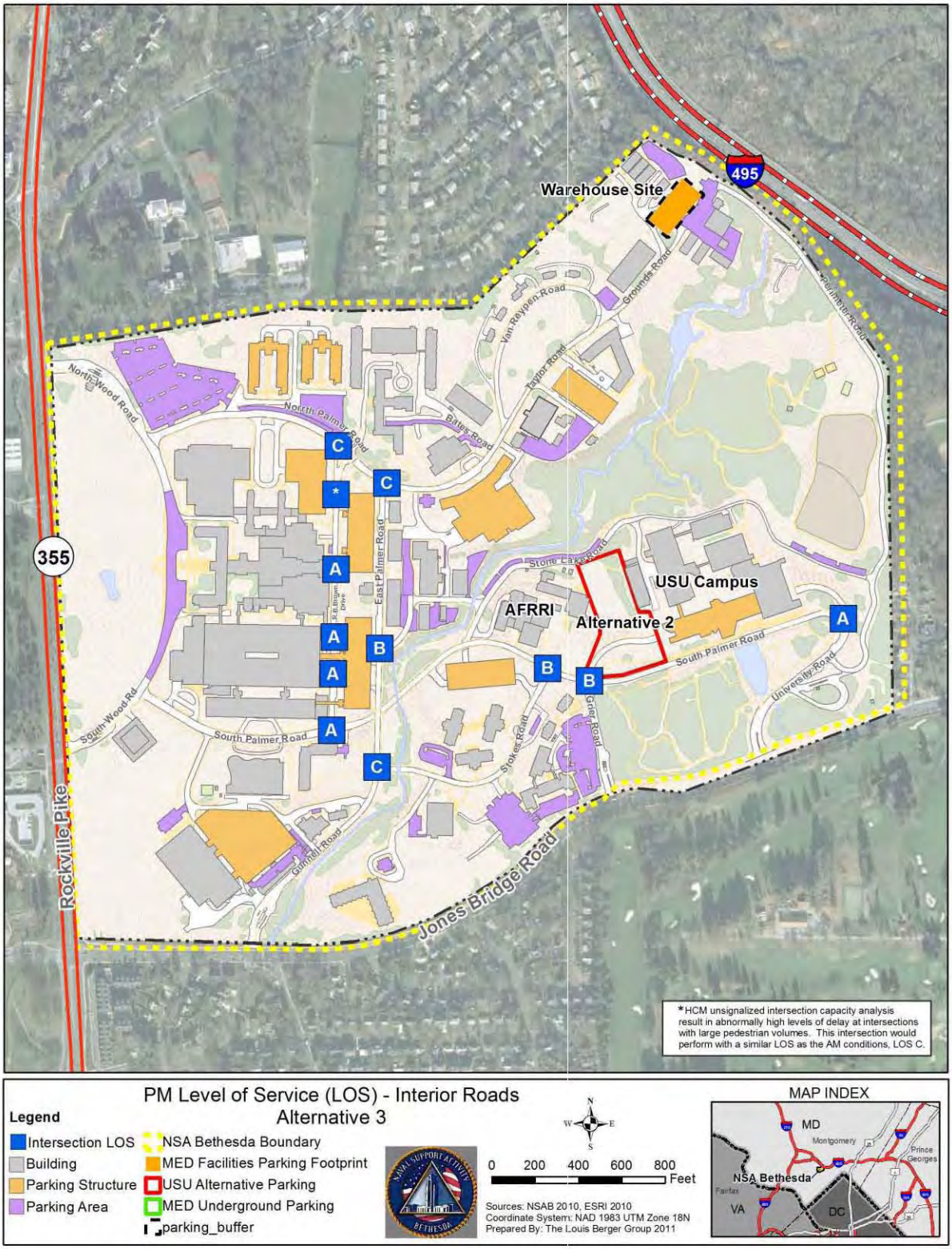


Figure 44B: 2018 PM Peak Hour Build Alternative 3 Internal Intersection LOS



3.2.6.6 Bicycle and Pedestrian Impacts

This alternative would include the placement of two new parking structures, resulting in increased pedestrian activity between the parking structures and destination buildings. The new parking structure serving Building C would be located off of Grounds Road in the industrial/warehouse area of NSA Bethesda facility, creating new pedestrian trips between the parking structure and Medical Buildings. Specifically, there would be 285 pedestrian trips during the AM peak hour and 297 pedestrian trips during the PM peak hour.

The new USU Alternative 2 parking structure would be placed next to the USU Campus; therefore, the only new pedestrian activity that would cross roadways would be the Medical Building Development trips (50 new employees plus trips shifting from Buildings 54 and 55) crossing two intersections, the South Palmer Road at Stokes Road and South Palmer Road at Brown Drive. This would result in 26 new pedestrian trips during the AM peak hour and 20 new pedestrian trips during the PM peak hour. Both the Building C and F parking structure trips were included in the internal HCM analysis in Tables 45A and 45B.

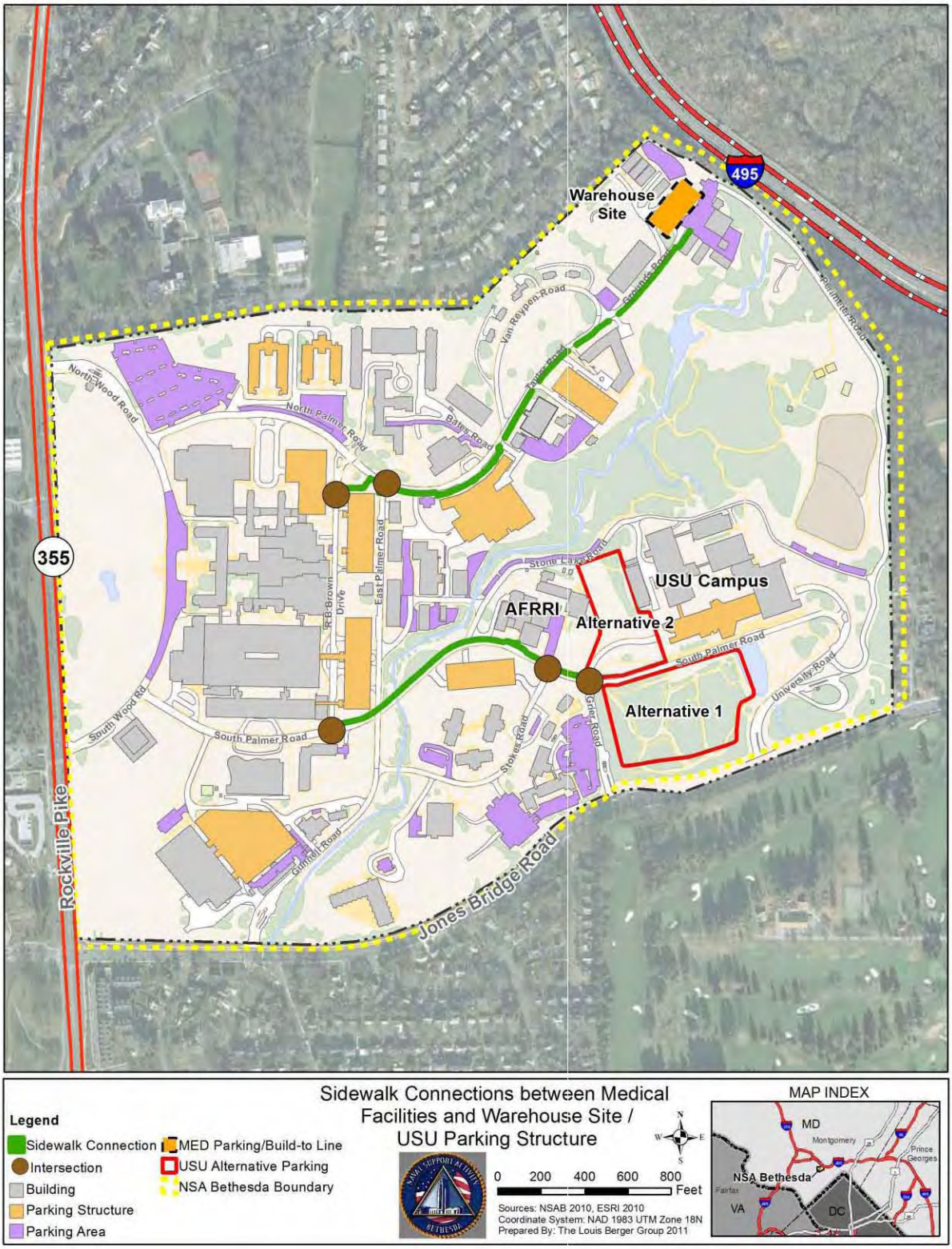
Existing 5-foot plus sidewalks connect both new parking structures with the Medical Buildings via South Palmer Road or Grounds Road/ Taylor Road/North Palmer Road. Based on the 270 new employees included in the trip generation and adequate existing sidewalks serving these pedestrian trips, this alternative would have no significant pedestrian or bicycle impacts. Figure 45 shows the 2018 Build Alternative 3 sidewalk connections.

3.2.7 ***Build Alternative 4***

This alternative would include the construction of a new 500-space parking structure replacing H-Lot to serve Building C and the construction of a 400-space parking structure known as USU Alternative 2. The 500-space parking structure would be located in the existing H-Lot next to the Navy Lodge, with the entrance and exit ramps connecting to Stokes Road.

The new USU Alternative 2 parking structure would replace the existing N-Lot, with the entrance located on Stone Lake Road and two exits, one serving Stone Lake Road and the other connecting to the South Palmer Road and Grier Road intersection.

Figure 45: 2018 Build Alternative 3 Sidewalk Connections



3.2.7.1 Trip Generation

The trip generation for this alternative would differ from the previous alternatives as there would only be 228 parking spaces available for new staff in the new USU Alternative 2 parking structure. This would occur because the new 500-space parking structure serving Building C would need to accommodate the 110 lost spaces in H-Lot. After adjusting for the 110 spaces, the new H-Lot 500-space structure would be able to accommodate 390 more staff. This would result in 110 staff spaces relocated to the new USU Alternative 2 parking structure, plus the 62 spaces relocated from the existing N-Lot, thus leaving 228 spaces for new employees in the new USU Alternative 2 parking structure. Table 46 shows the 2018 Build Alternative 4 trip generation.

Table 46: 2018 Build Alternative 4 Trip Generation

	Facility Name	Employees	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
1	Medical Facilities Development	42#	10	4	14	4	10	14
2	University Expansion	186*	111	24	135	47	116	163
	Total	228	121	28	149	51	126	177

#ITE Land Use Code 610: Hospital
*ITE Land Use Code 550: University

3.2.7.2 Trip Distribution

Since 500 new parking spaces must be made available for patients, 390 staff spaces would be moved from Building 55 to the new H-Lot facility, thus filling the facility to capacity. The remaining 110 staff spaces that must be relocated would come from a combination of Buildings 54 (108 spaces) and Building 55 (2 spaces) and would be moved to the new USU Alternative 2 parking structure in N-Lot.

The Alternative 4 assumptions would be similar to Alternative 3, listed below:

- All existing staff spaces that are removed from one facility will be placed in another facility at the installation.
- Staff will continue to have set patterns and drive to the closest parking facility available, based upon their daily arrival time. If they arrive later in the morning, they would automatically drive to the warehouse parking facility.
- The percentage of spaces reassigned to patient parking in Building 54 would be 14 percent, the percentage of staff spaces (108) relocated compared to the total spaces housed in the structure (749).
- The number of AM and PM peak trips shifted would be 14 percent of the peak hour trips currently using the facility.

- Based on the patient temporal distribution (Figure 33), 15 percent of patients would arrive during the AM peak hour and 6 percent leave during the same period, while 0.5 percent would arrive during the PM peak hour and 4 percent leave.

- The percentage of staff entering and exiting Building 55 during the peak hours would be the inverse of the patient percentages (85 percent/94 percent during the AM peak hour and 99.5 percent/96 percent during the PM peak hour).

Based on these assumptions, there would be the same number of trips removed from the network along R.B. Brown Drive as in Alternative 3, reflecting the change in travel for staff. The split between the two new parking structures would be 22 percent of the trips from Buildings 54 and 55 headed to the new USU Alternative 2 parking structure in N-Lot and 78 percent headed to the new parking structure in H-Lot. Table 47 shows the trip distribution from both Buildings 54 and 55 to the proposed parking structures in H- and N-Lots.

Table 47: Trip Distribution from both Building 54 and 55 to the Proposed Parking Structures in H- and N-Lots

	Facility Name	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
1	H-Lot Structure	196	34	230	27	212	239
2	N-Lot Structure	55	9	64	7	60	67
	Total	251	43	294	34	272	305

The Build Alternative 4 trip distribution would consist of combining the shift in staff from Buildings 54 and 55 to the new parking structures and the trips generated from the 228 new employee trips. It is assumed that the existing 62-space N-Lot would be relocated into the new USU Alternative 2 parking facility, resulting in a shift of 18 (30 percent of N-Lot – same peak hour exiting percentage as adjacent USU parking facility) PM peak hour exiting trips from Stone Lake Road to the new ramp connecting to the South Palmer Road at Grier Road intersection. It is also assumed that the 110-space H-Lot would be relocated into the new 500-space parking facility, resulting in no additional trips added or removed.

The internal installation generated or shifted trips follow the updated trip distribution pattern based on the 2008 NNMC Transportation Study (Figure 26). The distribution patterns for the shifted staff trips from Buildings 54 and 55 would follow the following paths:

- From the north: Turn left onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Stokes Road.

- To the north: Turn left onto Stokes Road, turn left onto Gunnell Road, exit through Gate #3, turn right into Jones Bridge Road, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Stokes Road.

- To the south: Turn left onto Stokes Road, turn left onto Gunnell Road, exit through Gate #3, turn right onto Jones Bridge Road, and turn left onto Rockville Pike southbound.

- From the east (AM peak hour): Turn right onto Grier Road, enter through Gate #4, turn left onto South Palmer Road, and turn left onto Stokes Road.

- From the east (PM peak hour): Turn right onto University Road, enter through Gate #5, turn left onto South Palmer Road, and turn left onto Stokes Road.

- To the east (AM peak hour): Turn right onto Stokes Road, turn right onto South Palmer Road, turn right onto University Road, exit through Gate #5, and turn left onto Jones Bridge Road.

- To the east (PM peak hour): Turn right onto Stokes Road, turn right onto South Palmer Road, turn right onto Grier Road, exit through Gate #4, and turn left onto Jones Bridge Road.

The result of these new distribution patterns would remove trips from R.B. Brown Drive and South Palmer Road (west of Stokes Road), and North Palmer Road.

During the AM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto North Wood Road, enter through Gate #1, turn left onto North Palmer Road, turn right onto East Palmer Road, turn left onto Rixey Road, and turn left onto Stone Lake Road.

- To the north: Turn right onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Rixey Road, and turn left onto Stone Lake Road.

- To the south: Turn left onto Stone Lake Road, turn right onto Rixey Road, turn left onto East Palmer Road, follow to Gunnell Road and exit through Gate #3, turn right onto Jones Bridge Road, and turn left onto Jones Bridge Road.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and turn left onto Stone Lake Road.

- To the east: Turn left onto South Palmer Road, turn right onto University Road and exit though Gate #5, and turn left onto Jones Bridge Road.

During the PM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto North Wood Road, enter through Gate #1, turn left onto North Palmer Road, turn right onto East Palmer Road, turn left onto Rixey Road, and turn left onto Stone Lake Road.

- To the north: Turn right onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Rixey Road, and turn left onto Stone Lake Road.

- To the south: Go straight onto Grier Road and exit through Gate #4, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and turn left onto Stone Lake Road.

- To the east: Go straight onto Grier Road and exit through Gate #4, and turn left onto Jones Bridge Road.

Figures 46A, 46B, and 46C show the 2018 Build Alternative 4 trip distribution.

Figure 46A: 2018 Alternative 4 Trip Distribution

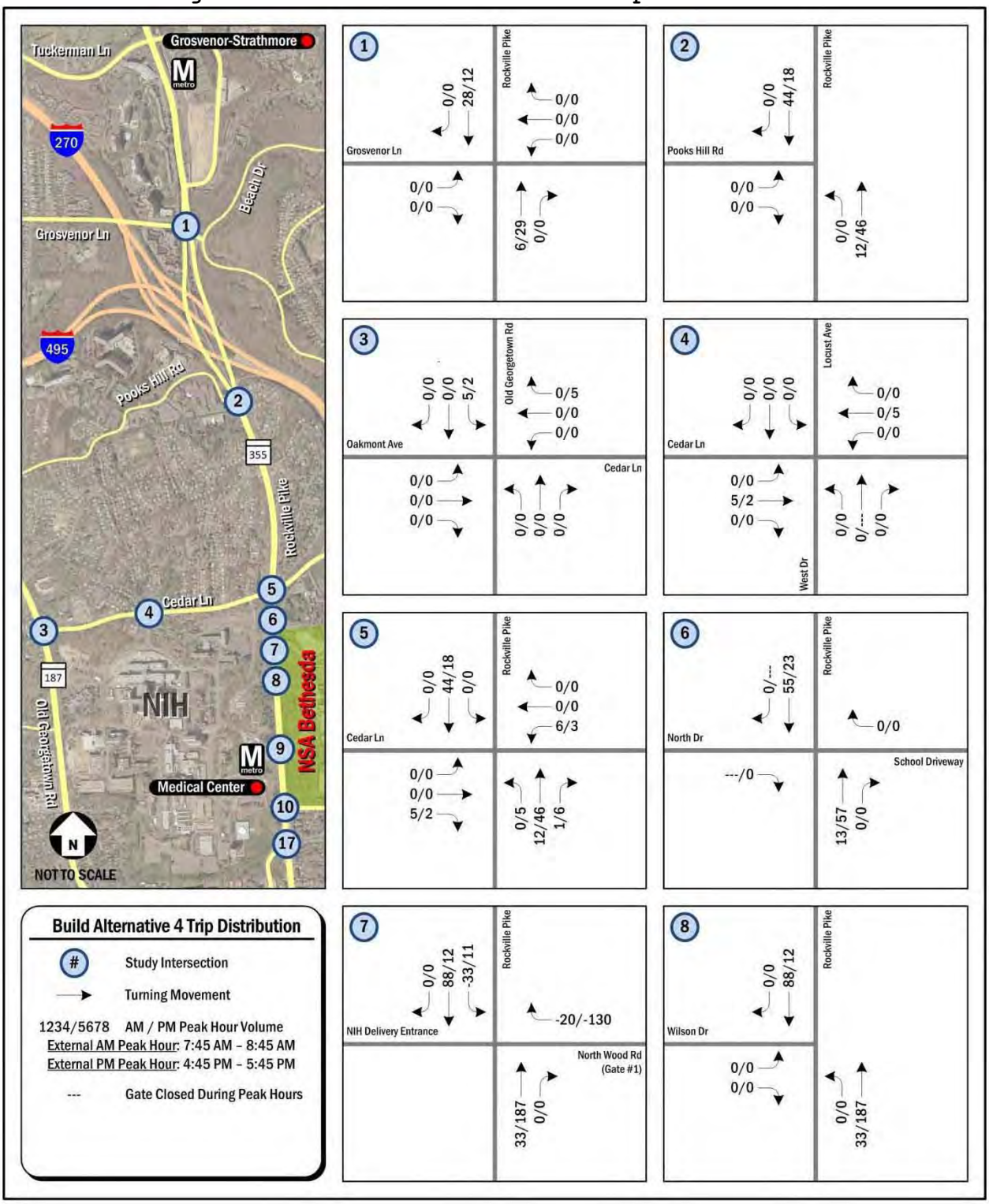


Figure 46B: 2018 Alternative 4 Trip Distribution

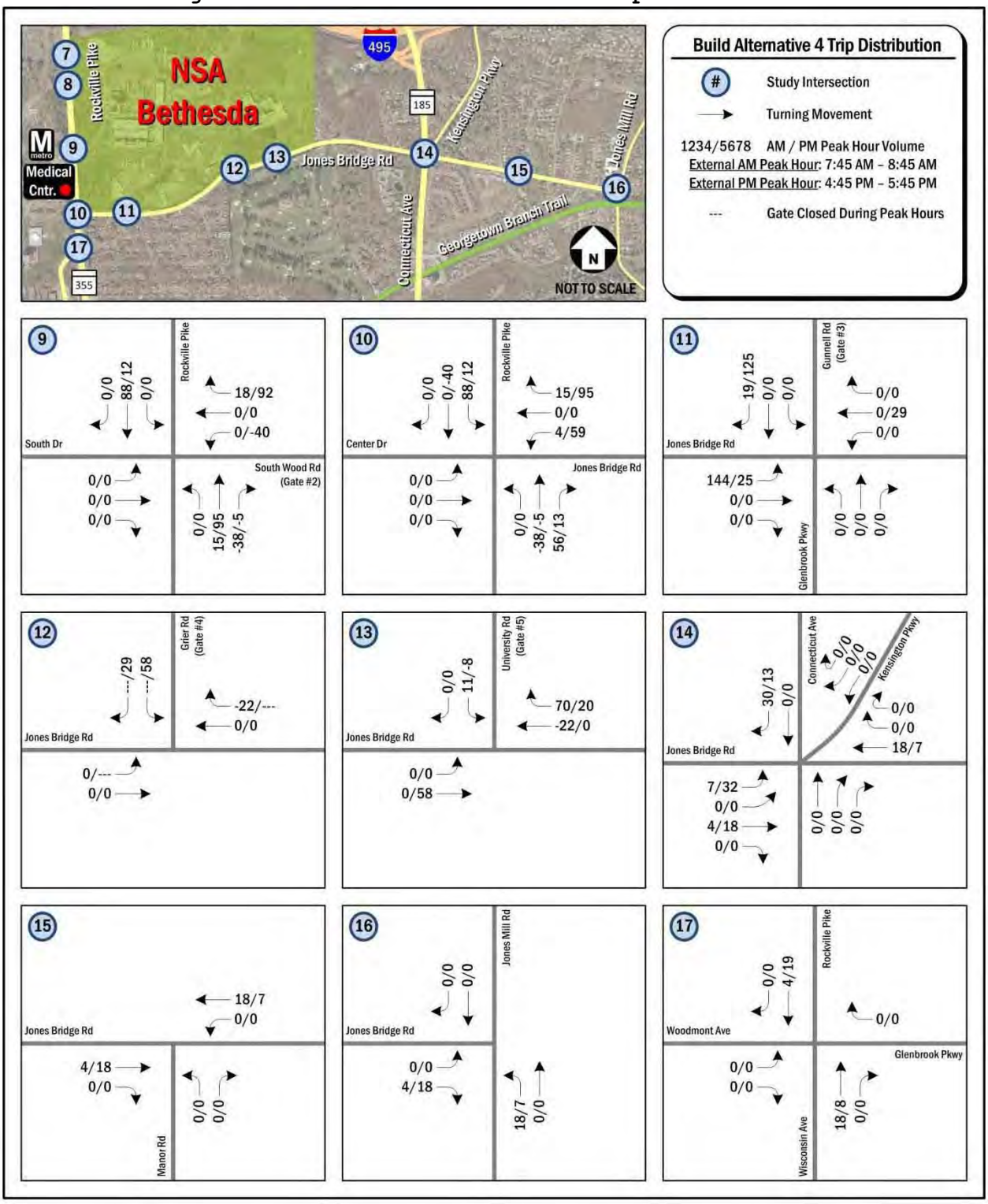
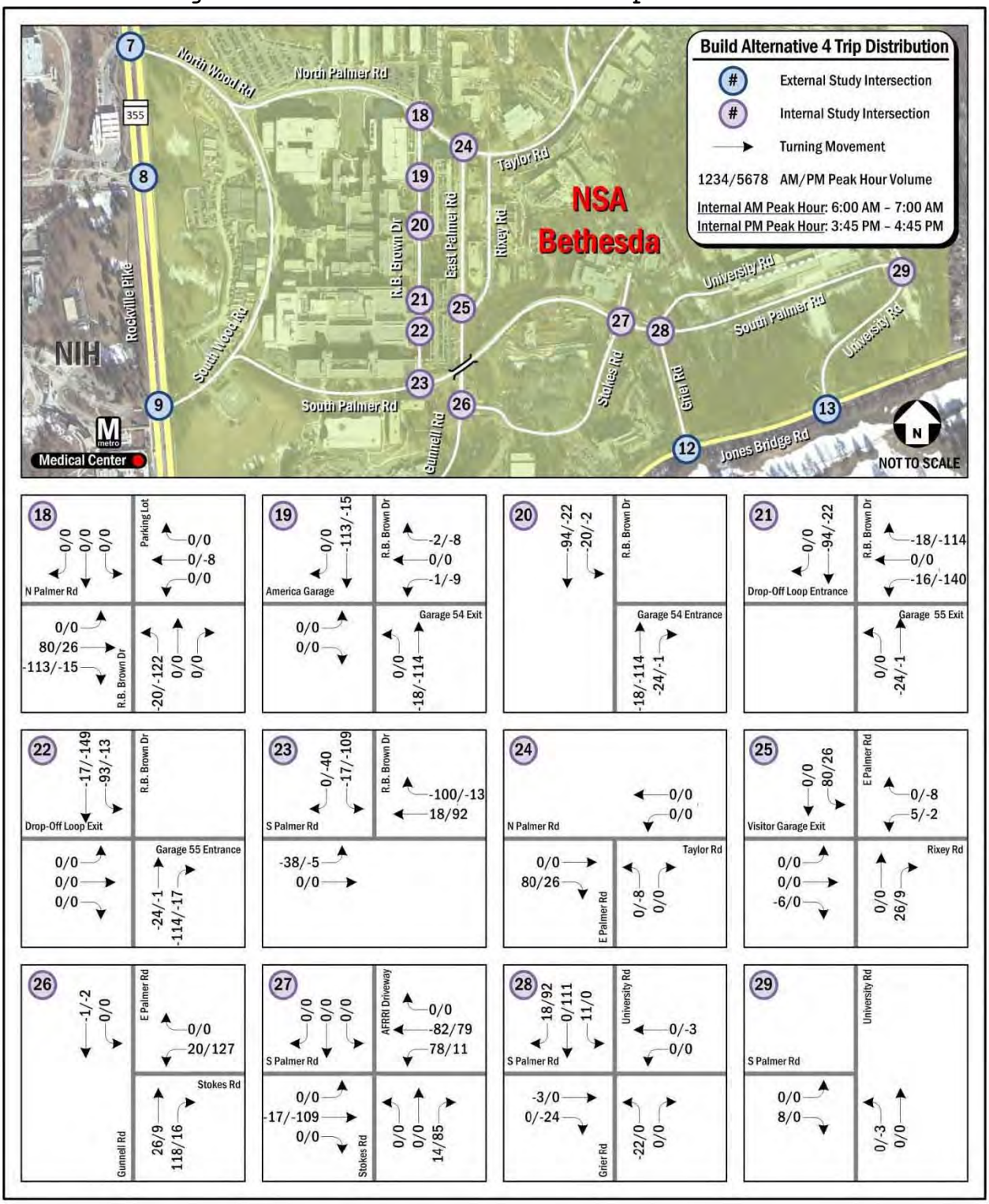


Figure 46C: 2018 Alternative 4 Trip Distribution



3.2.7.3 External Intersection Analysis

The 2018 Build Alternative 4 includes all projects listed in the No Build condition. The addition of a new exit ramp from the New USU Alternative 2 parking structure in N-Lot would add more trips to the existing ramp connecting to South Palmer Road at Grier Road intersection. Figure 29C shows the 2018 Build Alternatives 2 through 5 and 7 through 10 internal lane utilization and traffic control.

Critical Lane Volume Analysis

The CLV analysis was conducted for the 16 external signalized intersections to compare to the No Build condition. During the AM peak hour, intersection #9 Rockville Pike at South Wood Road (Gate #2) would change from LOS B to C. During the PM peak hour, intersection #8 Rockville Pike at Wilson Drive would change from LOS A to B and #12 Jones Bridge Road at Grier Road (Gate #4) would change from LOS B to C. Based on these results, the external signalized intersections would have no significant traffic impacts from implementing Alternative 4. Table 48 shows the 2018 Build Alternative 4 CLV analysis for the external intersection compared to the No Build condition. Figures 47A and 47B show the 2018 Build Alternative 4 CLV LOS.

Table 48: 2018 Build Alternative 4 CLV External Intersection Analysis

		Build Alternative 4				No Build Condition			
		AM Peak Hr.		*PM Peak Hr.*		*AM Peak Hr.*		*PM Peak Hr.*	
		CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS
1.	**Rockville Pike & Grosvenor Lane**	1,383	D	1,340	D	1,373	D	1,336	D
2.	**Rockville Pike & Pooks Hill Road**	1,357	D	1,396	D	1,343	D	1,379	D
3.	**Old Georgetown Road & Oakmont Avenue/Cedar Lane**	1,437	D	1,538	E	1,437	D	1,536	E
4.	**Locust Avenue/West Drive & Cedar Lane**	465	A	941	A	489	A	939	A
5.	**Rockville Pike & Cedar Lane**	1,551	E	1,241	C	1,529	E	1,236	C
6.	**Rockville Pike & North Drive/School Driveway**	*un-signalized*		*un-signalized*		*un-signalized*		*un-signalized*	
7.	**Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)**	822	A	1,055	B	843	A	1,033	B
8.	**Rockville Pike & Wilson Drive**	991	A	1,013	B	958	A	948	A
9.	**Rockville Pike & South Drive/South Wood Road (Gate #2)**	1,171	C	1,135	B	1,121	B	1,039	B
10.	**Rockville Pike & Center Drive/Jones Bridge Road**	703	A	837	A	715	A	808	A
11.	**Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road**	945	A	1,067	B	801	A	1,024	B
12.	**Grier Road (Gate #4) & Jones Bridge Road**	692	A	1,162	C	692	A	1,104	B
13.	**University Road (Gate #5) & Jones Bridge Road**	734	A	1,054	B	729	A	1,023	B
14.	**Connecticut Avenue & Jones Bridge Road & Kensington Parkway**	1,503	E	1,752	F	1,490	E	1,735	F
15.	**Manor Road & Jones Bridge Road**	757	A	1,027	B	739	A	1,009	B
16.	**Jones Bridge Road & Jones Mill Road**	1,057	B	1,080	B	1,039	B	1,062	B
17.	**Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway**	773	A	941	A	771	A	938	A

Figure 47A: 2018 AM Peak Hour Build Alternative 4 CLV Intersection LOS

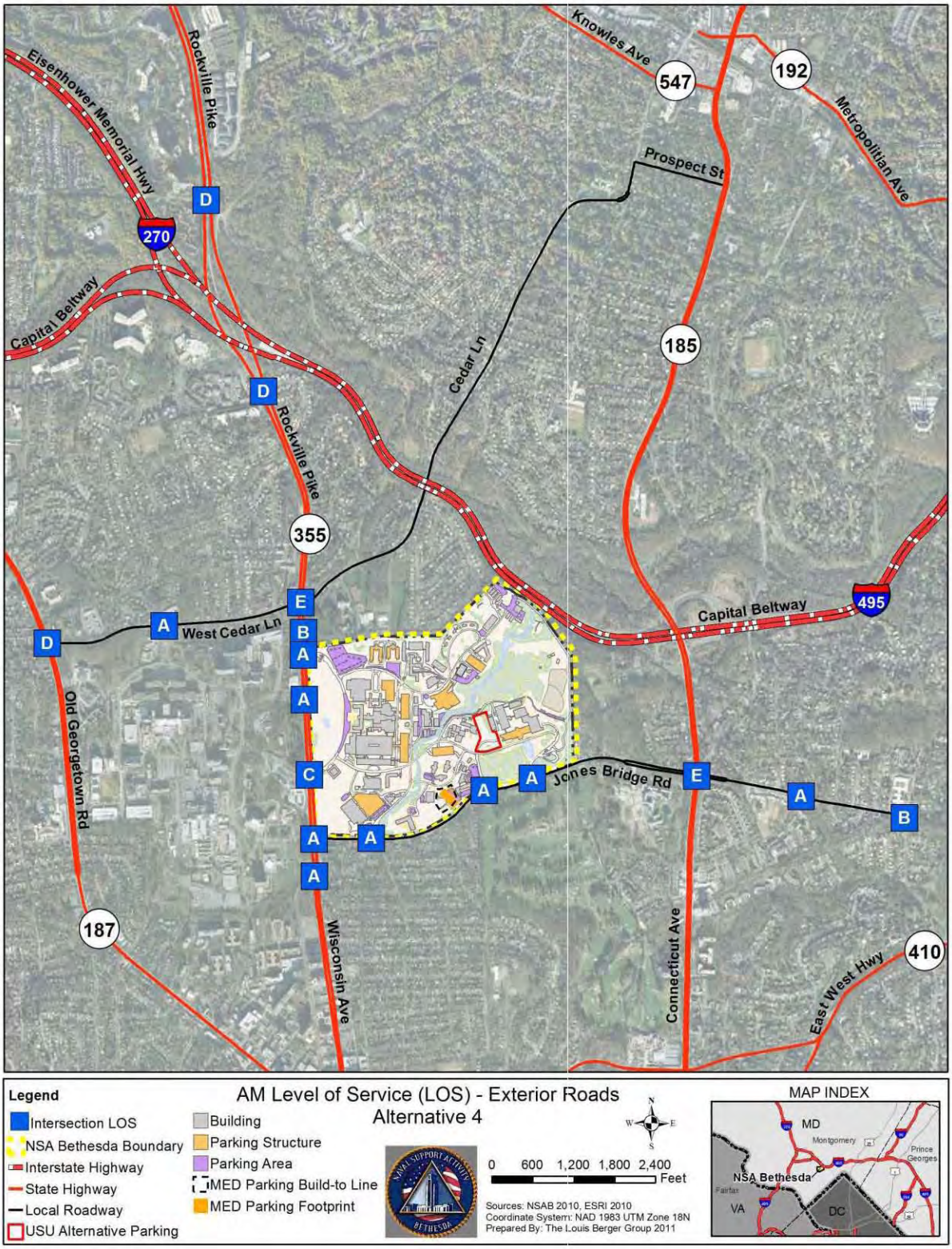
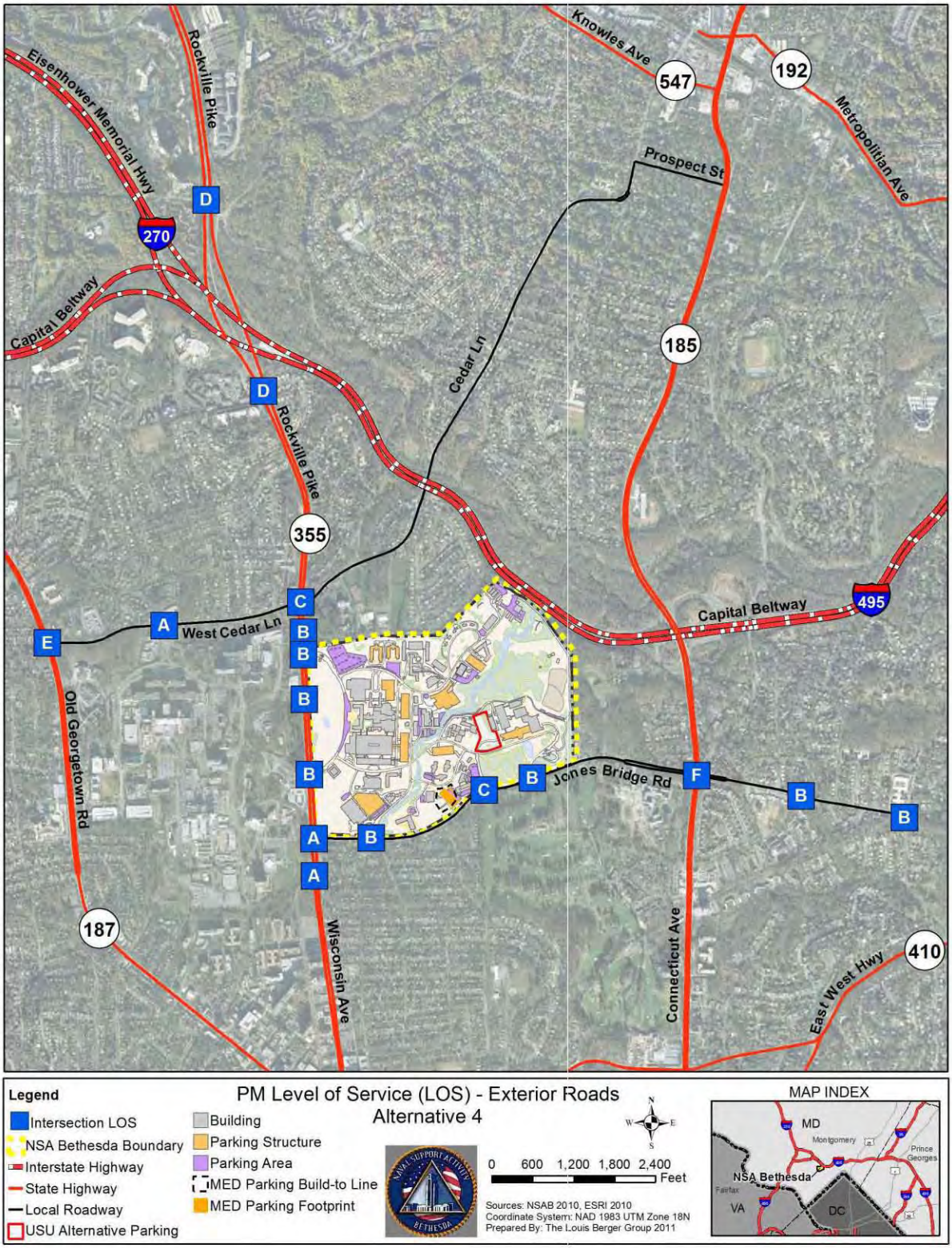


Figure 47B: 2018 PM Peak Hour Build Alternative 4 CLV Intersection LOS



Highway Capacity Manual Intersection Analysis

The HCM analysis was conducted as a secondary comparison to the CLV analysis between the No Build condition and Build Alternatives for the external intersections. When comparing Build Alternative 4 with the No Build condition, intersection #17 Wisconsin Avenue at Woodmont Avenue would change from a LOS of B to C during the AM peak hour. This is due to the traffic analysis software calculating the LOS based upon the increase of traffic flows at the #10 Rockville Pike at Jones Bridge Road intersection, thus adding less than 1 second of delay to intersection #17. In addition, the No Build condition LOS calculated for intersection #17 would be on the LOS B/C line; therefore, the fraction of a second in added delay above the No Build condition would assign a LOS of C.

For the PM peak hour, LOS changes would occur at intersection #2 Rockville Pike at Pooks Hill Road (C to D), #9 Rockville Pike at South Wood Road (Gate #2) (B to C), and #15 Jones Bridge Road at Manor Road (B to C). Since the CLV process was not used to evaluate unsignalized intersections, HCM analysis was used to provide a No Build condition comparison for intersection #6 Rockville Pike at North Drive/School Driveway, which showed no significant impacts. Tables 49A and 49B show the 2018 Build Alternative 4 HCM external analysis.

3.2.7.4 Arterial Analysis

Arterial analysis was performed for Rockville Pike, West Cedar Lane, and Jones Bridge Road, comparing the alternative to the No Build condition. The greatest change between the No Build condition and Build Alternative 4 was a 4 percent increase along Jones Bridge Road westbound during the AM peak hour. Based upon this analysis, Alternative 4 would not require PAMR-RAM external intersection mitigation. Tables 50 and 51 show the 2018 Build Alternative 4 arterial analyses.

Table 49A: 2018 AM Peak Hour Build Alternative 4 HCM External Analysis

	HCM Analysis	AM Peak Hour					
		Alternative 4			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	47.0	1.03	D	45.6	1.02	D
	Eastbound	69.8		E	69.8		E
	Westbound	70.3		E	70.3		E
	Northbound	15.4		B	15.4		B
	Southbound	46.1		D	43.2		D
2. Rockville Pike & Pooks Hill Road	Overall	223.0	1.64	F	219.9	1.63	F
	Eastbound	83.4		F	83.4		F
	Northbound	341.2		F	335.9		F
	Southbound	21.9		C	21.3		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.5	0.89	B
	Eastbound	23.9		C	23.9		C
	Westbound	37.4		D	37.4		D
	Northbound	14.1		B	14.1		B
	Southbound	18.5		B	18.5		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.3	0.40	B	15.2	0.39	B
	Eastbound	19.8		B	19.6		B
	Westbound	11.8		B	11.8		B
	Northbound	14.7		B	14.7		B
	Southbound	15.1		B	15.1		B
5. Rockville Pike & Cedar Lane	Overall	43.7	0.99	D	41.8	0.98	D
	Eastbound	86.5		F	82.1		F
	Westbound	62.5		E	61.1		E
	Northbound	13.9		B	14.4		B
	Southbound	42.0		D	39.3		D
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.8		B	11.7		B
	Westbound	9.8		A	9.8		A
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.4	0.64	A	7.8	0.62	A
	Westbound	20.8		C	21.2		C
	Northbound	22.2		C	18.3		B
	Southbound	2.7		A	3.2		A
8. Rockville Pike & Wilson Drive	Overall	2.1	0.61	A	2.1	0.59	A
	Eastbound	60.9		E	60.9		E
	Northbound	1.8		A	1.9		A
	Southbound	0.9		A	0.8		A
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	14.3	0.79	B	12.7	0.76	B
	Eastbound	67.7		E	63.5		E
	Westbound	52.7		D	52.1		D
	Northbound	16.7		B	13.2		B
	Southbound	6.9		A	6.6		A
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	33.1	0.82	C	32.3	0.84	C
	Eastbound	54.3		D	54.3		D
	Westbound	97.7		F	97.3		F
	Northbound	21.8		C	18.0		B
	Southbound	6.4		A	6.9		A

Table 49A: 2018 AM Peak Hour Build Alternative 4 HCM External Analysis (continued)

	HCM Analysis	AM Peak Hour					
		Alternative 4			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	16.0	0.69	B	12.3	0.63	B
	Eastbound	4.8		A	3.3		A
	Westbound	21.0		C	14.7		B
	Northbound	22.0		C	22.0		C
	Southbound	24.3		C	24.5		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	4.5	0.52	A	3.8	0.51	A
	Eastbound	2.4		A	2.1		A
	Westbound	5.6		A	4.7		A
	Southbound	0.0		A	0.0		A
13. University Road (Gate #5) & Jones Bridge Road	Overall	7.4	0.54	A	6.4	0.51	A
	Eastbound	5.0		A	4.5		A
	Westbound	7.8		A	7.1		A
	Southbound	24.3		C	24.6		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	51.5	1.04	D	49.4	1.01	D
	Eastbound	58.5		E	55.7		E
	Westbound	44.2		D	42.2		D
	Northbound	24.0		C	24.0		C
	Southbound	62.2		E	58.9		E
	Southwestbound	82.6		F	82.6		F
15. Manor Road & Jones Bridge Road	Overall	15.5	0.57	B	15.1	0.56	B
	Eastbound	18.1		B	18.0		B
	Westbound	15.9		B	15.3		B
	Northbound	10.8		B	10.8		B
16. Jones Bridge Road & Jones Mill Road	Overall	44.7	0.77	D	42.3	0.76	D
	Eastbound	30.5		C	30.2		C
	Northbound	52.2		D	46.8		D
	Southbound	46.5		D	46.5		D
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	20.8	0.71	C	19.5	0.71	B
	Eastbound	48.7		D	48.7		D
	Westbound	41.2		D	41.2		D
	Northbound	5.5		A	5.4		A
	Southbound	3.9		C	3.3		C

Note: Intersections with only two-way stops have no overall LOS identified.

Table 49B: 2018 PM Peak Hour Build Alternative 4 HCM External Analysis

	HCM Analysis	PM Peak Hour					
		Alternative 4			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density (Veh/ hr)	LOS
1. Rockville Pike & Grosvenor Lane	Overall	60.0	1.01	E	58.9	1.01	E
	Eastbound	48.4		D	48.4		D
	Westbound	88.7		F	88.7		F
	Northbound	30.8		C	30.3		C
	Southbound	71.9		E	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	35.5	1.01	D	33.1	0.99	C
	Eastbound	65.4		E	65.4		E
	Northbound	40.0		D	35.7		D
	Southbound	23.6		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.2	0.84	B	19.1	0.83	B
	Eastbound	31.9		C	31.9		C
	Westbound	37.2		D	37.3		D
	Northbound	20.2		C	20.2		C
	Southbound	13.3		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	30.4	0.73	C	30.2	0.73	C
	Eastbound	39.9		D	39.5		D
	Westbound	7.5		A	7.5		A
	Northbound	24.8		C	24.8		C
	Southbound	26.7		C	26.7		C
5. Rockville Pike & Cedar Lane	Overall	37.9	0.97	D	36.4	0.97	D
	Eastbound	57.4		E	57.4		E
	Westbound	65.5		E	63.5		E
	Northbound	29.7		C	26.5		C
	Southbound	31.9		C	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.1		B	11.0		B
	Westbound	11.1		B	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	7.6	0.74	A	8.6	0.70	A
	Westbound	36.6		D	39.9		D
	Northbound	10.1		B	9.9		A
	Southbound	1.0		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	12.1	0.66	B	12.3	0.63	B
	Eastbound	44.6		D	44.6		D
	Northbound	5.1		A	4.8		A
	Southbound	10.6		B	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	23.1	0.81	C	18.7	0.72	B
	Eastbound	68.1		E	52.8		D
	Westbound	33.3		C	35.8		D
	Northbound	17.7		B	13.5		B
	Southbound	20.1		C	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	59.5	0.95	E	59.9	0.94	E
	Eastbound	57.6		E	58.2		E
	Westbound	43.6		D	42.8		D
	Northbound	77.5		E	78.3		E
	Southbound	46.2		D	45.4		D

Table 49B: 2018 PM Peak Hour Build Alternative 4 HCM External Analysis (continued)

	HCM Analysis	PM Peak Hour					
		Alternative 4			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density (Veh/ hr)	LOS	Delay	Density (Veh/ hr)	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.5	0.75	B	14.0	0.75	B
	Eastbound	11.3		B	11.2		B
	Westbound	14.5		B	12.9		B
	Northbound	13.7		B	13.8		B
	Southbound	21.8		C	23.9		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	17.1	0.84	B	13.6	0.79	B
	Eastbound	13.3		B	12.1		B
	Westbound	5.3		A	5.2		A
	Southbound	43.7		D	32.7		C
13. University Road (Gate #5) & Jones Bridge Road	Overall	13.9	0.69	B	10.7	0.67	B
	Eastbound	15.4		B	11.2		B
	Westbound	9.3		A	9.3		A
	Southbound	20.1		C	21.0		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	70.4	1.10	E	68.7	1.10	E
	Eastbound	99.4		F	92.8		F
	Westbound	119.0		F	119.7		F
	Northbound	76.1		E	76.1		E
	Southbound	18.8		B	18.9		B
	Southwestbound	126.1		F	126.1		F
15. Manor Road & Jones Bridge Road	Overall	21.1	0.73	C	19.7	0.71	B
	Eastbound	31.3		C	28.9		C
	Westbound	4.0		A	3.7		A
	Northbound	21.9		C	21.9		C
16. Jones Bridge Road & Jones Mill Road	Overall	24.1	0.72	C	23.5	0.71	C
	Eastbound	12.9		B	13.0		B
	Northbound	40.4		D	38.5		D
	Southbound	20.0		C	20.0		C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	12.7	0.70	B	12.6	0.69	B
	Eastbound	12.8		B	12.8		B
	Westbound	9.2		A	9.2		A
	Northbound	18.3		B	18.1		B
	Southbound	7.9		A	7.8		A

Note: Intersections with only two-way stops have no overall LOS identified.

Table 50: 2018 AM Peak Hour Build Alternative 4 Arterial Analysis

		AM Peak Hour						
		Alt 4			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	11.2	11:42	E	11.5	11:25	E	3%
	Southbound	20.8	6:29	C	21.1	6:22	C	1%
Jones Bridge Road	Eastbound	20.6	5:0	C	20.7	4:59	C	0%
	Westbound	16.5	6:14	D	17.1	6:01	D	4%
West Cedar Lane	Eastbound	15.4	2:49	D	15.4	2:49	D	0%
	Westbound	16.9	2:34	D	16.9	2:34	D	0%

Table 51: 2018 PM Peak Hour Build Alternative 4 Arterial Analysis

		PM Peak Hour						
		Alt 4			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	15.6	8:23	D	16.0	8:11	D	3%
	Southbound	17.5	7:42	D	17.7	7:36	D	1%
Jones Bridge Road	Eastbound	16.7	6:11	D	17.1	6:02	D	2%
	Westbound	16.5	6:14	D	16.7	6:12	D	1%
West Cedar Lane	Eastbound	12.8	3:24	E	12.8	3:23	E	0%
	Westbound	17.4	2:30	D	17.4	2:30	D	0%

3.2.7.5 Internal Intersection Analysis

This alternative includes the addition of a new exit ramp from the New USU parking facility in N-Lot and would add more trips to the existing ramp connecting to South Palmer Road at Grier Road intersection.

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal intersections. For this alternative, there were no significant changes in LOS during the AM peak hour. During the PM peak hour intersection #26 East Palmer Road at Stokes Road would change from a LOS of B to D, reflecting the increase in traffic to and from the new Building C parking facility in H-Lot en route to Gate #3, and #28 South Palmer Road at Grier Road intersection would change from a LOS B to C, reflecting the new trips exiting the new USU Alternative 2 parking structure. Based on this analysis, there would be no significant impact to the internal roadway intersections for this alternative, as there would be no failing LOS. Tables 52A and 52B show the 2018 Build Alternative 4 internal intersection analysis and Figures 48A and 48B show the 2018 Build Alternative 4 internal intersection LOS.

Table 52A: 2018 Build Alternative 4 Internal Intersection Analysis

		AM Peak Hour				
			Build Alt. 4		*No Build Condition*	
		Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18.	**Parking Lot/R.B. Brown Drive & North Palmer Road**	Overall	11.3	B	10.3	B
		Eastbound	12.5	B	10.9	B
		Westbound	8.5	A	8.7	A
		Northbound	8.6	A	9.0	A
		Southbound	9.6	A	9.6	A
19.	**R.B. Brown Drive & America Garage/Garage 54 Exit**	Eastbound	14.7	B	17.6	C
		Westbound	11.6	B	12.8	B
		Northbound Left	3.4	A	3.1	A
20.	**R.B. Brown Drive & Garage 54 Entrance**	Overall	8.9	A	10.5	B
		Northbound	8.4	A	9.2	A
		Southbound	9.4	A	11.5	B
21.	**R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit**	Overall	8.3	A	9.1	A
		Westbound	7.4	A	8.1	A
		Northbound	8.6	A	9.4	A
		Southbound	7.7	A	8.8	A
22.	**R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance**	Overall	8.2	A	9.7	A
		Eastbound	7.5	A	8.1	A
		Northbound	8.5	A	10.1	B
		Southbound	7.7	A	9.0	A
23.	**R.B. Brown Drive & South Palmer Road**	Overall	9.1	A	9.8	A
		Eastbound	9.4	A	10.3	B
		Westbound	8.1	A	8.7	A
		Southbound	8.4	A	9.1	A
24.	**East Palmer Road & North Palmer Road/Taylor Road**	Overall	10.5	B	9.6	A
		Eastbound	11.2	B	10.0	A
		Westbound	8.7	A	8.6	A
		Northbound	9.9	A	9.5	A
25.	**East Palmer Road & Visitor Garage Exit/Rixey Road**	Overall	9.8	A	9.0	A
		Eastbound	0.0	A	7.5	A
		Westbound	8.5	A	8.1	A
		Northbound	9.9	A	9.4	A
		Southbound	10.0	A	8.7	A
26.	**East Palmer Road/Gunnell Road & Stokes Road**	Overall	11.9	B	9.5	A
		Westbound	9.4	A	8.6	A
		Northbound	13.2	B	10.1	B
		Southbound	9.3	A	8.9	A
27.	**AFRRI Driveway/Stokes Road & South Palmer Road**	Overall	9.6	A	9.5	A
		Eastbound	7.9	A	8.1	A
		Westbound	10.5	B	10.4	B
		Northbound	8.9	A	8.9	A
		Southbound	0.0	A	0.0	A
28.	**University Road/Grier Road & South Palmer Road**	Overall	8.6	A	8.7	A
		Eastbound	8.4	A	8.4	A
		Westbound	9.1	A	9.1	A
		Northbound	8.7	A	9.0	A
		Southbound	7.2	A	6.9	A
29.	**University Road & South Palmer Road**	Westbound	8.0	A	8.0	A
		Northbound	7.9	A	7.9	A

Table 52B: 2018 Build Alternative 4 Internal Intersection Analysis

		PM Peak Hour			
		Build Alt. 4		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	12.0	B	16.5	C
	Eastbound	9.3	A	9.7	A
	Westbound	13.1	B	15.6	C
	Northbound	12.5	B	20.5	C
	Southbound	9.6	A	10.0	B
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	*	F	*	F
	Westbound	*	F	*	F
	Northbound Left	0.9	A	0.6	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.0	A	8.8	A
	Northbound	7.9	A	9.0	A
	Southbound	8.1	A	8.5	A
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	9.1	A	11.3	B
	Westbound	7.4	A	10.9	B
	Northbound	8.2	A	9.5	A
	Southbound	9.5	A	12.3	B
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	8.0	A	9.4	A
	Eastbound	7.3	A	7.8	A
	Northbound	7.9	A	8.3	A
	Southbound	8.0	A	10.0	B
23. R.B. Brown Drive & South Palmer Road	Overall	10.2	B	10.6	B
	Eastbound	8.2	A	8.9	A
	Westbound	11.5	B	10.7	B
	Southbound	8.9	A	11.4	B
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	10.8	B	10.7	B
	Eastbound	10.3	B	10.0	B
	Westbound	11.4	B	11.4	B
	Northbound	10.7	B	10.7	B
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	10.5	B	10.2	B
	Eastbound	8.5	A	8.4	A
	Westbound	9.9	A	9.8	A
	Northbound	9.8	A	9.7	A
	Southbound	11.5	B	11.0	B
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	29.4	D	15.0	B
	Westbound	42.1	E	16.0	C
	Northbound	14.8	B	11.5	B
	Southbound	21.8	C	16.2	C
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	13.6	B	10.7	B
	Eastbound	9.4	A	10.3	B
	Westbound	15.3	C	11.0	B
	Northbound	13.2	B	10.8	B
	Southbound	9.0	A	8.6	A
28. University Road/Grier Road & South Palmer Road	Overall	19.1	C	12.5	B
	Eastbound	15.0	B	13.7	B
	Westbound	9.7	A	9.2	A
	Northbound	9.1	A	8.9	A
	Southbound	21.3	C	11.9	B
29. University Road & South Palmer Road	Westbound	7.1	A	7.1	A
	Northbound	7.0	A	7.1	A

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no overall LOS identified.

Figure 48A: 2018 AM Peak Hour Build Alternative 4 Internal Intersection LOS

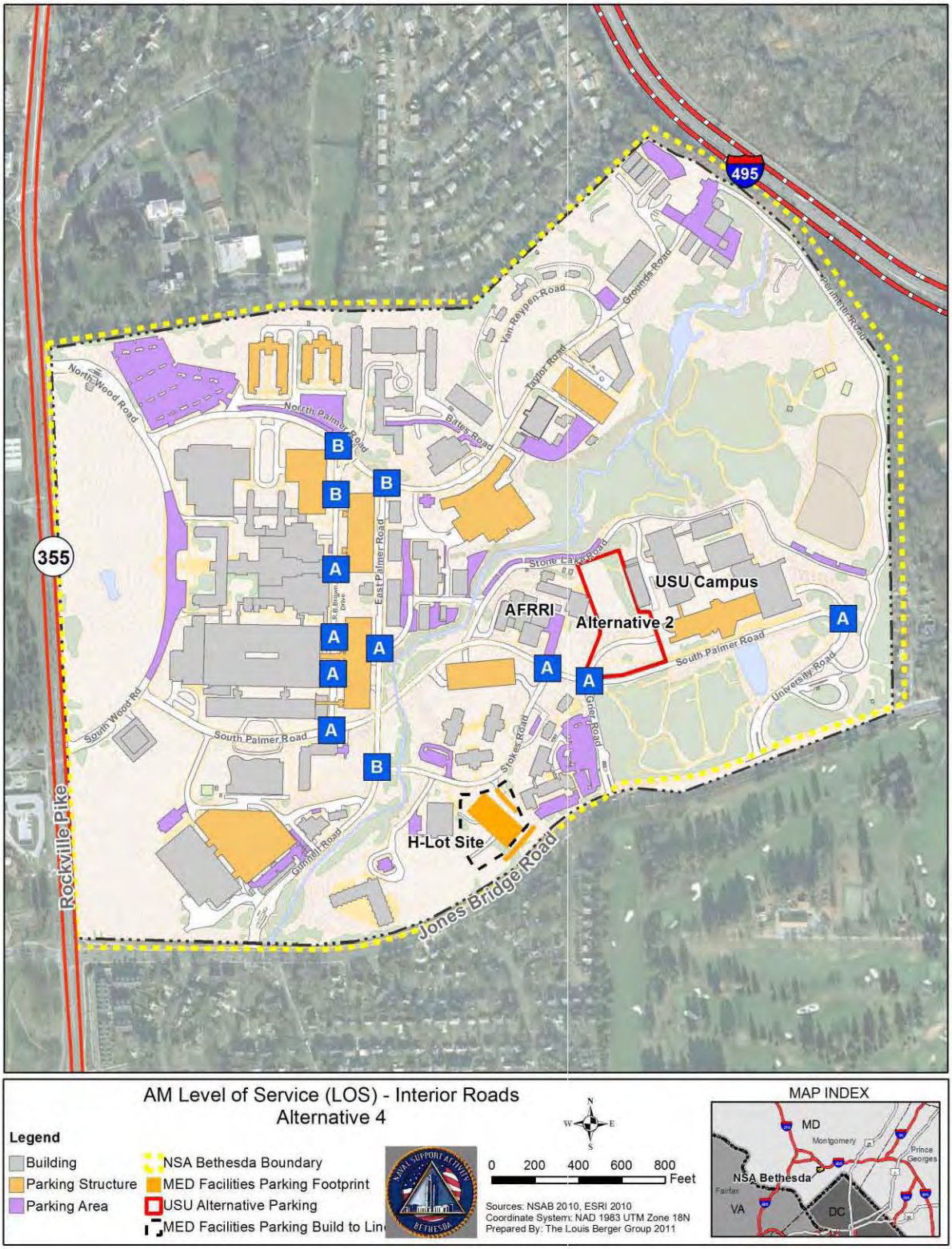
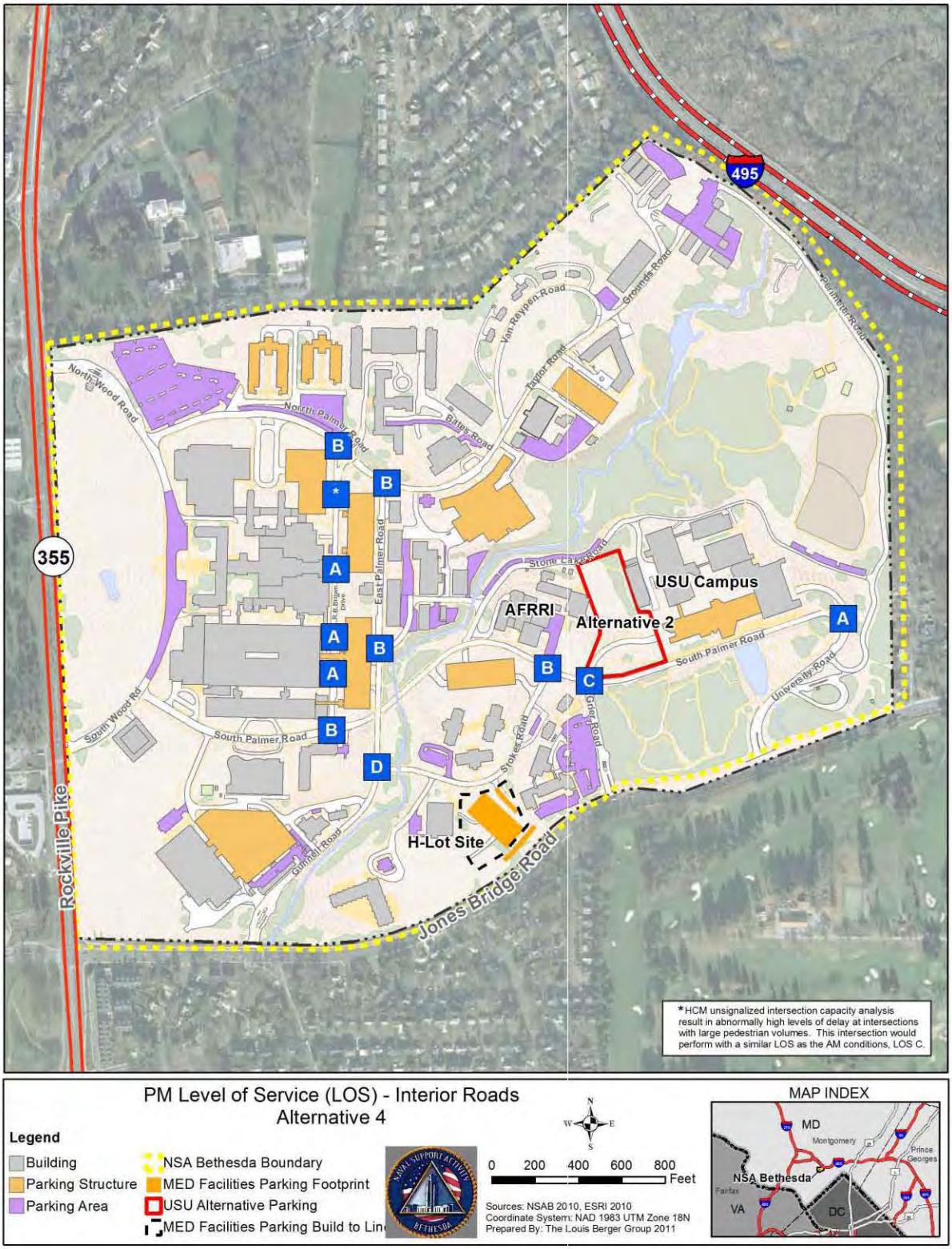


Figure 48B: 2018 PM Peak Hour Build Alternative 4 Internal Intersection LOS



3.2.7.6 Bicycle and Pedestrian Impacts

This alternative would include the placement of two new parking structures, resulting in increased pedestrian activity between the parking structures and destination buildings. The new parking structure serving Building C would be located off of Stokes Road in the Navy Lodge area of NSA Bethesda; therefore, new pedestrian trips would be created between the parking structure and Medical Buildings. Specifically, there would be 230 pedestrian trips during the AM peak hour and 239 pedestrian trips during the PM peak hour.

The new USU Alternative 2 parking structure would be placed next to the USU Campus; therefore, new pedestrian activity would cross roadways en route to the Medical Building based on 42 new employees and 131 shifted staff trips (formerly parking at Buildings 54 and 55) crossing two intersections, the South Palmer Road at Stokes Road and South Palmer Road at Brown Drive. This would result in 78 and 81 new pedestrian trips during the AM peak hour and PM peak hour, respectively. Both the Building C and F parking structure trips were included in the internal HCM analysis in Tables 52A and 52B.

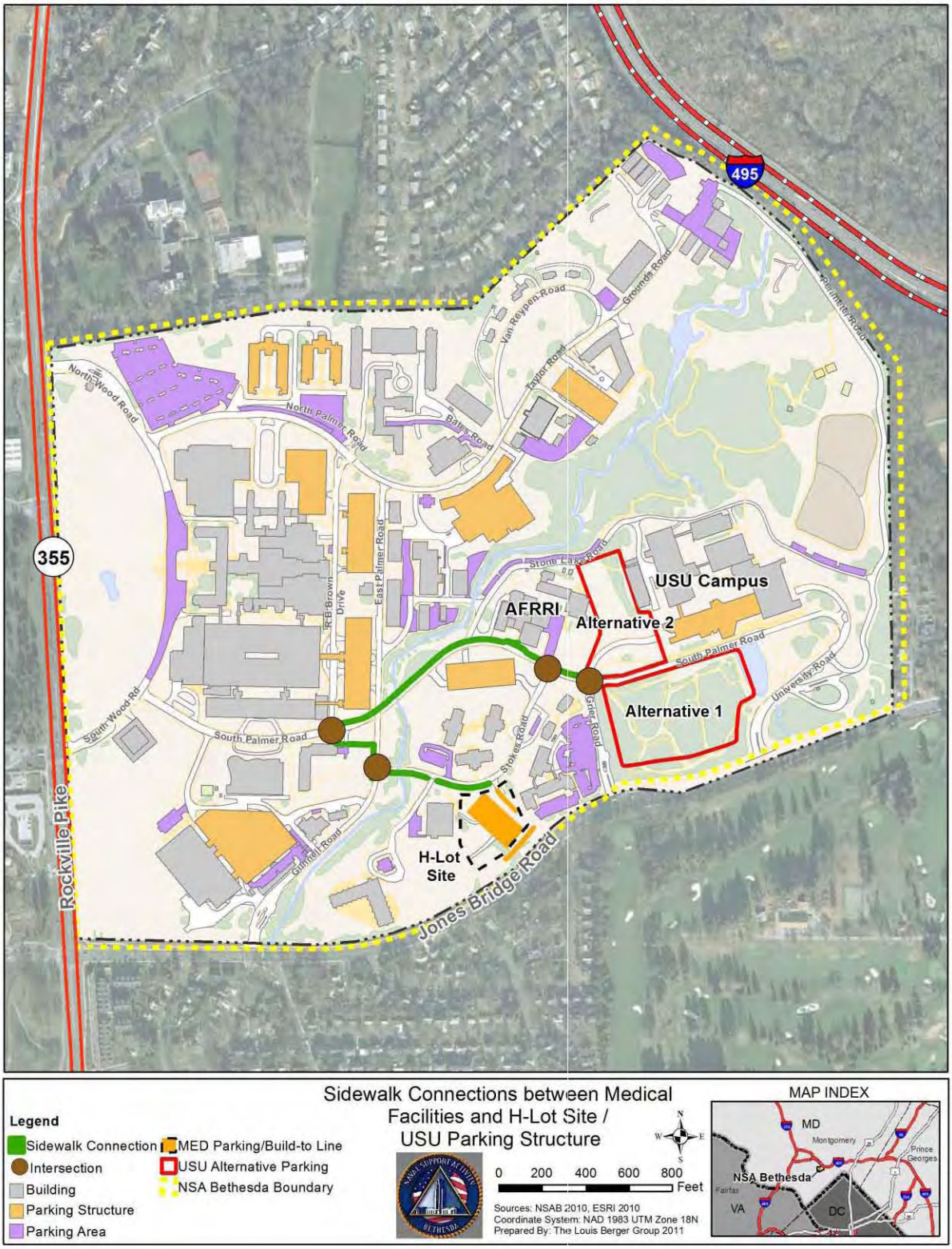
Existing 5-foot plus sidewalks connect both new parking structures with the Medical Buildings via South Palmer Road and Stokes Road. Any other new pedestrian or bicycle activity generated from the 42 employees not included in the original Alternative 4 trip generation would be able to use the new Metro tunnel connecting the Medical Center Metro station with the Gate #2 entrance or park their bicycle at any of the four bike storage racks serving the Medical Facility or two racks serving the USU. Based on the No Build condition including the existing bicycle racks and sidewalks, this alternative would have no significant pedestrian or bicycle impacts. Figure 49 shows the 2018 Alternative 4 sidewalk connections.

3.2.8 ***Build Alternative 5***

This alternative would include the construction of a new 500-space parking structure in the Taylor Road Facilities to serve Building C and the construction of a 400-space parking structure known as USU Alternative 2. The 500-space parking structure would be located next to the planned Sanctuary Hall (WWTL) parking facility along Taylor Road, with the entrance and exit ramps connecting to Taylor Road.

The new USU Alternative 2 parking structure would replace the existing N-Lot, with the entrance located on Stone Lake Road and two exits, one serving Stone Lake Road and the other connecting to the South Palmer Road and Grier Road intersection.

Figure 49: 2018 Build Alternative 4 Sidewalk Connections



3.2.8.1 Trip Generation

The trips generated for this alternative would be the same as Alterative 1, see Section 3.2.4.1.

3.2.8.2 Trip Distribution

The new parking structure serving Building C would shift existing staff trips from Buildings 54 and 55 to the new parking structure in the Taylor Road facilities. The new staff trips generated from Buildings C and F would be destined for the new USU Alternative 2 parking structure in N-Lot.

Since 500 new parking spaces must be made available for patients, 392 spaces would come from Building 55 and 108 spaces from Building 54. To determine the number of staff trips that would be shifted to the Taylor Road facilities, the study used the following assumptions:

- All existing staff spaces that are removed from one facility will be placed in another facility at the installation.
- Staff will continue to have set patterns and drive to the closest parking facility available, based upon their daily arrival time. If they arrive later in the morning, they would automatically drive to the warehouse parking facility.
- The number of spaces reassigned to patient parking in Building 54 would be 14 percent, the percentage of staff spaces (108) relocated compared to the total spaces in the structure (749).
- The number of AM and PM peak trips shifted would be 14 percent of the peak hour trips currently using the facility.
- Based on the patient temporal distribution (Figure 33), 15 percent of patients would arrive during the AM peak hour and 6 percent leave during the same period, while 0.5 percent would arrive during the PM peak hour and 4 percent leave.
- The percentage of staff entering and exiting Building 55 during the peak hours would be the inverse of the patient percentages (85 percent/94 percent during the AM peak hour and 99.5 percent/96 percent during the PM peak hour).

Based upon these assumptions, the number of trips shifted from Building 54 during the AM peak hour would be 43 staff (14 percent of 305) inbound and three staff (14 percent of 19) outbound. For the PM peak, three staff (14 percent of 19) inbound and 18 (14 percent of 126) would be shifted outbound. In Building 55, the staff shifted would be based on the fifth bullet above, resulting in 208 (85 percent of 245) inbound and 40 outbound (94 percent of 43) during the AM peak hour and 30 (99.5 percent of 30) inbound and 254 (96 percent of 265) outbound during the PM peak hour. Table 53 shows the trip distribution

shift between Buildings 54 and 55 to the proposed Taylor Road facilities parking structure.

Table 53: Trip Distribution shift between Buildings 54 and 55 to the Proposed Taylor Road Facilities Parking Structure

	Facility Name	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
1	Building 54	43	3	46	3	18	21
2	Building 55	208	40	248	31	254	284
	Total	251	43	294	34	272	305

The internal installation generated or shifted trips follow the updated trip distribution pattern based upon the 2008 NNMC Transportation Study (Figure 26). The distribution patterns for the shifted staff trips from Buildings 54 and 55 would follow the following paths:

- From the north: Continue past R.B. Brown Drive on North Palmer Road then continue onto Taylor Road.
- To the north: Turn left into Taylor Road, then continue straight on North Palmer Road past R.B. Brown Drive.
- From the south: Turn right Enter through Gate #3, follow Gunnell Road to East Palmer Road, and turn right onto Taylor Road.
- To the south: Turn left onto Taylor Road, turn left onto East Palmer Road, follow to Gunnell Road and exit through Gate #3, and turn right onto Jones Bridge Road.
- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and follow through to Grounds Road Taylor Road.
- To the east: Turn right onto Taylor Road/Grounds Road, follow onto Perimeter Road, turn left onto University Road, exit though Gate #5, and turn left onto Jones Bridge Road.

The result of these new distribution patterns would remove trips from R.B. Brown Drive and South Palmer Road.

During the AM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto North Wood Road, enter through Gate #1, turn left onto North Palmer Road, turn right onto East Palmer Road, turn left onto Rixey Road, and turn left onto Stone Lake Road.

- To the north: Turn right onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Rixey Road, and turn left onto Stone Lake Road.

- To the south: Turn left onto Stone Lake Road, turn right onto Rixey Road, turn left onto East Palmer Road, follow to Gunnell Road and exit through Gate #3, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and turn left onto Stone Lake Road.

- To the east: Turn left onto South Palmer Road, turn right onto University Road and exit though Gate #5, and turn left onto Jones Bridge Road.

During the PM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto North Wood Road, enter through Gate #1, turn left onto North Palmer Road, turn right onto East Palmer Road, turn left onto Rixey Road, and turn left onto Stone Lake Road.

- To the north: Turn right onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Rixey Road, and turn left onto Stone Lake Road.

- To the south: Go straight onto Grier Road and exit through Gate #4, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and turn left onto Stone Lake Road.

- To the east: Go straight onto Grier Road and exit through Gate #4, and turn left onto Jones Bridge Road.

Figures 50A, 50B, and 50C show trip distribution for Alternative 5.

Figure 50A: Alternative 5 Trip Distribution

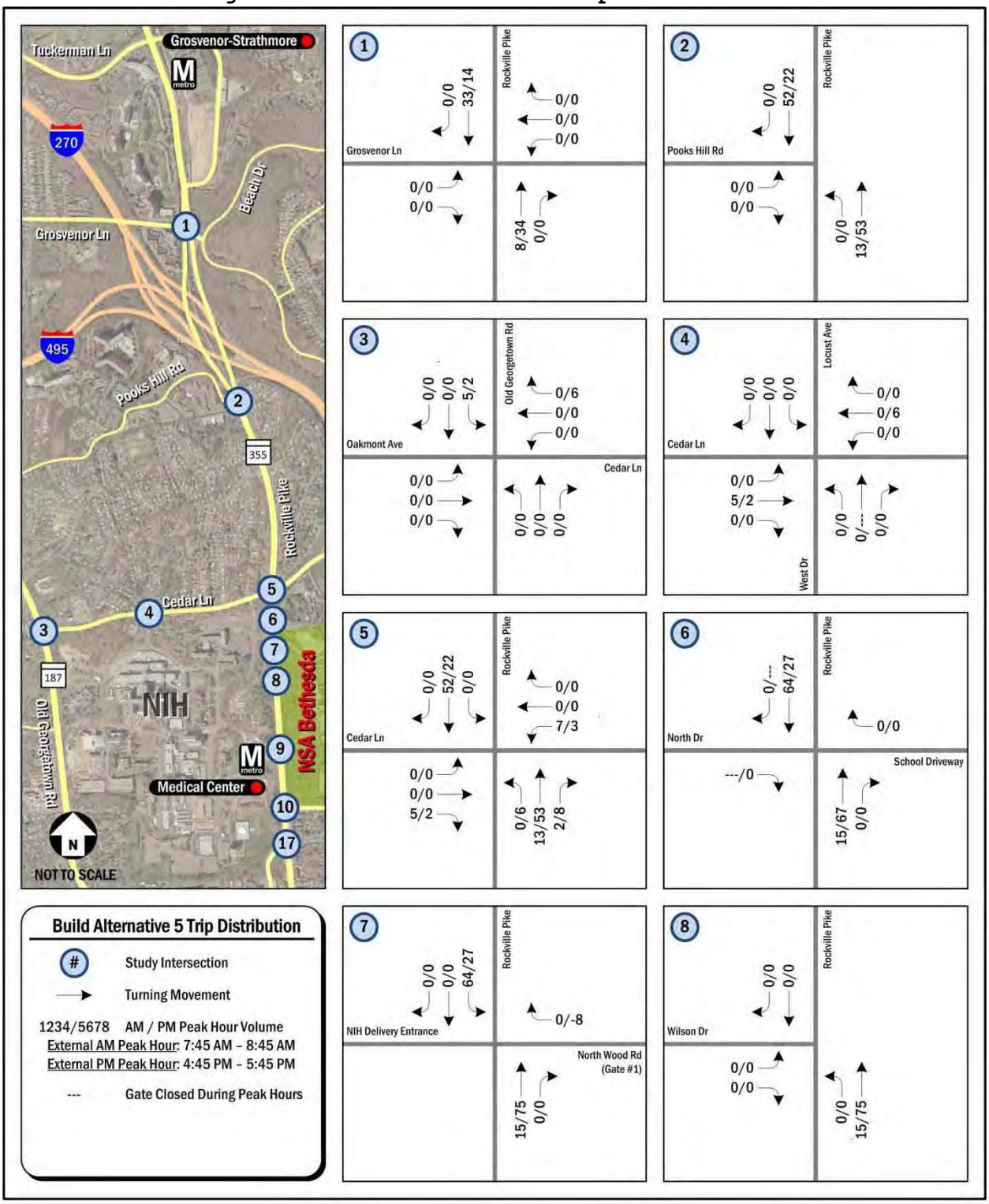


Figure 50B: Alternative 5 Trip Distribution

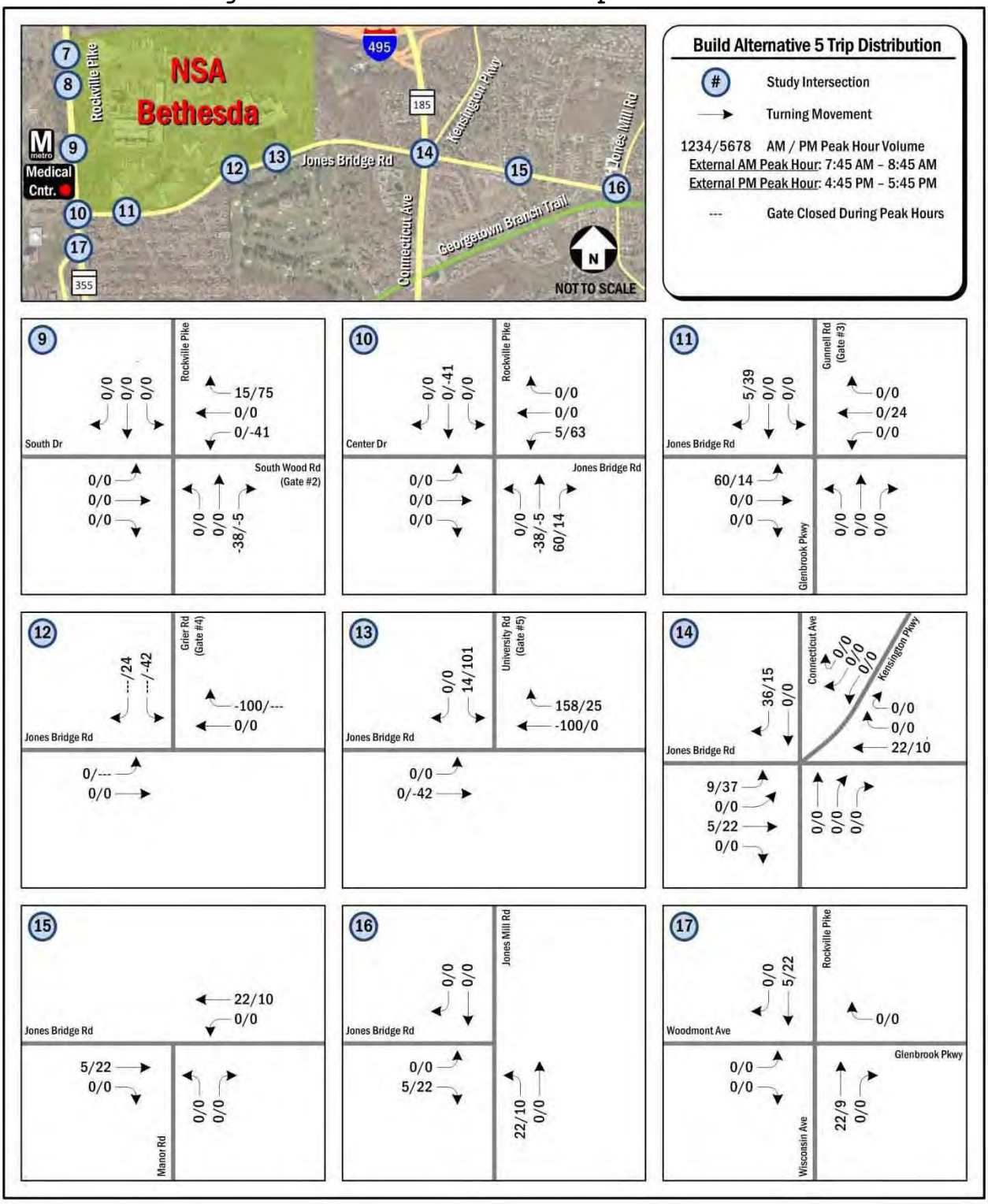
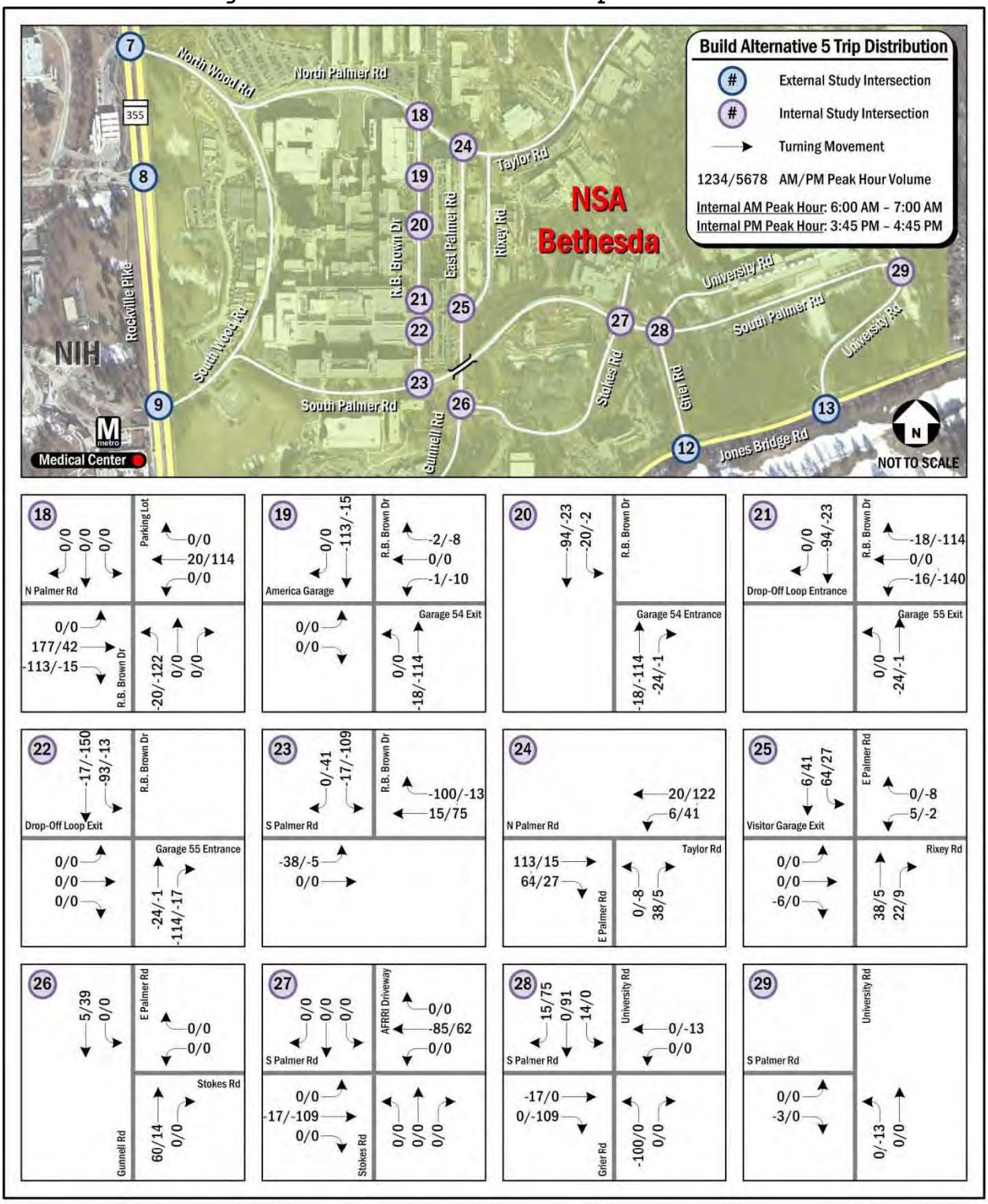


Figure 50C: Alternative 5 Trip Distribution



3.2.8.3 ***External Intersection Analysis***

The 2018 Build Alternative 5 includes all projects listed in the No Build condition. The addition of a new exit ramp from the New USU

Alternative 2 parking structure in N-Lot would add more trips to the existing ramp connecting to South Palmer Road at Grier Road intersection. Figure 29C shows the 2018 Build Alternatives 2 through 5 and 7 through 10 internal lane utilization and traffic control.

Critical Lane Volume Analysis

The CLV analysis was conducted for the 16 external signalized intersections to compare to the No Build condition. According to the analysis, there would be no change between Build Alternative 5 and the No Build condition. Based upon these results, the external signalized intersections would have no significant traffic impacts from implementing Alternative 5. Table 54 shows the 2018 Build Alternative 5 CLV external analysis. Figures 51A and 51B show the 2018 Build Alternative 5 CLV intersection LOS.

Table 54: Build Alternative 5 CLV External Analysis

		Build Alternative 5				No Build Condition			
		AM Peak Hr.		*PM Peak Hr.*		*AM Peak Hr.*		*PM Peak Hr.*	
		CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS
1.	**Rockville Pike & Grosvenor Lane**	1,385	D	1,341	D	1,373	D	1,336	D
2.	**Rockville Pike & Pooks Hill Road**	1,359	D	1,399	D	1,343	D	1,379	D
3.	**Old Georgetown Road & Oakmont Avenue/Cedar Lane**	1,437	D	1,538	E	1,437	D	1,536	E
4.	**Locust Avenue/West Drive & Cedar Lane**	465	A	941	A	489	A	939	A
5.	**Rockville Pike & Cedar Lane**	1,554	E	1,242	C	1,529	E	1,236	C
6.	**Rockville Pike & North Drive/School Driveway**	*un-signalized*		*un-signalized*		*un-signalized*		*un-signalized*	
7.	**Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)**	912	A	1,058	B	843	A	1,033	B
8.	**Rockville Pike & Wilson Drive**	958	A	971	A	958	A	948	A
9.	**Rockville Pike & South Drive/South Wood Road (Gate #2)**	1,136	B	1,114	B	1,121	B	1,039	B
10.	**Rockville Pike & Center Drive/Jones Bridge Road**	704	A	840	A	715	A	808	A
11.	**Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road**	861	A	1,056	B	801	A	1,024	B
12.	**Grier Road (Gate #4) & Jones Bridge Road**	692	A	1,062	B	692	A	1,104	B
13.	**University Road (Gate #5) & Jones Bridge Road**	696	A	1,107	B	729	A	1,023	B
14.	**Connecticut Avenue & Jones Bridge Road & Kensington Parkway**	1,507	E	1,755	F	1,490	E	1,735	F
15.	**Manor Road & Jones Bridge Road**	761	A	1,031	B	739	A	1,009	B
16.	**Jones Bridge Road & Jones Mill Road**	1,061	B	1,084	B	1,039	B	1,062	B
17.	**Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway**	773	A	942	A	771	A	938	A

Highway Capacity Manual Intersection Analysis

The HCM analysis was conducted as a secondary comparison to the CLV analysis between the No Build condition and Build Alternatives for the external intersections. When comparing Build Alternative 5 with the No Build condition, the AM peak hour did not experience any change in LOS. For the PM peak hour, LOS changes would occur at the following intersections: #2 Rockville Pike at Pooks Hill Road (C to D), #9 Rockville Pike at South Wood Road (Gate #2) (B to C), and #15 Jones Bridge Road at Manor Road (B to C). Since the CLV process was not used to evaluate unsignalized intersections, HCM analysis was used to provide a comparison to the No Build condition for the intersection #6 Rockville Pike at North Drive/School Driveway, which showed no significant impacts. Tables 55A and 55B show the 2018 Build Alternative 5 HCM external analysis.

Figure 51A: 2018 AM Peak Hour Build Alternative 5 CLV intersection LOS

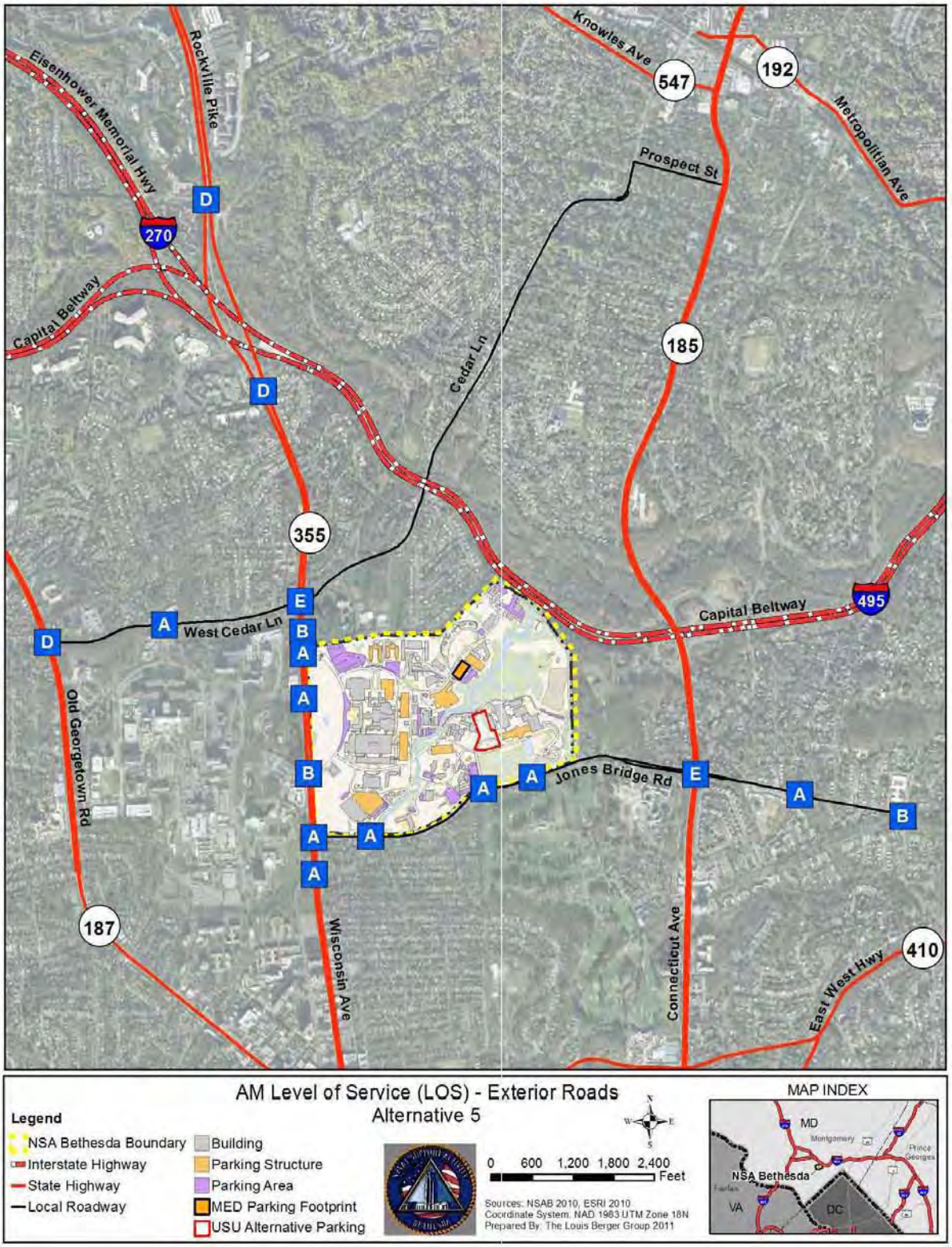


Figure 51B: 2018 PM Peak Hour Build Alternative 5 CLV intersection LOS

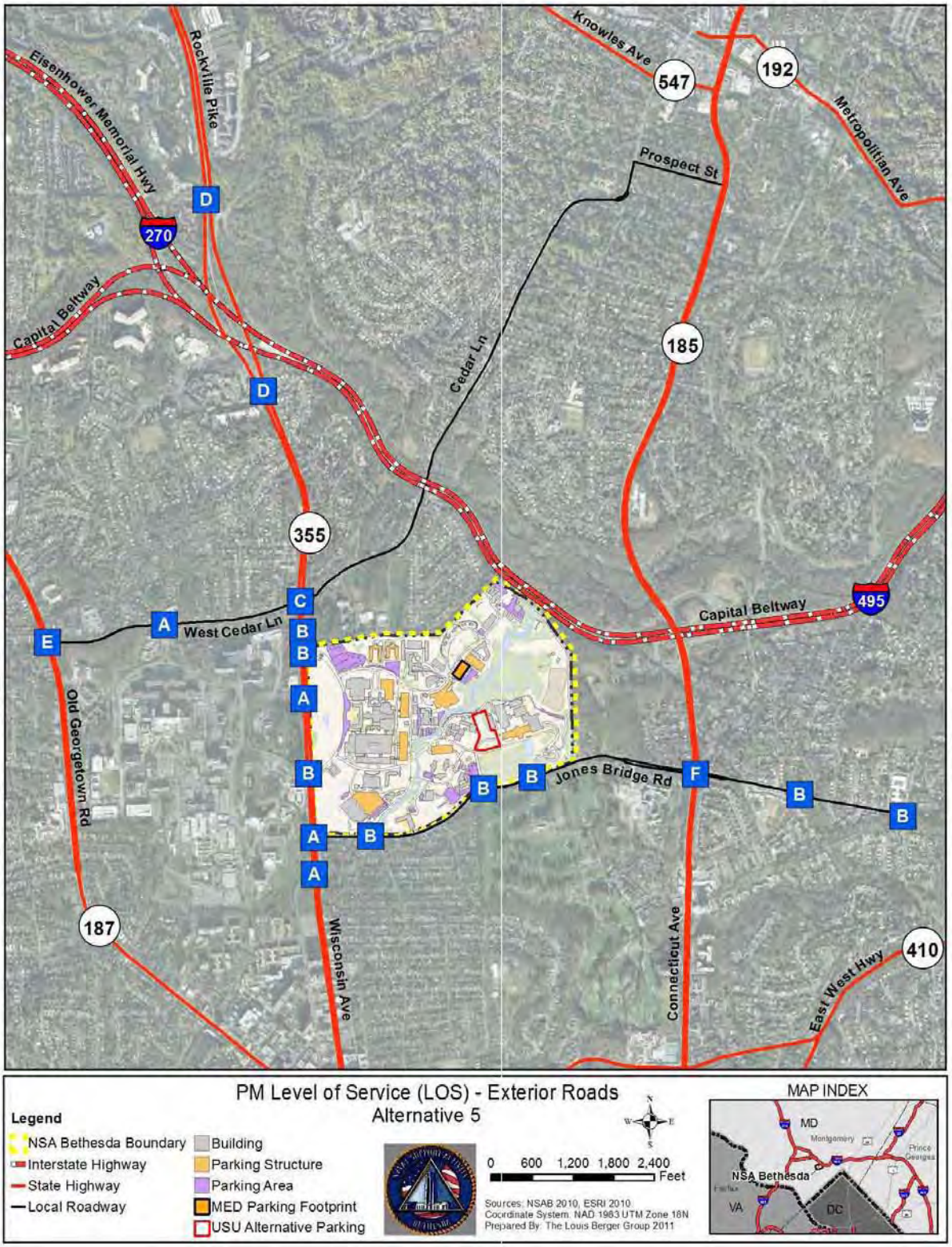


Table 55A: 2018 AM Peak Hour Build Alternative 5 HCM External Analysis

	HCM Analysis	AM Peak Hour					
		Alternative 5			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	47.2	1.03	D	45.6	1.02	D
	Eastbound	69.8		E	69.8		E
	Westbound	70.3		E	70.3		E
	Northbound	15.4		B	15.4		B
	Southbound	46.6		D	43.2		D
2. Rockville Pike & Pooks Hill Road	Overall	223.2	1.64	F	219.9	1.63	F
	Eastbound	83.4		F	83.4		F
	Northbound	341.6		F	335.9		F
	Southbound	22.0		C	21.3		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.5	0.89	B
	Eastbound	23.9		C	23.9		C
	Westbound	37.4		D	37.4		D
	Northbound	14.1		B	14.1		B
	Southbound	18.5		B	18.5		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.3	0.40	B	15.2	0.39	B
	Eastbound	19.8		B	19.6		B
	Westbound	11.8		B	11.8		B
	Northbound	14.7		B	14.7		B
	Southbound	15.1		B	15.1		B
5. Rockville Pike & Cedar Lane	Overall	44.1	1.00	D	41.8	0.98	D
	Eastbound	86.5		F	82.1		F
	Westbound	62.7		E	61.1		E
	Northbound	14.6		B	14.4		B
	Southbound	42.4		D	39.3		D
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.8		B	11.7		B
	Westbound	9.8		A	9.8		A
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.3	0.62	A	7.8	0.62	A
	Westbound	21.2		C	21.2		C
	Northbound	18.5		B	18.3		B
	Southbound	3.9		A	3.2		A
8. Rockville Pike & Wilson Drive	Overall	2.1	0.59	A	2.1	0.59	A
	Eastbound	60.9		E	60.9		E
	Northbound	1.9		A	1.9		A
	Southbound	0.8		A	0.8		A
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	12.9	0.76	B	12.7	0.76	B
	Eastbound	66.9		E	63.5		E
	Westbound	52.6		D	52.1		D
	Northbound	12.8		B	13.2		B
	Southbound	6.5		A	6.6		A
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	32.5	0.84	C	32.3	0.84	C
	Eastbound	54.3		D	54.3		D
	Westbound	99.6		F	97.3		F
	Northbound	17.4		B	18.0		B
	Southbound	6.6		A	6.9		A

Table 55A: AM Peak Hour 2018 Build Alternative 5 HCM External Analysis (continued)

	HCM Analysis	AM Peak Hour					
		Alternative 5			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.0	0.64	B	12.3	0.63	B
	Eastbound	3.8		A	3.3		A
	Westbound	17.5		B	14.7		B
	Northbound	22.0		C	22.0		C
	Southbound	24.5		C	24.5		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	4.5	0.53	A	3.8	0.51	A
	Eastbound	2.5		A	2.1		A
	Westbound	5.6		A	4.7		A
	Southbound	0.0		A	0.0		A
13. University Road (Gate #5) & Jones Bridge Road	Overall	7.3	0.52	A	6.4	0.51	A
	Eastbound	5.1		A	4.5		A
	Westbound	7.5		A	7.1		A
	Southbound	24.3		C	24.6		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	52.1	1.04	D	49.4	1.01	D
	Eastbound	59.4		E	55.7		E
	Westbound	44.7		D	42.2		D
	Northbound	24.0		C	24.0		C
	Southbound	63.1		E	58.9		E
	Southwestbound	82.6		F	82.6		F
15. Manor Road & Jones Bridge Road	Overall	15.6	0.57	B	15.1	0.56	B
	Eastbound	18.1		B	18.0		B
	Westbound	16.1		B	15.3		B
	Northbound	10.8		B	10.8		B
16. Jones Bridge Road & Jones Mill Road	Overall	45.4	0.77	D	42.3	0.76	D
	Eastbound	30.5		C	30.2		C
	Northbound	53.8		D	46.8		D
	Southbound	46.5		D	46.5		D
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	19.4	0.71	B	19.5	0.71	B
	Eastbound	48.7		D	48.7		D
	Westbound	41.2		D	41.2		D
	Northbound	5.5		A	5.4		A
	Southbound	3.3		C	3.3		C

Note: Intersections with only two-way stops have no overall LOS identified.

Table 55B: 2018 PM Peak Hour Build Alternative 5 HCM External Analysis

	HCM Analysis	PM Peak Hour					
		Alternative 5			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density (Veh/ hr)	LOS
1. Rockville Pike & Grosvenor Lane	Overall	60.1	1.01	E	58.9	1.01	E
	Eastbound	48.4		D	48.4		D
	Westbound	88.7		F	88.7		F
	Northbound	30.9		C	30.3		C
	Southbound	72.2		E	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	35.8	1.01	D	33.1	0.99	C
	Eastbound	65.4		E	65.4		E
	Northbound	40.7		D	35.7		D
	Southbound	23.7		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.2	0.84	B	19.1	0.83	B
	Eastbound	31.9		C	31.9		C
	Westbound	37.2		D	37.3		D
	Northbound	20.2		C	20.2		C
	Southbound	13.3		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	30.4	0.73	C	30.2	0.73	C
	Eastbound	39.9		D	39.5		D
	Westbound	7.5		A	7.5		A
	Northbound	24.8		C	24.8		C
	Southbound	26.7		C	26.7		C
5. Rockville Pike & Cedar Lane	Overall	38.4	0.97	D	36.4	0.97	D
	Eastbound	57.4		E	57.4		E
	Westbound	65.5		E	63.5		E
	Northbound	30.9		C	26.5		C
	Southbound	31.9		C	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.1		B	11.0		B
	Westbound	10.7		B	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.5	0.72	A	8.6	0.70	A
	Westbound	39.7		D	39.9		D
	Northbound	9.8		A	9.9		A
	Southbound	1.0		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	12.2	0.63	B	12.3	0.63	B
	Eastbound	44.6		D	44.6		D
	Northbound	5.0		A	4.8		A
	Southbound	10.4		B	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	22.0	0.79	C	18.7	0.72	B
	Eastbound	65.2		E	52.8		D
	Westbound	33.6		C	35.8		D
	Northbound	16.2		B	13.5		B
	Southbound	19.2		B	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	59.4	0.94	E	59.9	0.94	E
	Eastbound	58.2		E	58.2		E
	Westbound	44.2		D	42.8		D
	Northbound	77.5		E	78.3		E
	Southbound	44.5		D	45.4		D

Table 55B: 2018 PM Peak Hour Build Alternative 5 HCM External Analysis (continued)

	HCM Analysis	PM Peak Hour					
		Alternative 5			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density (Veh/ hr)	LOS	Delay	Density (Veh/ hr)	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.4	0.75	B	14.0	0.75	B
	Eastbound	11.1		B	11.2		B
	Westbound	14.2		B	12.9		B
	Northbound	13.8		B	13.8		B
	Southbound	23.1		C	23.9		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	12.1	0.75	B	13.6	0.79	B
	Eastbound	11.0		B	12.1		B
	Westbound	5.4		A	5.2		A
	Southbound	27.7		C	32.7		C
13. University Road (Gate #5) & Jones Bridge Road	Overall	9.8	0.73	A	10.7	0.67	B
	Eastbound	9.2		A	11.2		B
	Westbound	9.3		A	9.3		A
	Southbound	23.8		C	21.0		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	71.2	1.10	E	68.7	1.10	E
	Eastbound	102.6		F	92.8		F
	Westbound	118.7		F	119.7		F
	Northbound	76.1		E	76.1		E
	Southbound	18.8		B	18.9		B
	Southwestbound	126.1		F	126.1		F
15. Manor Road & Jones Bridge Road	Overall	21.4	0.73	C	19.7	0.71	B
	Eastbound	32.0		C	28.9		C
	Westbound	4.1		A	3.7		A
	Northbound	21.9		C	21.9		C
16. Jones Bridge Road & Jones Mill Road	Overall	24.4	0.73	C	23.5	0.71	C
	Eastbound	12.9		B	13.0		B
	Northbound	41.2		D	38.5		D
	Southbound	20.0		C	20.0		C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	12.7	0.70	B	12.6	0.69	B
	Eastbound	12.8		B	12.8		B
	Westbound	9.2		A	9.2		A
	Northbound	18.3		B	18.1		B
	Southbound	7.9		A	7.8		A

Note: Intersections with only two-way stops have no overall LOS identified.

3.2.8.4 Arterial Analysis

Arterial analysis was performed for Rockville Pike, West Cedar Lane, and Jones Bridge Road, comparing the alternative to the No Build condition. The greatest change between the No Build condition and Build Alternative 5 was a 3 percent increase along Jones Bridge Road westbound during the AM peak hour and Rockville Pike northbound during the PM peak hour. Based upon this analysis, Alternative 5 would not require PAMR-RAM external intersection mitigation. Tables 56 and 57 show the 2018 Build Alternative 5 arterial analyses.

Table 56: 2018 AM Peak Hour Build Alternative 5 Arterial Analysis

		AM Peak Hour						
		Alt 5			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	11.4	11:30	E	11.5	11:25	E	1%
	Southbound	20.7	6:30	C	21.1	6:22	C	2%
Jones Bridge Road	Eastbound	20.6	5:1	C	20.7	4:59	C	0%
	Westbound	16.6	6:12	D	17.1	6:01	D	3%
West Cedar Lane	Eastbound	15.4	2:49	D	15.4	2:49	D	0%
	Westbound	16.9	2:34	D	16.9	2:34	D	0%

Table 57: 2018 PM Peak Hour Build Alternative 5 Arterial Analysis

		PM Peak Hour						
		Alt 5			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	15.6	8:24	D	16.0	8:11	D	3%
	Southbound	17.5	7:41	D	17.7	7:36	D	1%
Jones Bridge Road	Eastbound	17.1	6:2	D	17.1	6:02	D	0%
	Westbound	16.5	6:14	D	16.7	6:12	D	1%
West Cedar Lane	Eastbound	12.8	3:24	E	12.8	3:23	E	0%
	Westbound	17.4	2:30	D	17.4	2:30	D	0%

3.2.8.5 Internal Intersection Analysis

This alternative includes adding a new exit ramp from the New USU Alternative 2 parking facility in N-Lot and would add more trips to the existing ramp connecting to South Palmer Road at Grier Road intersection.

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal intersections. For this alternative, intersection #18 R.B. Brown Drive at North Palmer Road would change from a LOS of B to C during the AM peak hour, reflecting the increased trips headed to the Taylor Road facilities from Gate #1 and intersection #19 R.B. Brown Drive at America Garage approach would change from a LOS of C to D, reflecting the increase in pedestrian traffic crossing at this intersection walking between the Medical Center and Taylor Road facilities parking facility.

During the PM peak hour #26 East Palmer Road at Stokes Road and #28 South Palmer Road at Grier Road intersections would change from a LOS B to C. The #28 intersection change would be the result of the new trips exiting the new USU Alternative 2 parking structure. The #26 intersection change would be due to the increased trips from the

Taylor Road facilities heading to Gate #3. Based on this analysis, there would be no significant impact to the internal roadway intersections for this alternative. Tables 58A and 58B show the 2018 Build Alternative 5 internal intersection analysis and Figures 52A and 52B show the 2018 Build Alternative 5 internal intersection LOS.

Table 58A: 2018 Build Alternative 5 Internal Intersection Analysis

		AM Peak Hour			
		Build Alt. 5		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	15.9	C	10.3	B
	Eastbound	18.7	C	10.9	B
	Westbound	8.8	A	8.7	A
	Northbound	8.9	A	9.0	A
	Southbound	9.8	A	9.6	A
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	26.5	D	17.6	C
	Westbound	16.4	C	12.8	B
	Northbound Left	3.4	A	3.1	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.9	A	10.5	B
	Northbound	8.4	A	9.2	A
	Southbound	9.4	A	11.5	B
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	8.3	A	9.1	A
	Westbound	7.4	A	8.1	A
	Northbound	8.6	A	9.4	A
	Southbound	7.7	A	8.8	A
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	8.2	A	9.7	A
	Eastbound	7.5	A	8.1	A
	Northbound	8.5	A	10.1	B
	Southbound	7.7	A	9.0	A
23. R.B. Brown Drive & South Palmer Road	Overall	9.1	A	9.8	A
	Eastbound	9.4	A	10.3	B
	Westbound	8.1	A	8.7	A
	Southbound	8.4	A	9.1	A
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	13.8	B	9.6	A
	Eastbound	16.0	C	10.0	A
	Westbound	9.7	A	8.6	A
	Northbound	11.5	B	9.5	A
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	10.1	B	9.0	A
	Eastbound	0.0	A	7.5	A
	Westbound	8.6	A	8.1	A
	Northbound	10.5	B	9.4	A
	Southbound	9.9	A	8.7	A
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	10.4	B	9.5	A
	Westbound	8.8	A	8.6	A
	Northbound	11.3	B	10.1	B
	Southbound	9.1	A	8.9	A
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	8.7	A	9.5	A
	Eastbound	7.7	A	8.1	A
	Westbound	9.2	A	10.4	B
	Northbound	8.5	A	8.9	A
	Southbound	0.0	A	0.0	A
28. University Road/Grier Road & South Palmer Road	Overall	8.1	A	8.7	A
	Eastbound	7.9	A	8.4	A
	Westbound	8.7	A	9.1	A
	Northbound	7.3	A	9.0	A
	Southbound	7.0	A	6.9	A
29. University Road & South Palmer Road	Westbound	8.0	A	8.0	A
	Northbound	7.9	A	7.9	A

Table 58B: 2018 Build Alternative 5 Internal Intersection Analysis

		PM Peak Hour			
		Build Alt. 5		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	17.7	C	16.5	C
	Eastbound	10.0	B	9.7	A
	Westbound	23.3	C	15.6	C
	Northbound	13.8	B	20.5	C
	Southbound	10.2	B	10.0	B
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	*	F	*	F
	Westbound	*	F	*	F
	Northbound Left	0.9	A	0.6	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.0	A	8.8	A
	Northbound	7.9	A	9.0	A
	Southbound	8.1	A	8.5	A
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	9.1	A	11.3	B
	Westbound	7.4	A	10.9	B
	Northbound	8.2	A	9.5	A
	Southbound	9.5	A	12.3	B
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	8.0	A	9.4	A
	Eastbound	7.3	A	7.8	A
	Northbound	7.9	A	8.3	A
	Southbound	8.1	A	10.0	B
23. R.B. Brown Drive & South Palmer Road	Overall	9.8	A	10.6	B
	Eastbound	8.2	A	8.9	A
	Westbound	11.0	B	10.7	B
	Southbound	8.8	A	11.4	B
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	15.3	C	10.7	B
	Eastbound	11.9	B	10.0	B
	Westbound	19.0	C	11.4	B
	Northbound	12.0	B	10.7	B
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	13.0	B	10.2	B
	Eastbound	9.0	A	8.4	A
	Westbound	10.5	B	9.8	A
	Northbound	10.3	B	9.7	A
	Southbound	15.5	C	11.0	B
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	16.7	C	15.0	B
	Westbound	17.0	C	16.0	C
	Northbound	12.2	B	11.5	B
	Southbound	19.2	C	16.2	C
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	11.2	B	10.7	B
	Eastbound	8.9	A	10.3	B
	Westbound	12.5	B	11.0	B
	Northbound	10.7	B	10.8	B
	Southbound	8.6	A	8.6	A
28. University Road/Grier Road & South Palmer Road	Overall	14.6	B	12.5	B
	Eastbound	11.7	B	13.7	B
	Westbound	9.3	A	9.2	A
	Northbound	8.6	A	8.9	A
	Southbound	15.8	C	11.9	B
29. University Road & South Palmer Road	Westbound	7.1	A	7.1	A
	Northbound	6.2	A	7.1	A

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no overall LOS identified.

Figure 52A: 2018 AM Peak Hour Build Alternative 5 Internal Intersection LOS

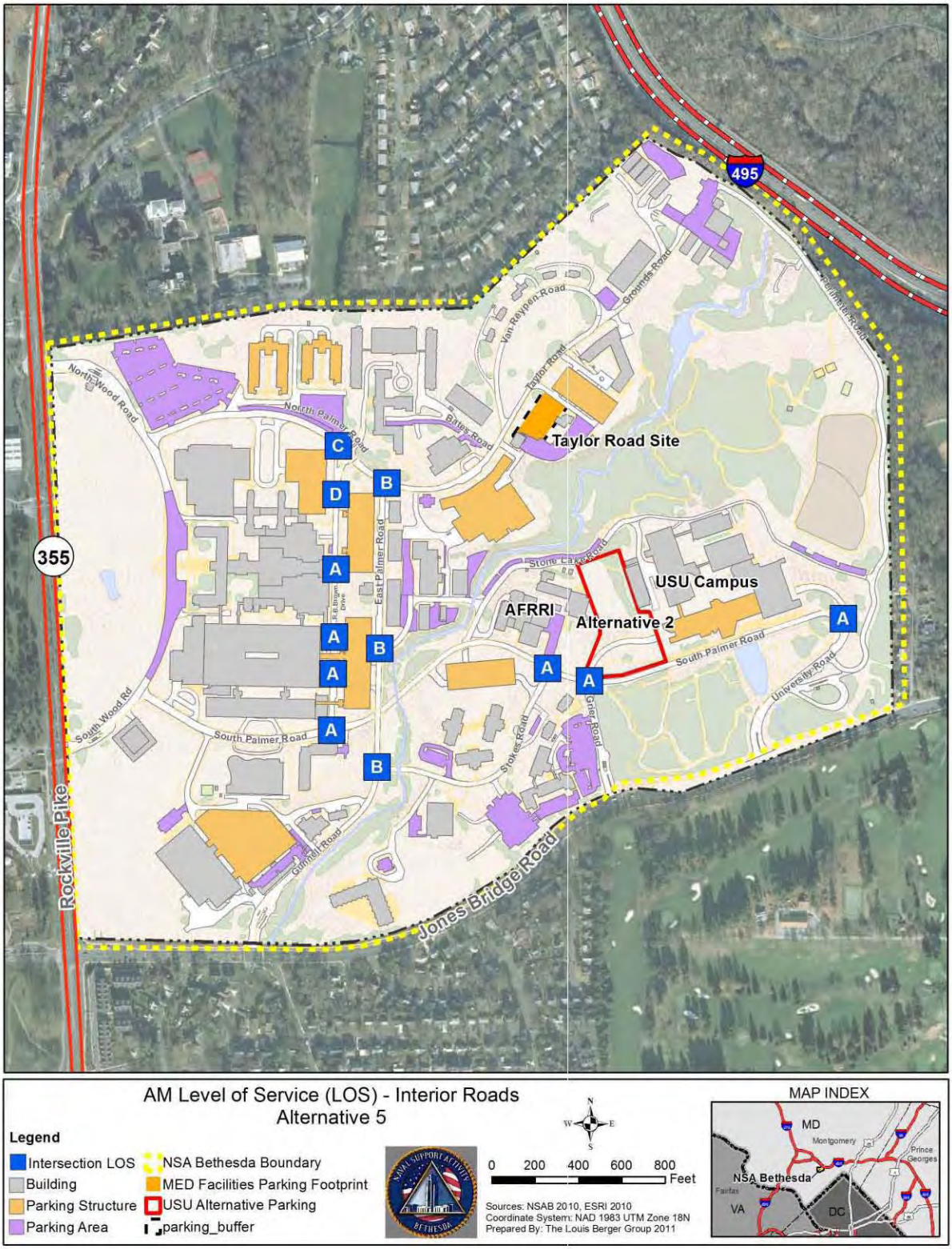
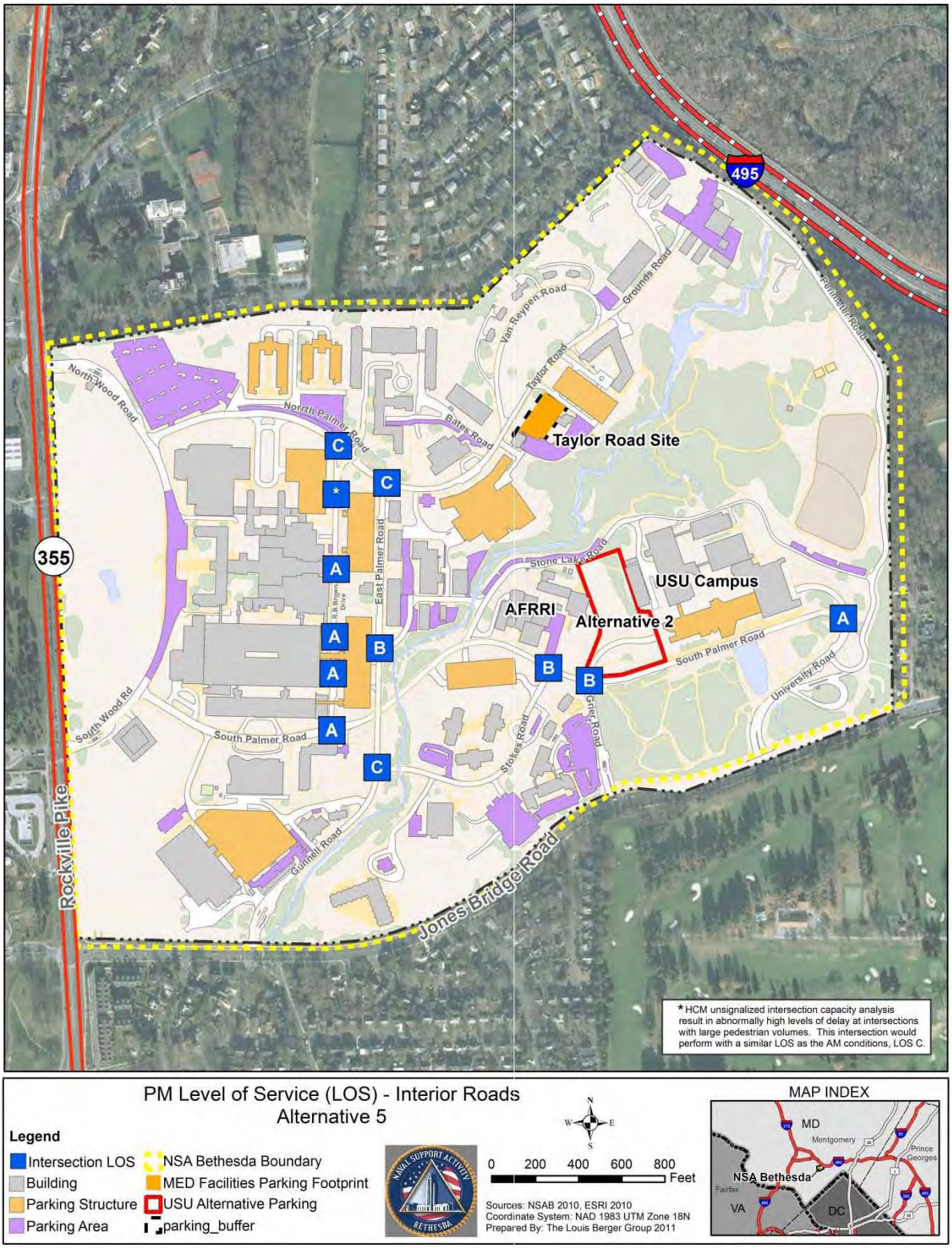


Figure 52B: 2018 PM Peak Hour Build Alternative 5 Internal Intersection LOS



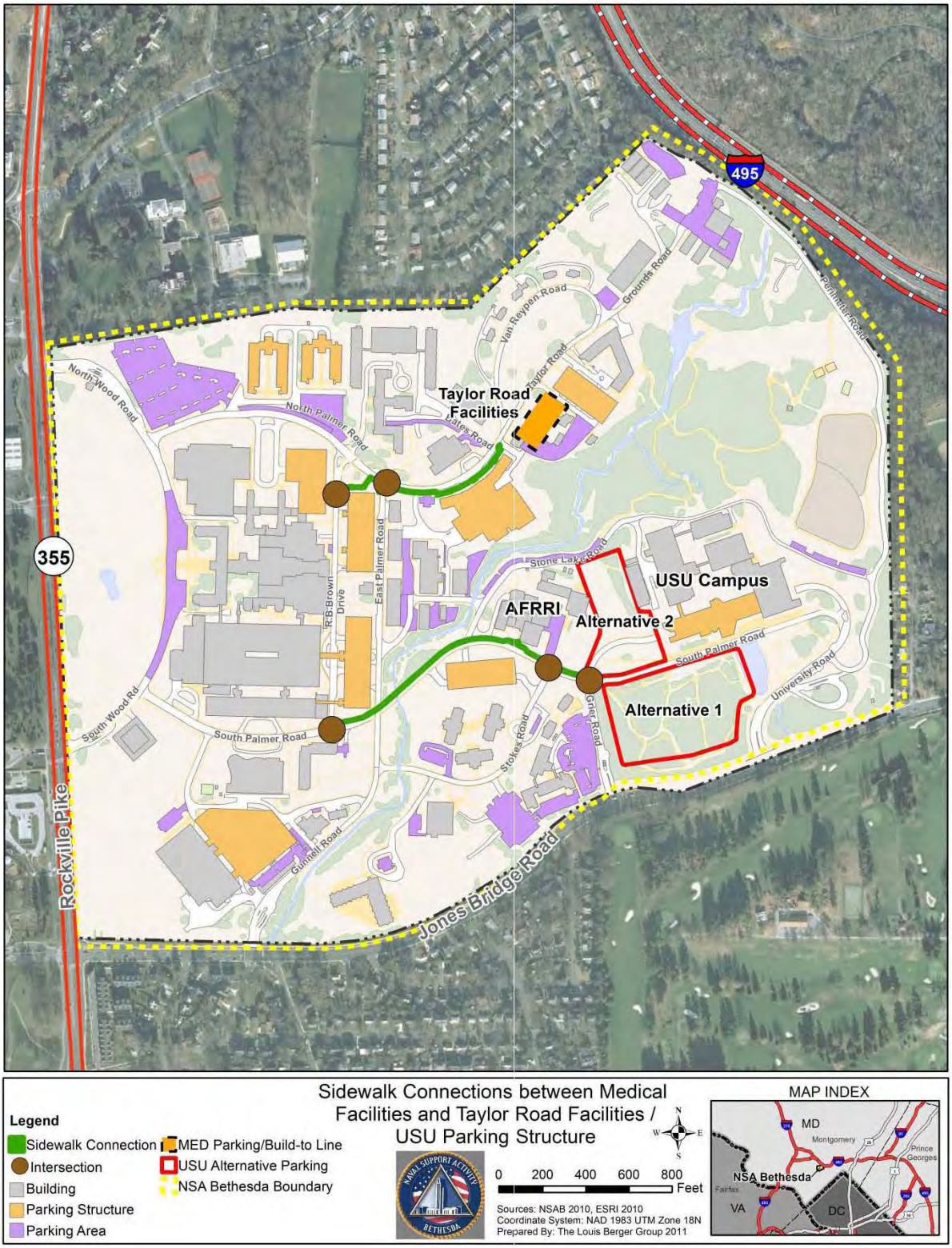
3.2.8.6 Bicycle and Pedestrian Impacts

This alternative would include the placement of two new parking structures, resulting in increased pedestrian activity between the parking structures and destination buildings. The new parking structure serving Building C would be located off of Taylor Road in the Taylor Road Facilities of NSA Bethesda; therefore, new pedestrian trips would be created between the parking structure and Medical Buildings. Specifically, there would be 294 pedestrian trips during the AM peak hour and 305 pedestrian trips during the PM peak hour.

The new USU Alternative 2 parking structure would be placed next to the USU Campus. The only new pedestrian activity that would cross roadways would be the Medical Building Development trips (50 new employees)crossing the intersections at South Palmer Road at Stokes Road and South Palmer Road at Brown Drive. This would result in 17 and 16 new pedestrian trips during the AM peak hour and PM peak hour, respectively. Both the Building C and F parking structure trips were included in the internal HCM analysis in Tables 58A and 58B.

Existing 5-foot plus sidewalks connect both new parking structures with the Medical Buildings via South Palmer Road or Taylor Road/North Palmer Road. Based on the 270 new employees included in the trip generation and adequate existing sidewalks serving these pedestrian trips, this alternative would have no significant pedestrian or bicycle impacts. Figure 53 shows the 2008 Build Alternative 5 sidewalk connections.

Figure 53: 2018 Build Alternative 5 Sidewalk Connections



3.2.9 ***Build Alternative 6***

This alternative would include the construction of a new underground 500-space parking structure to serve Building C and the construction of a 400-space parking structure known as USU Alternative 1. The 500-space underground parking structure would be located between North and South Wood Roads, with the entrance located at the North Wood Road and North Palmer Road intersection and exit located at the South Wood Road and South Palmer Road intersection. Appendix D4 contains the proposed concept for this facility.

The new USU Alternative 1 parking structure would be located across from the USU campus, south of South Palmer Road, with the entrance and exit ramps connecting to South Palmer Road.

3.2.9.1 Trip Generation

The trips generated for this alternative would be the same as Alterative 1, see Section 3.2.4.1

3.2.9.2 Trip Distribution

The trip distribution for this alternative would be based upon the same assumptions described in Alternative 1 (Section 3.2.4.2) with regard to patient trip shifts between Building 55 and the new underground parking facility. Since the new USU Alternative 1 parking structure would be located south of South Palmer Road, not affecting any existing or future planned parking facility, no other shifting trips would occur.

The Build Alternative 6 trip distribution would consist of combining the shift in patients from Building 55 to the new underground parking structure and the trips generated from the 270 new employee trips destined for the new USU Alternative 1 parking structure.

The internal installation generated or shifted trips follow the updated trip distribution pattern based off the 2008 NNMC Transportation Study (Figure 26)

The distribution patterns for the shifted patient trips from Buildings 55 and 63 would continue to enter Gate #1 from Rockville Pike and proceed directly to the new underground parking facility. Patients leaving the new underground parking facility would exit through Gate #2 and turn right onto Rockville Pike northbound. The result of these new distribution patterns would remove trips from R.B. Brown Drive and North Palmer Road.

During the AM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto South Wood Road, enter through Gate #2, and turn right onto South Palmer Road.

- To the north: Turn left onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Grier Road, enter through Gate #4, and turn right onto South Palmer Road.

- To the south: Turn right onto South Palmer Road, turn right onto University Road, exit through Gate #5, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto Grier Road, enter through Gate #4, and turn right onto South Palmer Road.

- To the east: Turn right onto South Palmer Road, turn right onto University Road, exit though Gate #5, and turn left onto Jones Bridge Road.

During the PM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto South Wood Road, enter through Gate #2, and turn right onto South Palmer Road.

- To the north: Turn left onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto University Road, enter through Gate #5, and turn left onto South Palmer Road.

- To the south: Turn left onto South Palmer Road, turn left onto Grier Road, exit through Gate #4, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, and turn left onto South Palmer Road.

- To the east: Turn left onto South Palmer Road, turn left onto Grier Road, exit though Gate #4, and turn left onto Jones Bridge Road.

Figures 54A, 54B, and 54C show the 2018 Build Alternative 6 trip distribution.

Figure 54A: 2018 Alternative 6 Trip Distribution

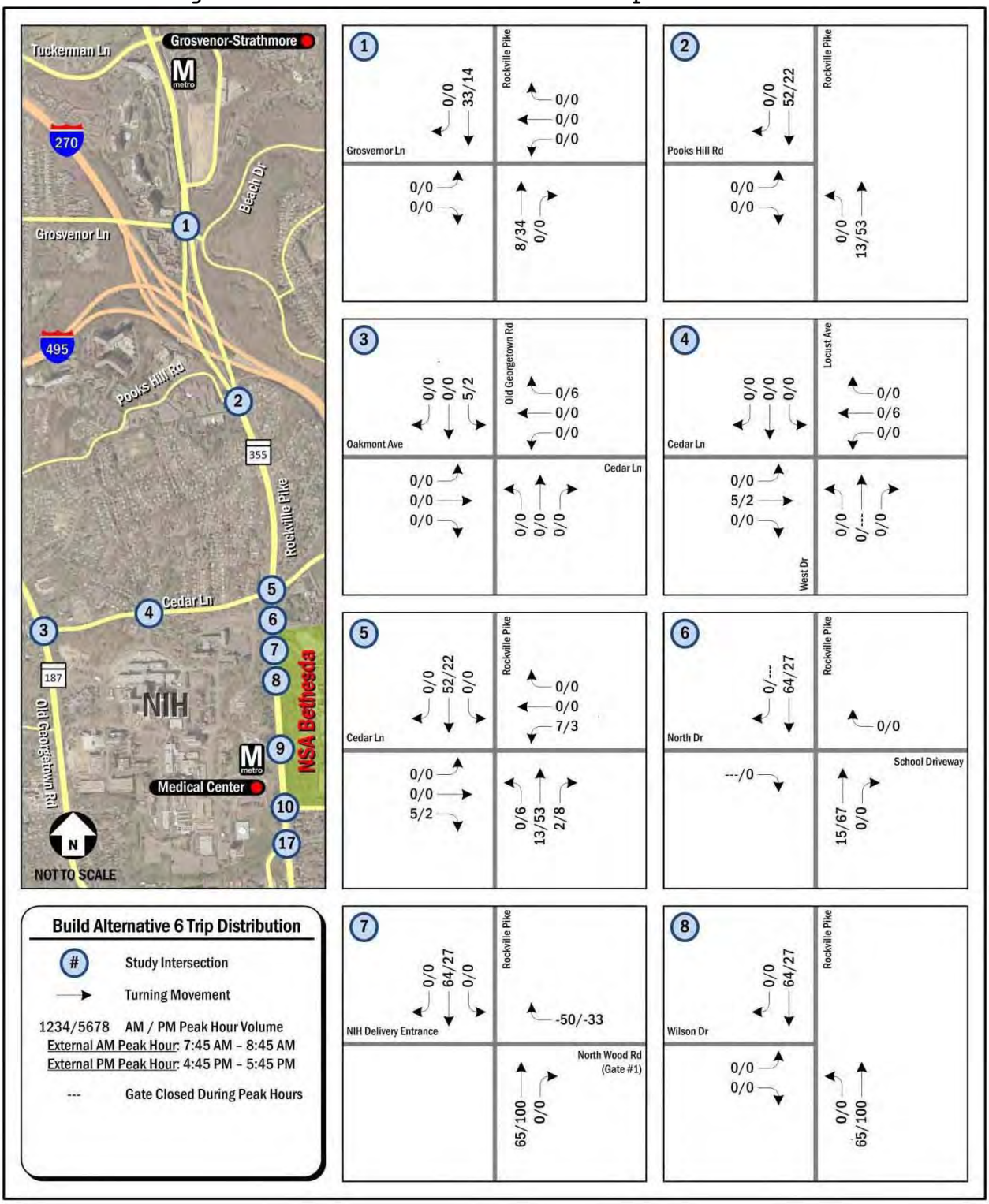


Figure 54B: 2018 Alternative 6 Trip Distribution

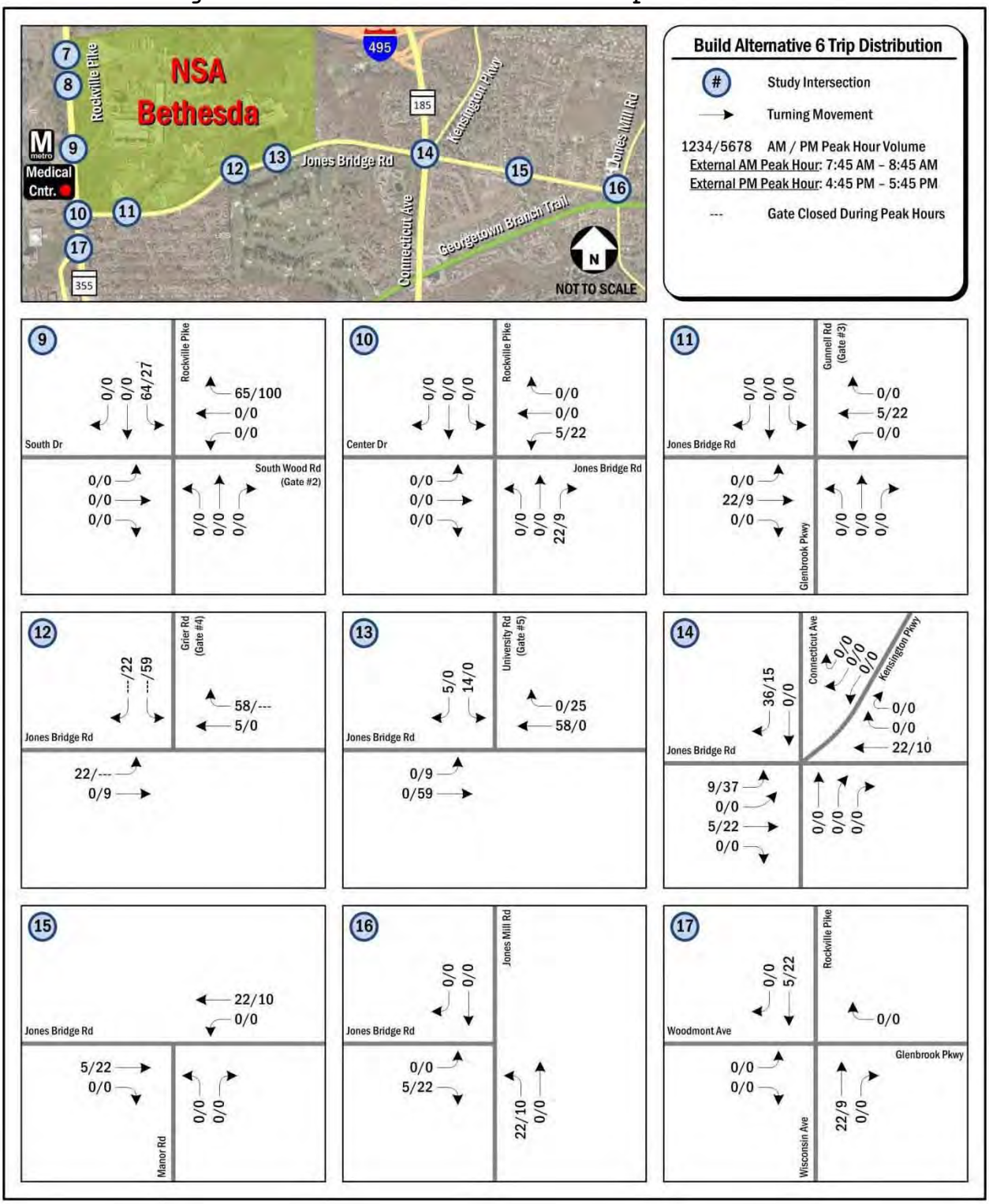
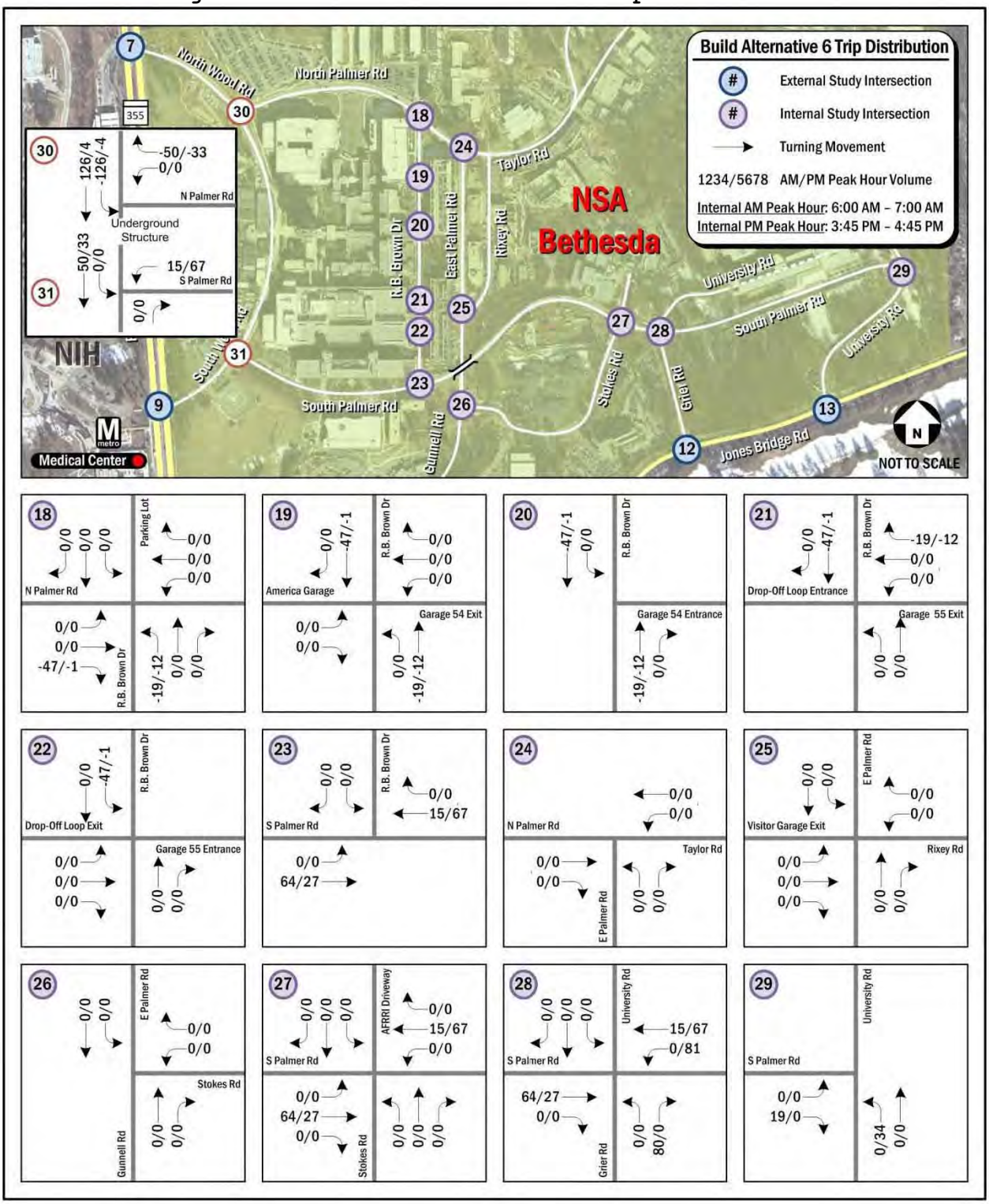


Figure 54C: 2018 Alternative 6 Trip Distribution



3.2.9.3 External Intersection Analysis

The 2018 Build Alternative 6 includes all projects listed in the No Build condition, plus the addition of a new entrance ramp connecting from North Wood Road/North Palmer Road intersection and the addition of a new exit ramp connecting to the South Wood Road/South Palmer Road intersection. Figure 36 shows the 2018 Build Alternatives 1 and 6 internal lane utilization and traffic control.

Critical Lane Volume Analysis

According to the analysis, the #9 Rockville Pike at South Wood Road (Gate #2) intersection would change from a LOS of B to C during the AM peak hour and #12 Jones Bridge Road at Grier Road (Gate #4) intersection would change from a LOS B to C during the PM peak hour. Based upon these results, the external signalized intersections would have no significant traffic impacts from implementing Alternative 6. Table 59 shows the 2018 Build Alternative 6 CLV analysis for the external intersection compared to the No Build condition. Figures 55A and 55B show the 2018 Build Alternative 6 CLV intersection LOS.

Table 59: 2018 Build Alternative 6 CLV External Analysis

		Build Alternative 6				No Build Condition			
		AM Peak Hr.		*PM Peak Hr.*		*AM Peak Hr.*		*PM Peak Hr.*	
		CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS
1.	**Rockville Pike & Grosvenor Lane**	1,385	D	1,341	D	1,373	D	1,336	D
2.	**Rockville Pike & Pooks Hill Road**	1,359	D	1,399	D	1,343	D	1,379	D
3.	**Old Georgetown Road & Oakmont Avenue/Cedar Lane**	1,437	D	1,538	E	1,437	D	1,536	E
4.	**Locust Avenue/West Drive & Cedar Lane**	465	A	941	A	489	A	939	A
5.	**Rockville Pike & Cedar Lane**	1,554	E	1,242	C	1,529	E	1,236	C
6.	**Rockville Pike & North Drive/School Driveway**	*un-signalized*		*un-signalized*		*un-signalized*		*un-signalized*	
7.	**Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)**	867	A	1,057	B	843	A	1,033	B
8.	**Rockville Pike & Wilson Drive**	982	A	981	A	958	A	948	A
9.	**Rockville Pike & South Drive/South Wood Road (Gate #2)**	1,223	C	1,139	B	1,121	B	1,039	B
10.	**Rockville Pike & Center Drive/Jones Bridge Road**	718	A	820	A	715	A	808	A
11.	**Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road**	803	A	1,047	B	801	A	1,024	B
12.	**Grier Road (Gate #4) & Jones Bridge Road**	717	A	1,168	C	692	A	1,104	B
13.	**University Road (Gate #5) & Jones Bridge Road**	780	A	1,060	B	729	A	1,023	B
14.	**Connecticut Avenue & Jones Bridge Road & Kensington Parkway**	1,507	E	1,755	F	1,490	E	1,735	F
15.	**Manor Road & Jones Bridge Road**	761	A	1,031	B	739	A	1,009	B
16.	**Jones Bridge Road & Jones Mill Road**	1,061	B	1,084	B	1,039	B	1,062	B
17.	**Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway**	773	A	942	A	771	A	938	A

Figure 55A: 2018 AM Peak Hour Build Alternative 6 CLV Intersection LOS

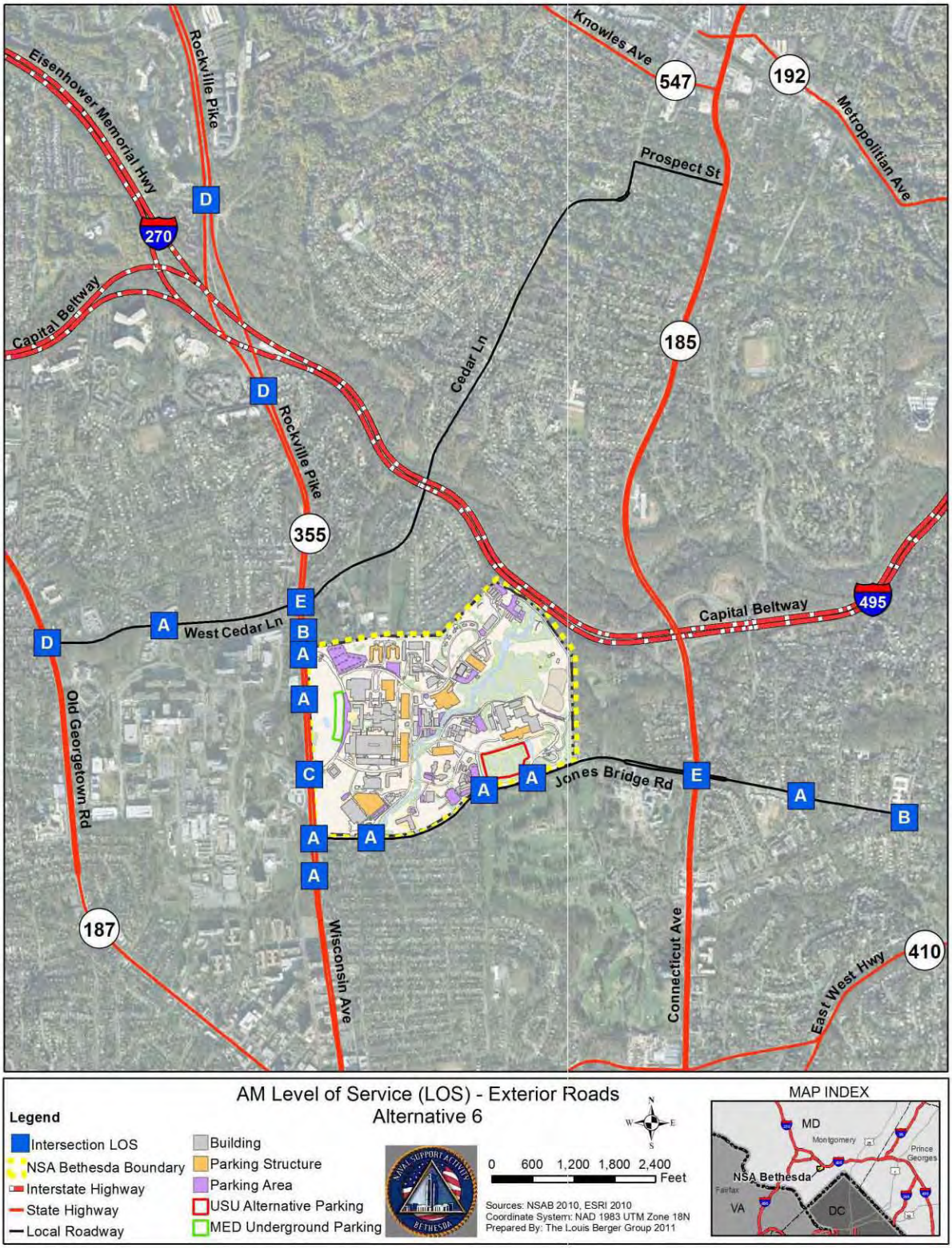
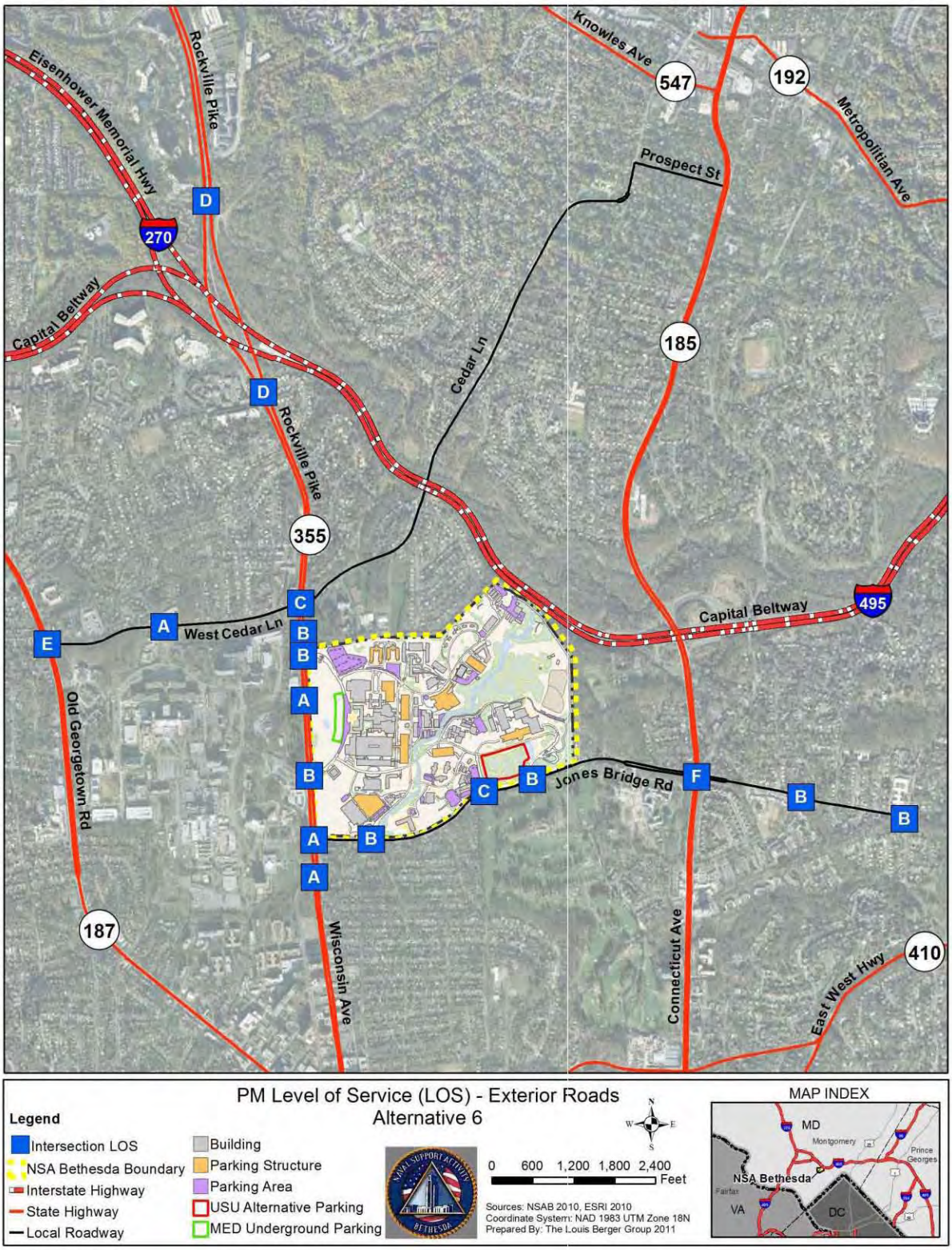


Figure 55B: 2018 PM Peak Hour Build Alternative 6 CLV Intersection LOS



Highway Capacity Manual Intersection Analysis

The HCM analysis was conducted as a secondary comparison to the CLV analysis between the No Build condition and Build Alternatives for the external intersections. When comparing Build Alternative 6 with the No Build condition, the AM peak hour did not experience any change in LOS. For the PM Peak hour, intersection #2 Rockville Pike at Pooks Hill Road would change from a LOS of C to D, #9 Rockville Pike at South Wood Road would change from a LOS of B to C, and #15 Jones Bridge Road at Manor Road would change from a LOS of B to C. Since the CLV process was not used to evaluate unsignalized intersections, HCM analysis was used to provide a No Build condition comparison for the intersection #6 Rockville Pike at North Drive/School Driveway, which showed no significant impacts. Tables 60A and 60B show the 2018 Build Alternative 6 HCM external analysis.

Table 60A: 2018 Build Alternative 6 HCM External Analysis

	HCM Analysis	AM Peak Hour					
		Alternative 6			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	45.0	1.03	D	45.6	1.02	D
	Eastbound	69.8		E	69.8		E
	Westbound	70.4		E	70.3		E
	Northbound	20.7		C	15.4		B
	Southbound	46.6		D	43.2		D
2. Rockville Pike & Pooks Hill Road	Overall	223.2	1.64	F	219.9	1.63	F
	Eastbound	83.4		F	83.4		F
	Northbound	341.6		F	335.9		F
	Southbound	22.0		C	21.3		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.5	0.89	B
	Eastbound	23.9		C	23.9		C
	Westbound	37.4		D	37.4		D
	Northbound	14.1		B	14.1		B
	Southbound	18.5		B	18.5		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.3	0.40	B	15.2	0.39	B
	Eastbound	19.8		B	19.6		B
	Westbound	11.8		B	11.8		B
	Northbound	14.7		B	14.7		B
	Southbound	15.1		B	15.1		B
5. Rockville Pike & Cedar Lane	Overall	43.8	1.00	D	41.8	0.98	D
	Eastbound	86.5		F	82.1		F
	Westbound	62.7		E	61.1		E
	Northbound	13.3		B	14.4		B
	Southbound	42.4		D	39.3		D
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.8		B	11.7		B
	Westbound	9.9		A	9.8		A
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	7.9	0.63	A	7.8	0.62	A
	Westbound	20.3		C	21.2		C
	Northbound	19.3		B	18.3		B
	Southbound	3.1		A	3.2		A
8. Rockville Pike & Wilson Drive	Overall	2.1	0.60	A	2.1	0.59	A
	Eastbound	60.9		E	60.9		E
	Northbound	1.9		A	1.9		A
	Southbound	0.9		A	0.8		A
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	15.0	0.81	B	12.7	0.76	B
	Eastbound	88.7		F	63.5		E
	Westbound	53.4		D	52.1		D
	Northbound	14.0		B	13.2		B
	Southbound	6.7		A	6.6		A
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	32.7	0.85	C	32.3	0.84	C
	Eastbound	54.3		D	54.3		D
	Westbound	99.6		F	97.3		F
	Northbound	17.8		B	18.0		B
	Southbound	6.7		A	6.9		A

Table 60A: 2018 Build Alternative 6 HCM External Analysis (continued)

	HCM Analysis	AM Peak Hour					
		Alternative 6			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	11.8	0.63	B	12.3	0.63	B
	Eastbound	3.4		A	3.3		A
	Westbound	13.9		B	14.7		B
	Northbound	22.0		C	22.0		C
	Southbound	24.5		C	24.5		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	5.0	0.53	A	3.8	0.51	A
	Eastbound	2.7		A	2.1		A
	Westbound	6.2		A	4.7		A
	Southbound	0.0		A	0.0		A
13. University Road (Gate #5) & Jones Bridge Road	Overall	8.2	0.57	A	6.4	0.51	A
	Eastbound	5.2		A	4.5		A
	Westbound	8.7		A	7.1		A
	Southbound	24.0		C	24.6		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	52.1	1.04	D	49.4	1.01	D
	Eastbound	59.4		E	55.7		E
	Westbound	44.7		D	42.2		D
	Northbound	24.0		C	24.0		C
	Southbound	63.0		E	58.9		E
	Southwestbound	82.6		F	82.6		F
15. Manor Road & Jones Bridge Road	Overall	15.6	0.57	B	15.1	0.56	B
	Eastbound	18.1		B	18.0		B
	Westbound	16.1		B	15.3		B
	Northbound	10.8		B	10.8		B
16. Jones Bridge Road & Jones Mill Road	Overall	45.4	0.77	D	42.3	0.76	D
	Eastbound	30.5		C	30.2		C
	Northbound	53.8		D	46.8		D
	Southbound	46.5		D	46.5		D
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	19.2	0.71	B	19.5	0.71	B
	Eastbound	48.7		D	48.7		D
	Westbound	41.2		D	41.2		D
	Northbound	5.5		A	5.4		A
	Southbound	3.3		C	3.3		C

Note: Intersections with only two-way stops have no overall LOS identified.

Table 60B: 2018 Build Alternative 6 HCM External Analysis

	HCM Analysis	PM Peak Hour					
		Alternative 6			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density (Veh/ hr)	LOS
1. Rockville Pike & Grosvenor Lane	Overall	60.1	1.01	E	58.9	1.01	E
	Eastbound	48.4		D	48.4		D
	Westbound	88.7		F	88.7		F
	Northbound	30.9		C	30.3		C
	Southbound	72.2		E	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	35.8	1.01	D	33.1	0.99	C
	Eastbound	65.4		E	65.4		E
	Northbound	40.7		D	35.7		D
	Southbound	23.7		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.2	0.84	B	19.1	0.83	B
	Eastbound	31.9		C	31.9		C
	Westbound	37.2		D	37.3		D
	Northbound	20.2		C	20.2		C
	Southbound	13.3		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	30.4	0.73	C	30.2	0.73	C
	Eastbound	39.9		D	39.5		D
	Westbound	7.5		A	7.5		A
	Northbound	24.8		C	24.8		C
	Southbound	26.7		C	26.7		C
5. Rockville Pike & Cedar Lane	Overall	38.3	0.97	D	36.4	0.97	D
	Eastbound	57.3		E	57.4		E
	Westbound	65.5		E	63.5		E
	Northbound	30.7		C	26.5		C
	Southbound	31.9		C	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.1		B	11.0		B
	Westbound	10.8		B	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.1	0.72	A	8.6	0.70	A
	Westbound	38.9		D	39.9		D
	Northbound	9.6		A	9.9		A
	Southbound	0.9		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	12.4	0.64	B	12.3	0.63	B
	Eastbound	44.6		D	44.6		D
	Northbound	5.2		A	4.8		A
	Southbound	10.7		B	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	23.6	0.81	C	18.7	0.72	B
	Eastbound	68.8		E	52.8		D
	Westbound	33.1		C	35.8		D
	Northbound	17.5		B	13.5		B
	Southbound	20.7		C	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	60.4	0.95	E	59.9	0.94	E
	Eastbound	58.1		E	58.2		E
	Westbound	43.2		D	42.8		D
	Northbound	78.3		E	78.3		E
	Southbound	46.7		D	45.4		D

Table 60B: 2018 Build Alternative 6 HCM External Analysis (continued)

	HCM Analysis	PM Peak Hour					
		Alternative 6			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density (Veh/ hr)	LOS	Delay	Density (Veh/ hr)	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.1	0.75	B	14.0	0.75	B
	Eastbound	11.3		B	11.2		B
	Westbound	13.1		B	12.9		B
	Northbound	13.8		B	13.8		B
	Southbound	23.9		C	23.9		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	17.2	0.84	B	13.6	0.79	B
	Eastbound	13.5		B	12.1		B
	Westbound	5.3		A	5.2		A
	Southbound	44.6		D	32.7		C
13. University Road (Gate #5) & Jones Bridge Road	Overall	13.9	0.69	B	10.7	0.67	B
	Eastbound	15.4		B	11.2		B
	Westbound	9.3		A	9.3		A
	Southbound	20.1		C	21.0		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	70.7	1.10	E	68.7	1.10	E
	Eastbound	100.7		F	92.8		F
	Westbound	118.7		F	119.7		F
	Northbound	76.1		E	76.1		E
	Southbound	18.8		B	18.9		B
	Southwestbound	126.1		F	126.1		F
15. Manor Road & Jones Bridge Road	Overall	21.4	0.73	C	19.7	0.71	B
	Eastbound	32.0		C	28.9		C
	Westbound	4.1		A	3.7		A
	Northbound	21.9		C	21.9		C
16. Jones Bridge Road & Jones Mill Road	Overall	24.4	0.73	C	23.5	0.71	C
	Eastbound	12.9		B	13.0		B
	Northbound	41.2		D	38.5		D
	Southbound	20.0		C	20.0		C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	12.7	0.70	B	12.6	0.69	B
	Eastbound	12.8		B	12.8		B
	Westbound	9.2		A	9.2		A
	Northbound	18.3		B	18.1		B
	Southbound	7.9		A	7.8		A

Note: Intersections with only two-way stops have no overall LOS identified.

3.2.9.4 Arterial Analysis

Arterial analysis was performed for Rockville Pike, West Cedar Lane, and Jones Bridge Road, comparing the alternative to the No Build condition. The greatest change between the No Build condition and Build Alternative 6 was a 3 percent increase along Rockville Pike northbound during the PM peak hour. Based upon this analysis, Alternative 6 would not require PAMR-RAM external intersection mitigation. Tables 61 and 62 show the 2018 Build Alternative 6 arterial analyses.

Table 61: 2018 AM Peak Hour Build Alternative 6 Arterial Analysis

		AM Peak Hour						
		Alt 6			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	11.3	11:36	E	11.5	11:25	E	2%
	Southbound	20.7	6:30	C	21.1	6:22	C	2%
Jones Bridge Road	Eastbound	20.5	5:1	C	20.7	4:59	C	1%
	Westbound	16.8	6:9	D	17.1	6:01	D	2%
West Cedar Lane	Eastbound	15.4	2:49	D	15.4	2:49	D	0%
	Westbound	16.9	2:34	D	16.9	2:34	D	0%

Table 62: 2018 PM Peak Hour Build Alternative 6 Arterial Analysis

		PM Peak Hour						
		Alt 6			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	15.5	8:25	D	16.0	8:11	D	3%
	Southbound	17.5	7:40	D	17.7	7:36	D	1%
Jones Bridge Road	Eastbound	16.7	6:12	D	17.1	6:02	D	2%
	Westbound	16.6	6:13	D	16.7	6:12	D	1%
West Cedar Lane	Eastbound	12.8	3:24	E	12.8	3:23	E	0%
	Westbound	17.4	2:30	D	17.4	2:30	D	0%

3.2.9.5 Internal Intersection Analysis

This alternative includes the addition of a new entrance ramp connecting from North Wood Road/North Palmer Road intersection and the addition of a new exit ramp connecting to the South Wood Road/South Palmer Road intersection.

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal intersections. The only notable change between Alternative 6 and the No Build condition would be the #28 South Palmer Road at Grier Road intersection changing from a LOS B to C, resulting from the new trips exiting the new USU Alternative 1 parking structure and heading toward Gates #2 and #4. Based on this analysis, there would be no significant impact to the internal roadway intersections for this alternative. Tables 63A and 63B show the 2018 Build Alternative 6 internal intersection analysis and Figures 56A and 56B show the 2018 Build Alternative 6 internal intersection LOS.

Table 63A: 2018 Build Alternative 6 Internal Intersection Analysis

		AM Peak Hour				
			Build Alt. 6		*No Build Condition*	
		Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18.	**Parking Lot/R.B. Brown Drive & North Palmer Road**	Overall	9.8	A	10.3	B
		Eastbound	10.3	B	10.9	B
		Westbound	8.5	A	8.7	A
		Northbound	8.5	A	9.0	A
		Southbound	9.5	A	9.6	A
19.	**R.B. Brown Drive & America Garage/Garage 54 Exit**	Eastbound	16.1	C	17.6	C
		Westbound	12.3	B	12.8	B
		Northbound Left	3.5	A	3.1	A
20.	**R.B. Brown Drive & Garage 54 Entrance**	Overall	9.7	A	10.5	B
		Northbound	8.7	A	9.2	A
		Southbound	10.5	B	11.5	B
21.	**R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit**	Overall	8.8	A	9.1	A
		Westbound	8.2	A	8.1	A
		Northbound	9.2	A	9.4	A
		Southbound	8.2	A	8.8	A
22.	**R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance**	Overall	9.5	A	9.7	A
		Eastbound	7.9	A	8.1	A
		Northbound	9.9	A	10.1	B
		Southbound	8.5	A	9.0	A
23.	**R.B. Brown Drive & South Palmer Road**	Overall	10.2	B	9.8	A
		Eastbound	10.8	B	10.3	B
		Westbound	9.0	A	8.7	A
		Southbound	9.3	A	9.1	A
24.	**East Palmer Road & North Palmer Road/Taylor Road**	Overall	9.6	A	9.6	A
		Eastbound	10.0	A	10.0	A
		Westbound	8.6	A	8.6	A
		Northbound	9.5	A	9.5	A
25.	**East Palmer Road & Visitor Garage Exit/Rixey Road**	Overall	9.0	A	9.0	A
		Eastbound	7.5	A	7.5	A
		Westbound	8.1	A	8.1	A
		Northbound	9.4	A	9.4	A
		Southbound	8.7	A	8.7	A
26.	**East Palmer Road/Gunnell Road & Stokes Road**	Overall	9.5	A	9.5	A
		Westbound	8.6	A	8.6	A
		Northbound	10.1	B	10.1	B
		Southbound	8.9	A	8.9	A
27.	**AFRRI Driveway/Stokes Road & South Palmer Road**	Overall	10.0	B	9.5	A
		Eastbound	9.0	A	8.1	A
		Westbound	11.0	B	10.4	B
		Northbound	9.2	A	8.9	A
		Southbound	0.0	A	0.0	A
28.	**University Road/Grier Road & South Palmer Road**	Overall	10.3	B	8.7	A
		Eastbound	10.4	B	8.4	A
		Westbound	10.3	B	9.1	A
		Northbound	10.6	B	9.0	A
		Southbound	7.5	A	6.9	A
29.	**University Road & South Palmer Road**	Westbound	8.0	A	8.0	A
		Northbound	8.0	A	7.9	A
31.	**South Wood Road & South Palmer Road**	Southbound	9.2	A	---	---

Table 63B: 2018 Build Alternative 6 Internal Intersection Analysis

		PM Peak Hour				
			Build Alt. 6		*No Build Condition*	
		Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18.	**Parking Lot/R.B. Brown Drive & North Palmer Road**	Overall	15.9	C	16.5	C
		Eastbound	9.6	A	9.7	A
		Westbound	15.4	C	15.6	C
		Northbound	19.3	C	20.5	C
		Southbound	10.0	A	10.0	B
19.	**R.B. Brown Drive & America Garage/Garage 54 Exit**	Eastbound	*	F	*	F
		Westbound	*	F	*	F
		Northbound Left	0.6	A	0.6	A
20.	**R.B. Brown Drive & Garage 54 Entrance**	Overall	8.7	A	8.8	A
		Northbound	8.9	A	9.0	A
		Southbound	8.5	A	8.5	A
21.	**R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit**	Overall	11.1	B	11.3	B
		Westbound	10.7	B	10.9	B
		Northbound	9.4	A	9.5	A
		Southbound	12.1	B	12.3	B
22.	**R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance**	Overall	9.4	A	9.4	A
		Eastbound	7.8	A	7.8	A
		Northbound	8.2	A	8.3	A
		Southbound	10.0	A	10.0	B
23.	**R.B. Brown Drive & South Palmer Road**	Overall	12.1	B	10.6	B
		Eastbound	9.3	A	8.9	A
		Westbound	13.5	B	10.7	B
		Southbound	12.5	B	11.4	B
24.	**East Palmer Road & North Palmer Road/Taylor Road**	Overall	10.7	B	10.7	B
		Eastbound	10.0	B	10.0	B
		Westbound	11.4	B	11.4	B
		Northbound	10.7	B	10.7	B
25.	**East Palmer Road & Visitor Garage Exit/Rixey Road**	Overall	10.2	B	10.2	B
		Eastbound	8.4	A	8.4	A
		Westbound	9.8	A	9.8	A
		Northbound	9.7	A	9.7	A
		Southbound	11.0	B	11.0	B
26.	**East Palmer Road/Gunnell Road & Stokes Road**	Overall	15.0	B	15.0	B
		Westbound	16.0	C	16.0	C
		Northbound	11.5	B	11.5	B
		Southbound	16.2	C	16.2	C
27.	**AFRRI Driveway/Stokes Road & South Palmer Road**	Overall	12.5	B	10.7	B
		Eastbound	11.4	B	10.3	B
		Westbound	13.9	B	11.0	B
		Northbound	11.9	B	10.8	B
		Southbound	9.1	A	8.6	A
28.	**University Road/Grier Road & South Palmer Road**	Overall	16.0	C	12.5	B
		Eastbound	18.9	C	13.7	B
		Westbound	13.2	B	9.2	A
		Northbound	10.1	B	8.9	A
		Southbound	14.8	B	11.9	B
29.	**University Road & South Palmer Road**	Westbound	7.3	A	7.1	A
		Northbound	7.6	A	7.1	A
31.	**South Wood Road & South Palmer Road**	Southbound	10.1	B	---	---

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no overall LOS identified.

Figure 56A: 2018 AM Peak Hour Build Alternative 6 Internal Intersection LOS

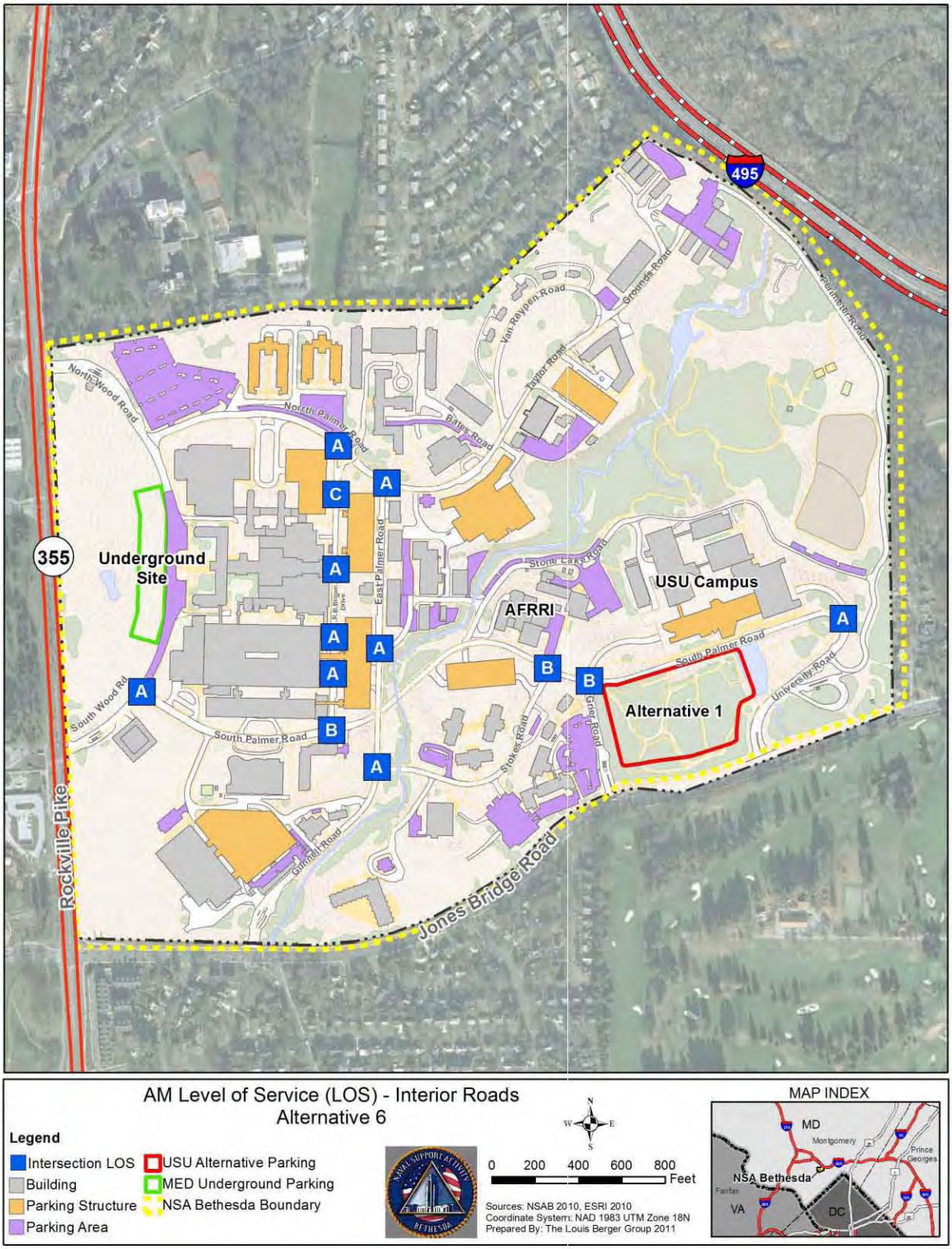
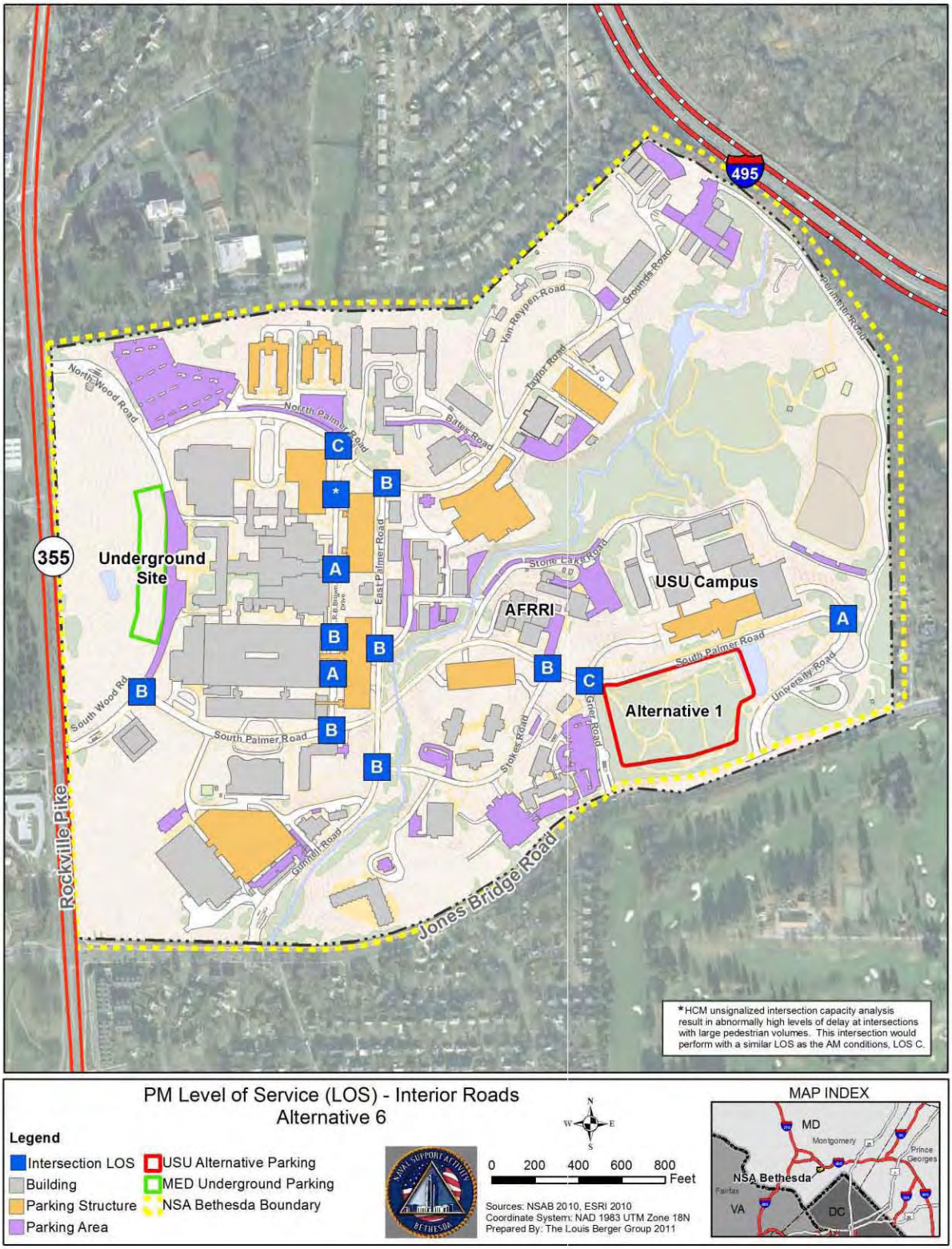


Figure 56B: 2018 PM Peak Hour Build Alternative 6 Internal Intersection LOS



3.2.9.6 Bicycle and Pedestrian Impacts

This alternative would include the placement of two new parking structures, resulting in increased pedestrian activity between the parking structures and destination buildings. The new underground parking structure would be located next to the main Medical Building with no significant impacts expected as pedestrians would be able to walk directly into Building 1 without crossing any roadways.

The new USU Alternative 1 parking structure would be placed across the street from the USU Campus; therefore, the new pedestrian activity would cross three intersections, South Palmer Road at Grier Road, South Palmer Road at Stokes Road, and South Palmer Road at Brown Drive. For the Medical Development, this would result in 17 new pedestrian trips during the AM peak hour and 16 new pedestrian trips during the PM peak hour. For the University Expansion, this would result in 161 new pedestrian trips during the AM peak hour and 193 new pedestrian trips during the PM peak hour.

The Medical Building pedestrian trips are included in the internal HCM analysis in Tables 63A and 63B. The USU pedestrian trips are not included as the location of the optimum pedestrian crossing has not been identified. However, the USU trips were temporarily added to the South Palmer Road at Stokes Road intersection, with the intersection continuing to perform at the same overall LOS in both peak periods as calculated in Tables 63A and 63B.

Existing 5-foot plus sidewalks connect the new parking structure serving Building F with the Medical Buildings via South Palmer Road. Based on the 270 new employees included in the trip generation and adequate existing sidewalks serving these pedestrian trips, this alternative would have no significant pedestrian or bicycle impacts. Figure 38 shows the sidewalk connections for this Build Alternative.

3.2.10 ***Build Alternative 7***

This alternative would include the construction of a new underground 500-space parking structure to serve Building C and the construction of a 400-space parking structure known as USU Alternative 1. The 500-space underground parking structure would be located between North and South Wood Roads, with the entrance and exit located in the existing G-Lot, with access from North Palmer Road. Appendix D4 contains the proposed concept for this facility.

The new USU Alternative 1 parking structure would be located across from the USU campus, south of South Palmer Road, with the entrance and exit ramps connecting to South Palmer Road.

3.2.10.1 Trip Generation

The trips generated for this alternative would be the same as Alterative 1, see Section 3.2.4.1

3.2.10.2 Trip Distribution

The trip distribution for this alternative would be the same as Alternative 6, with the added shift of 20 percent of G-Lot staff to the new USU parking structure. The patient shift assumptions would be the same as Alternative 1 and the G-Lot shifts would be the same as Alternative 2.

The Build Alternative 7 trip distribution would consist of combining the shift in patients from Building 55 to the new underground parking structure, the shift in staff trips from G-Lot to the new USU Alternative 1 parking structure, and the trips generated from the 270 new employee trips destined for the new USU Alternative 1 parking structure. The internal installation generated or shifted trips follow the updated trip distribution pattern based upon the 2008 NNMC Transportation Study (Figure 26).

The distribution patterns for the shifted patient trips from Buildings 55 and 63 would continue to enter Gate #1 from Rockville Pike and proceed directly to the new underground parking facility through G-Lot. Patients leaving the new underground parking facility would exit through G-Lot, turn right onto North Palmer Road, turn right onto North Wood Road, exit through Gate #1, and turn right onto Rockville Pike. The result of these new distribution patterns would remove trips from R.B. Brown Drive and North Palmer Road, east of G-Lot.

During the AM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto South Wood Road, enter through Gate #2, and turn right onto South Palmer Road.
- To the north: Turn left onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.
- From the south: Turn right onto Jones Bridge Road, turn left onto Grier Road, enter through Gate #4, and turn right onto South Palmer Road.
- To the south: Turn right onto South Palmer Road, turn right onto University Road, exit through Gate #5, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.
- From the east: Turn right onto Grier Road, enter through Gate #4, and turn right onto South Palmer Road.
- To the east: Turn right onto South Palmer Road, turn right onto University Road, exit though Gate #5, and turn left onto Jones Bridge Road.

During the PM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto South Wood Road, enter through Gate #2, and turn right onto South Palmer Road.

- To the north: Turn left onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto University Road, enter through Gate #5, and turn left onto South Palmer Road.

- To the south: Turn left onto South Palmer Road, turn left onto Grier Road, exit through Gate #4, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, and turn left onto South Palmer Road.

- To the east: Turn left onto South Palmer Road, turn left onto Grier Road, exit though Gate #4, and turn left onto Jones Bridge Road.

Figures 57A, 57B, and 57C show the 2018 Build Alternative 7 trip distribution.

Figure 57A: 2018 Alternative 7 Trip Distribution

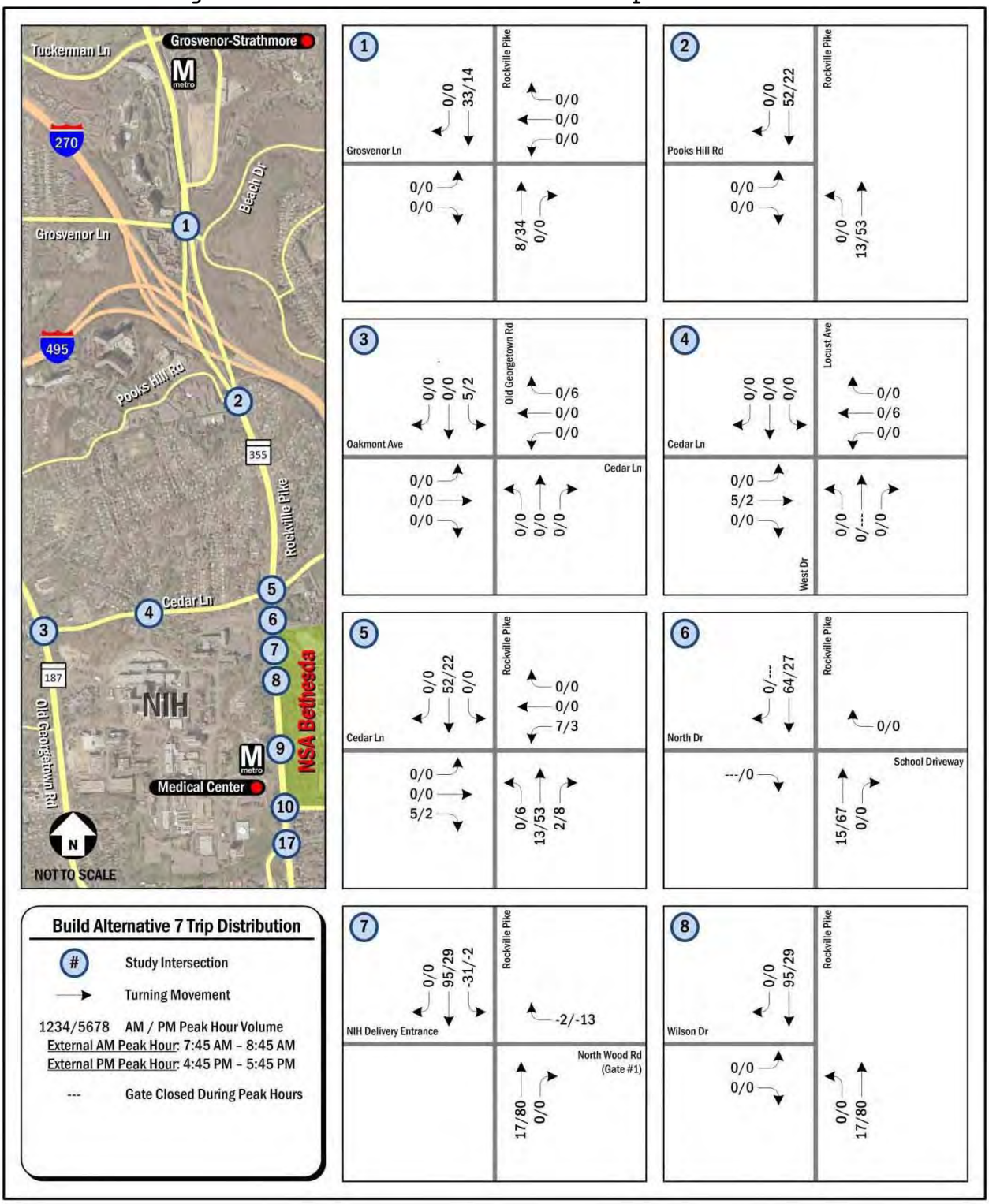


Figure 57B: 2018 Alternative 7 Trip Distribution

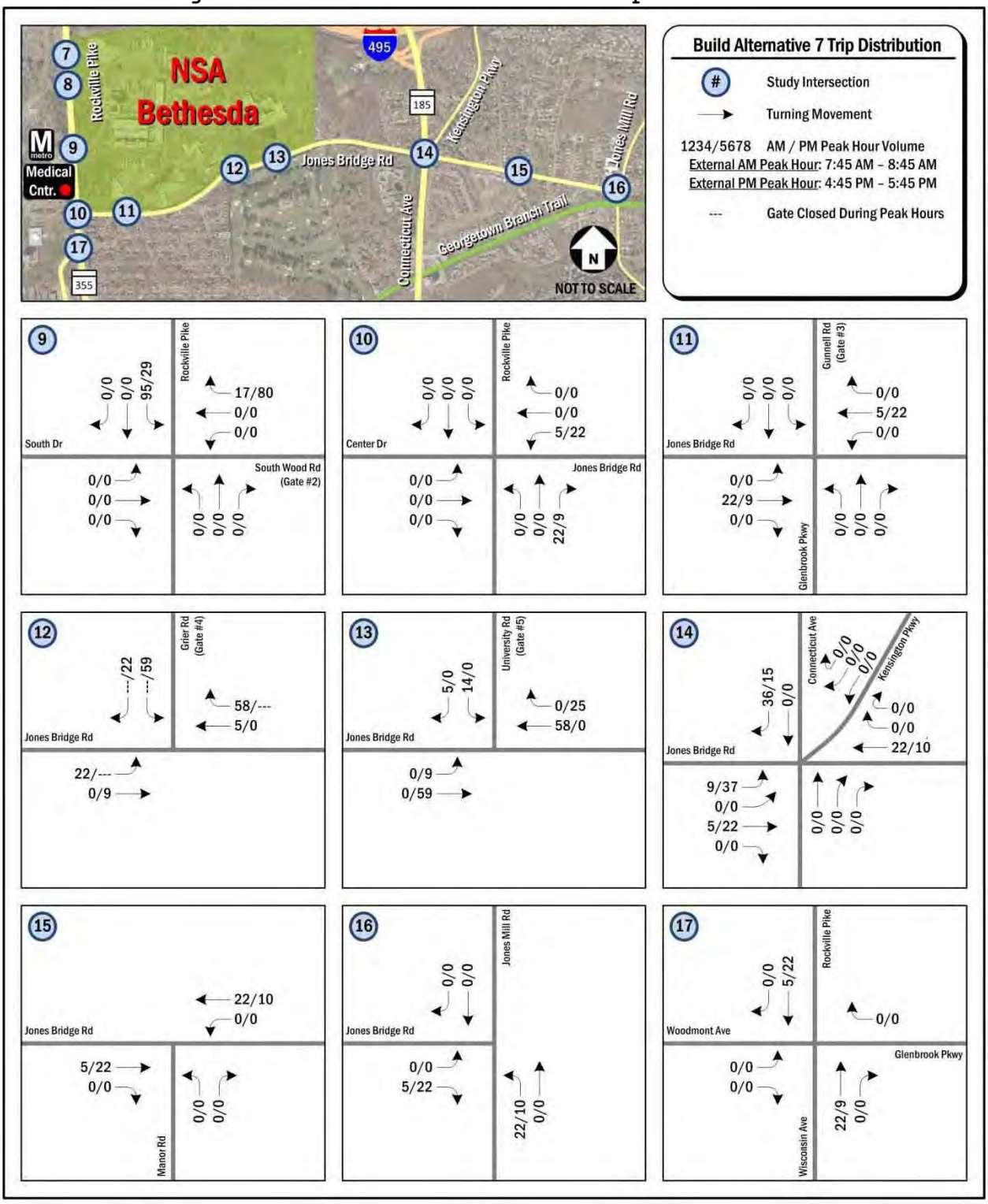
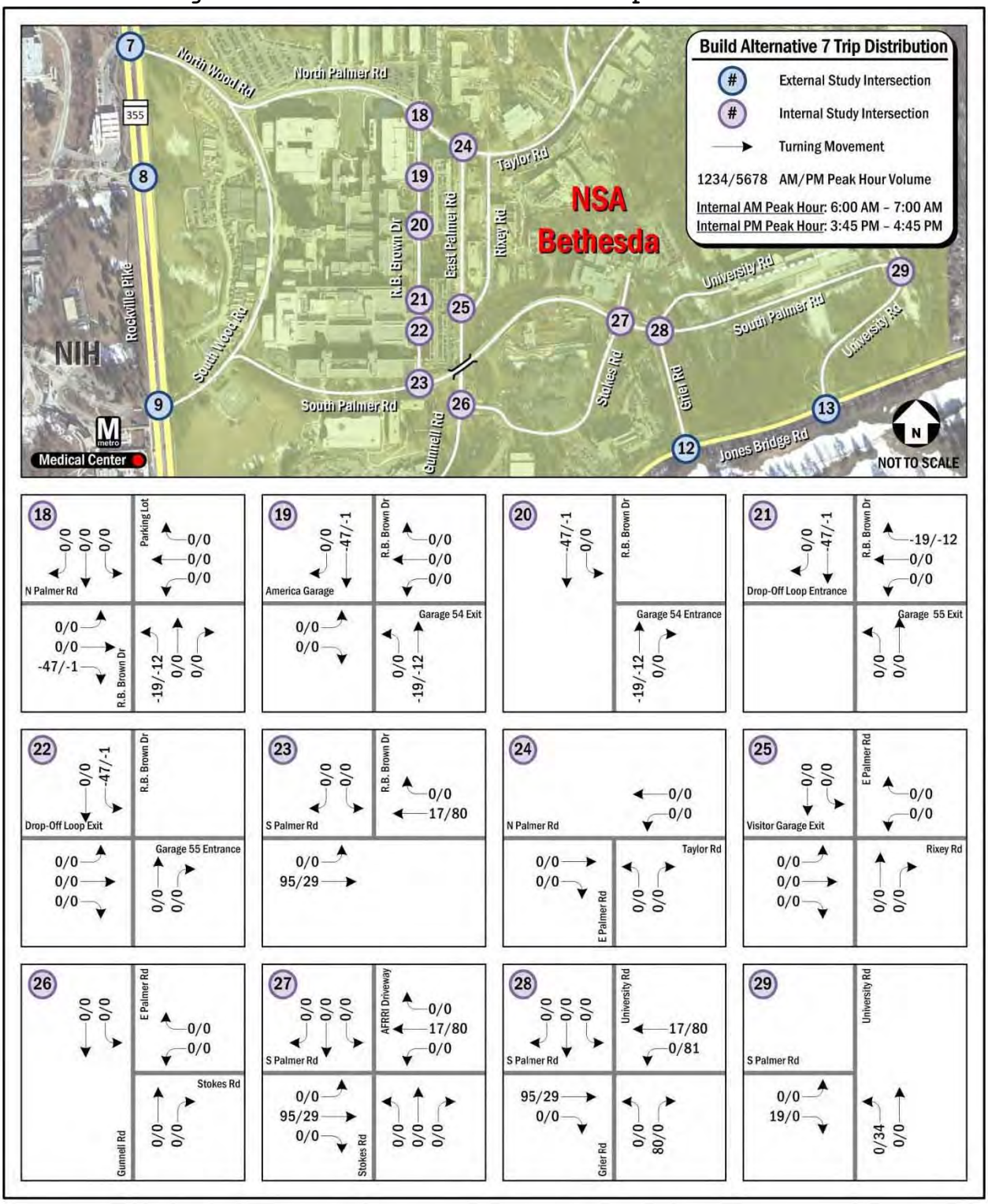


Figure 57C: 2018 Alternative 7 Trip Distribution



3.2.10.3 External Intersection Analysis

The 2018 Build Alternative 7 includes all projects listed in the No Build condition, plus the addition of a new entrance and exit ramp connecting from G-Lot to the new underground parking facility. Figure 29C shows the 2018 Build Alternative 2 through 5 and 6 through 10 internal lane utilization and traffic control.

Critical Lane Volume Analysis

The CLV analysis was conducted for the 16 external signalized intersections to compare to the No Build condition. According to the analysis, the #9 Rockville Pike at South Wood Road (Gate #2) intersection would change from a LOS B to C during the AM peak hour. Intersection #12 Jones Bridge Road at Grier Road (Gate #4) would change from a LOS of B to C during the PM peak hour. Based upon these results, the external signalized intersections would have no significant traffic impacts from implementing Alternative 7. Table 64 shows the 2018 Build Alternative 7 CLV external analysis. Figures 58A and 58B show the 2018 Build Alternative 7 CLV intersection LOS.

Table 64: 2018 Build Alternative 7 CLV External Analysis

		Build Alternative 7				No Build Condition			
		AM Peak Hr.		*PM Peak Hr.*		*AM Peak Hr.*		*PM Peak Hr.*	
		CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS
1.	**Rockville Pike & Grosvenor Lane**	1,385	D	1,341	D	1,373	D	1,336	D
2.	**Rockville Pike & Pooks Hill Road**	1,359	D	1,399	D	1,343	D	1,379	D
3.	**Old Georgetown Road & Oakmont Avenue/Cedar Lane**	1,437	D	1,538	E	1,437	D	1,536	E
4.	**Locust Avenue/West Drive & Cedar Lane**	465	A	941	A	489	A	939	A
5.	**Rockville Pike & Cedar Lane**	1,554	E	1,242	C	1,529	E	1,236	C
6.	**Rockville Pike & North Drive/School Driveway**	*un-signalized*		*un-signalized*		*un-signalized*		*un-signalized*	
7.	**Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)**	818	A	1,058	B	843	A	1,033	B
8.	**Rockville Pike & Wilson Drive**	993	A	973	A	958	A	948	A
9.	**Rockville Pike & South Drive/South Wood Road (Gate #2)**	1,206	C	1,119	B	1,121	B	1,039	B
10.	**Rockville Pike & Center Drive/Jones Bridge Road**	718	A	820	A	715	A	808	A
11.	**Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road**	803	A	1,042	B	801	A	1,024	B
12.	**Grier Road (Gate #4) & Jones Bridge Road**	717	A	1,168	C	692	A	1,104	B
13.	**University Road (Gate #5) & Jones Bridge Road**	780	A	1,060	B	729	A	1,023	B
14.	**Connecticut Avenue & Jones Bridge Road & Kensington Parkway**	1,507	E	1,755	F	1,490	E	1,735	F
15.	**Manor Road & Jones Bridge Road**	761	A	1,031	B	739	A	1,009	B
16.	**Jones Bridge Road & Jones Mill Road**	1,061	B	1,084	B	1,039	B	1,062	B
17.	**Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway**	773	A	942	A	771	A	938	A

Figure 58A: 2018 AM Peak Hour Build Alternative 7 CLV Intersection LOS

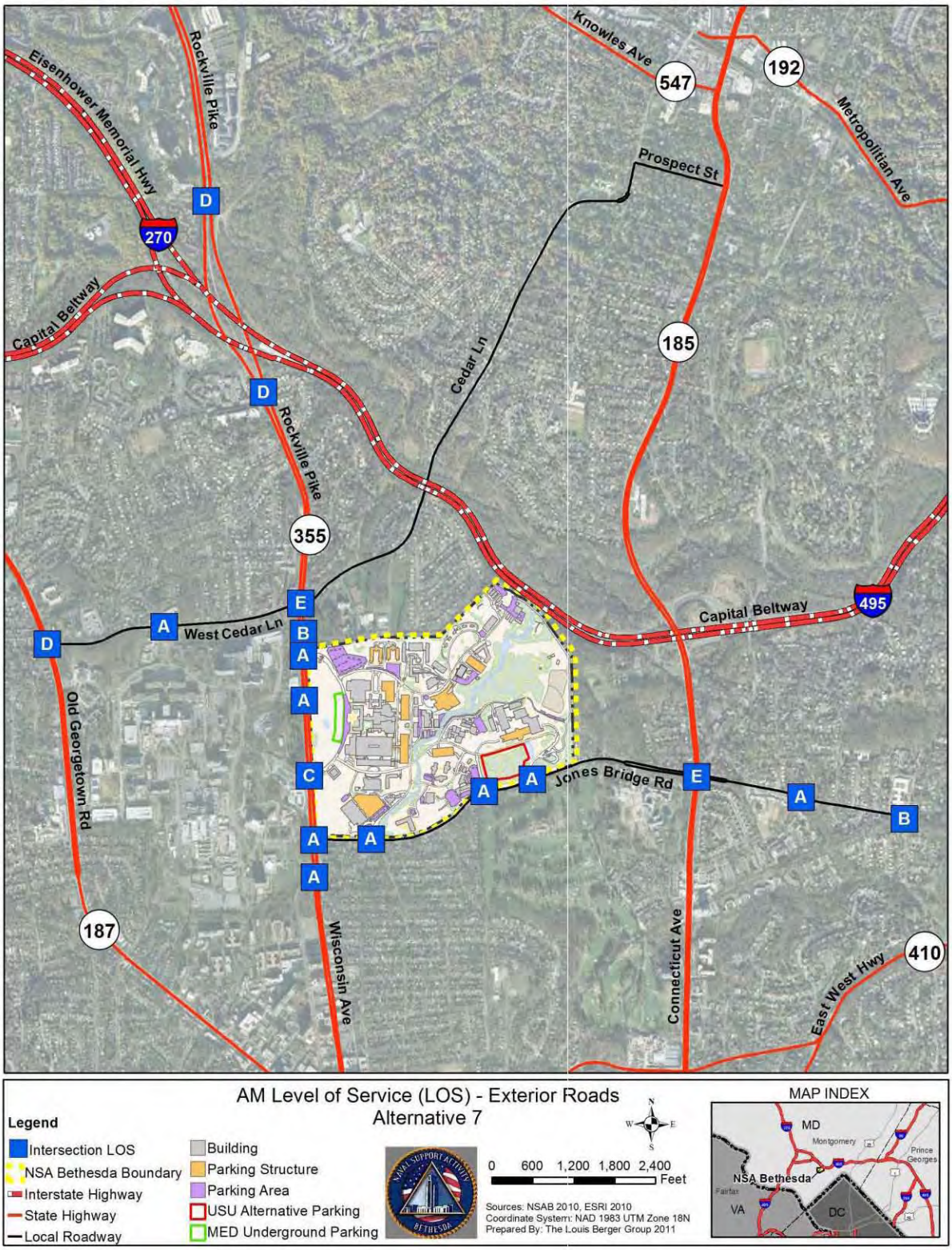
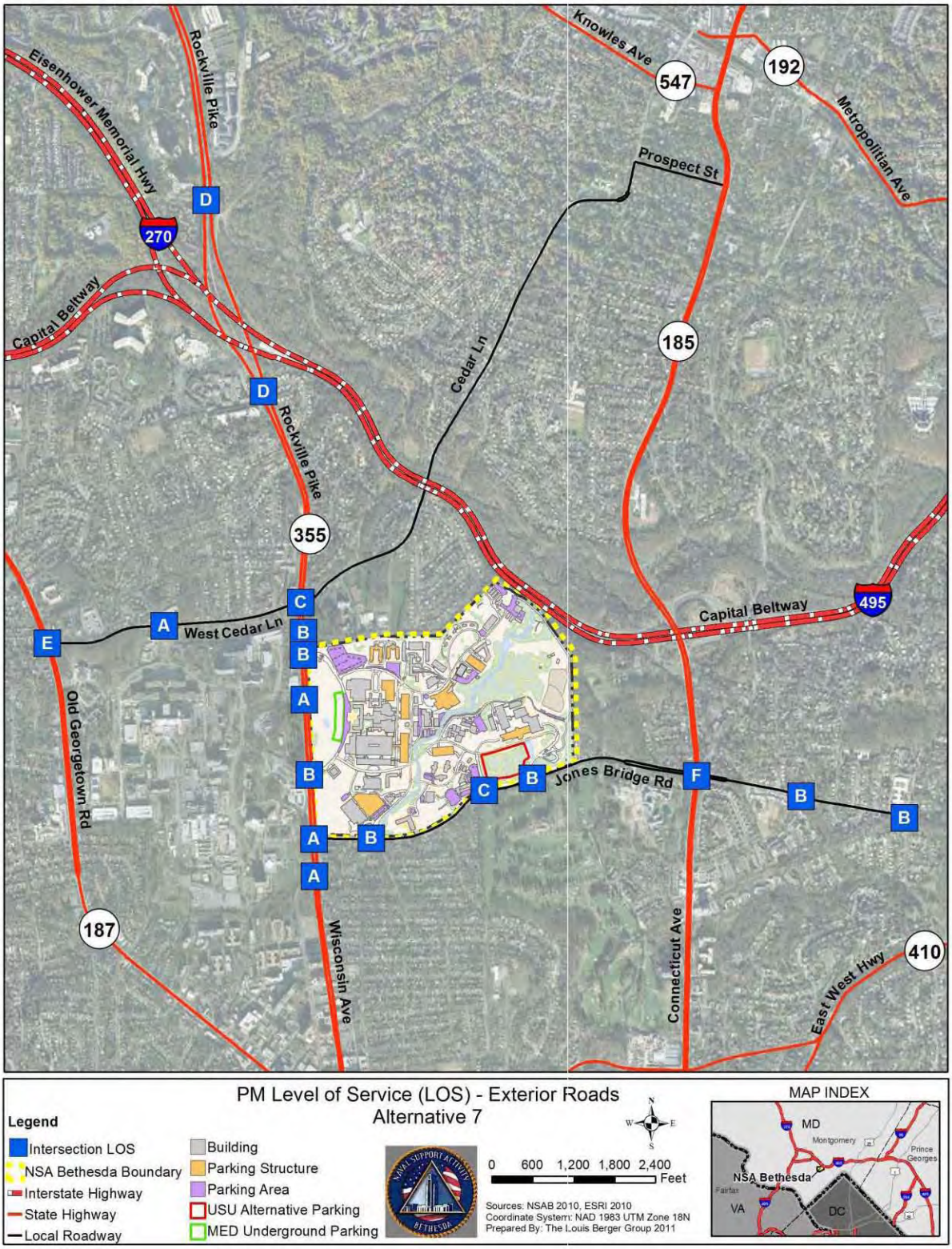


Figure 58B: 2018 PM Peak Hour Build Alternative 7 CLV Intersection LOS



Highway Capacity Manual Intersection Analysis

The HCM analysis was conducted as a secondary comparison to the CLV analysis between the No Build condition and Build Alternatives for the external intersections. When comparing Build Alternative 7 with the No Build condition, the AM peak hour did not experience any change in LOS. The following intersections would change in the PM Peak hour: #2 Rockville Pike at Pooks Hill Road would change from a LOS of C to D, #9 Rockville Pike at South Wood Road would change from a LOS of B to C, and #15 Jones Bridge Road at Manor Road would change from a LOS of B to C. Since the CLV process was not used to evaluate unsignalized intersections, HCM analysis was used to provide a No Build condition comparison for intersection #6 Rockville Pike at North Drive/School Driveway, which showed no significant impacts. Tables 65A and 65B show the 2018 Build Alternative 7 HCM external analysis.

Table 65A: 2018 Build Alternative 7 HCM External Analysis

	HCM Analysis	AM Peak Hour					
		Alternative 7			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	45.0	1.03	D	45.6	1.02	D
	Eastbound	69.8		E	69.8		E
	Westbound	70.4		E	70.3		E
	Northbound	20.7		C	15.4		B
	Southbound	46.6		D	43.2		D
2. Rockville Pike & Pooks Hill Road	Overall	223.2	1.64	F	219.9	1.63	F
	Eastbound	83.4		F	83.4		F
	Northbound	341.6		F	335.9		F
	Southbound	22.0		C	21.3		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.5	0.89	B
	Eastbound	23.9		C	23.9		C
	Westbound	37.4		D	37.4		D
	Northbound	14.1		B	14.1		B
	Southbound	18.5		B	18.5		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.3	0.40	B	15.2	0.39	B
	Eastbound	19.8		B	19.6		B
	Westbound	11.8		B	11.8		B
	Northbound	14.7		B	14.7		B
	Southbound	15.1		B	15.1		B
5. Rockville Pike & Cedar Lane	Overall	44.0	1.00	D	41.8	0.98	D
	Eastbound	86.5		F	82.1		F
	Westbound	62.7		E	61.1		E
	Northbound	14.4		B	14.4		B
	Southbound	42.4		D	39.3		D
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.8		B	11.7		B
	Westbound	9.8		A	9.8		A
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	7.4	0.64	A	7.8	0.62	A
	Westbound	21.1		C	21.2		C
	Northbound	18.2		B	18.3		B
	Southbound	2.7		A	3.2		A
8. Rockville Pike & Wilson Drive	Overall	2.2	0.61	A	2.1	0.59	A
	Eastbound	60.9		E	60.9		E
	Northbound	1.9		A	1.9		A
	Southbound	0.9		A	0.8		A
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	13.1	0.76	B	12.7	0.76	B
	Eastbound	67.5		E	63.5		E
	Westbound	52.7		D	52.1		D
	Northbound	13.6		B	13.2		B
	Southbound	6.6		A	6.6		A
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	32.8	0.85	C	32.3	0.84	C
	Eastbound	54.3		D	54.3		D
	Westbound	99.6		F	97.3		F
	Northbound	17.8		B	18.0		B
	Southbound	6.9		A	6.9		A

Table 65A: 2018 Build Alternative 7 HCM External Analysis (continued)

	HCM Analysis	AM Peak Hour					
		Alternative 7			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	11.8	0.63	B	12.3	0.63	B
	Eastbound	3.4		A	3.3		A
	Westbound	13.9		B	14.7		B
	Northbound	22.0		C	22.0		C
	Southbound	24.5		C	24.5		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	5.0	0.53	A	3.8	0.51	A
	Eastbound	2.7		A	2.1		A
	Westbound	6.2		A	4.7		A
	Southbound	0.0		A	0.0		A
13. University Road (Gate #5) & Jones Bridge Road	Overall	8.2	0.57	A	6.4	0.51	A
	Eastbound	5.2		A	4.5		A
	Westbound	8.7		A	7.1		A
	Southbound	24.0		C	24.6		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	52.1	1.04	D	49.4	1.01	D
	Eastbound	59.4		E	55.7		E
	Westbound	44.7		D	42.2		D
	Northbound	24.0		C	24.0		C
	Southbound	63.1		E	58.9		E
	Southwestbound	82.6		F	82.6		F
15. Manor Road & Jones Bridge Road	Overall	15.6	0.57	B	15.1	0.56	B
	Eastbound	18.1		B	18.0		B
	Westbound	16.1		B	15.3		B
	Northbound	10.8		B	10.8		B
16. Jones Bridge Road & Jones Mill Road	Overall	45.4	0.77	D	42.3	0.76	D
	Eastbound	30.5		C	30.2		C
	Northbound	53.8		D	46.8		D
	Southbound	46.5		D	46.5		D
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	19.3	0.71	B	19.5	0.71	B
	Eastbound	48.7		D	48.7		D
	Westbound	41.2		D	41.2		D
	Northbound	5.5		A	5.4		A
	Southbound	3.3		C	3.3		C

Note: Intersections with only two-way stops have no overall LOS identified.

Table 65B: 2018 Build Alternative 7 HCM External Analysis

	HCM Analysis	PM Peak Hour					
		Alternative 7			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density (Veh/ hr)	LOS
1. Rockville Pike & Grosvenor Lane	Overall	60.1	1.01	E	58.9	1.01	E
	Eastbound	48.4		D	48.4		D
	Westbound	88.7		F	88.7		F
	Northbound	30.9		C	30.3		C
	Southbound	72.2		E	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	35.9	1.01	D	33.1	0.99	C
	Eastbound	65.4		E	65.4		E
	Northbound	40.7		D	35.7		D
	Southbound	23.9		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.2	0.84	B	19.1	0.83	B
	Eastbound	31.9		C	31.9		C
	Westbound	37.2		D	37.3		D
	Northbound	20.2		C	20.2		C
	Southbound	13.3		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	30.4	0.73	C	30.2	0.73	C
	Eastbound	39.9		D	39.5		D
	Westbound	7.5		A	7.5		A
	Northbound	24.8		C	24.8		C
	Southbound	26.7		C	26.7		C
5. Rockville Pike & Cedar Lane	Overall	38.4	0.97	D	36.4	0.97	D
	Eastbound	57.4		E	57.4		E
	Westbound	65.5		E	63.5		E
	Northbound	30.9		C	26.5		C
	Southbound	31.9		C	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.1		B	11.0		B
	Westbound	10.7		B	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.5	0.72	A	8.6	0.70	A
	Westbound	39.5		D	39.9		D
	Northbound	10.1		B	9.9		A
	Southbound	0.9		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	13.0	0.64	B	12.3	0.63	B
	Eastbound	44.6		D	44.6		D
	Northbound	6.6		A	4.8		A
	Southbound	10.7		B	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	25.1	0.83	C	18.7	0.72	B
	Eastbound	140.9		F	52.8		D
	Westbound	38.0		D	35.8		D
	Northbound	13.5		B	13.5		B
	Southbound	16.2		B	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	60.4	0.95	E	59.9	0.94	E
	Eastbound	58.1		E	58.2		E
	Westbound	43.2		D	42.8		D
	Northbound	78.3		E	78.3		E
	Southbound	46.7		D	45.4		D

Table 65B: 2018 Build Alternative 7 HCM External Analysis (continued)

	HCM Analysis	PM Peak Hour					
		Alternative 7			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density (Veh/ hr)	LOS	Delay	Density (Veh/ hr)	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.1	0.75	B	14.0	0.75	B
	Eastbound	11.2		B	11.2		B
	Westbound	13.1		B	12.9		B
	Northbound	13.8		B	13.8		B
	Southbound	23.9		C	23.9		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	17.2	0.84	B	13.6	0.79	B
	Eastbound	13.5		B	12.1		B
	Westbound	5.4		A	5.2		A
	Southbound	44.6		D	32.7		C
13. University Road (Gate #5) & Jones Bridge Road	Overall	13.9	0.69	B	10.7	0.67	B
	Eastbound	15.4		B	11.2		B
	Westbound	9.3		A	9.3		A
	Southbound	20.1		C	21.0		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	70.7	1.10	E	68.7	1.10	E
	Eastbound	100.7		F	92.8		F
	Westbound	118.7		F	119.7		F
	Northbound	76.1		E	76.1		E
	Southbound	18.8		B	18.9		B
	Southwestbound	126.1		F	126.1		F
15. Manor Road & Jones Bridge Road	Overall	21.4	0.73	C	19.7	0.71	B
	Eastbound	32.0		C	28.9		C
	Westbound	4.1		A	3.7		A
	Northbound	21.9		C	21.9		C
16. Jones Bridge Road & Jones Mill Road	Overall	24.4	0.73	C	23.5	0.71	C
	Eastbound	12.9		B	13.0		B
	Northbound	41.2		D	38.5		D
	Southbound	20.0		C	20.0		C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	12.7	0.70	B	12.6	0.69	B
	Eastbound	12.8		B	12.8		B
	Westbound	9.2		A	9.2		A
	Northbound	18.3		B	18.1		B
	Southbound	7.9		A	7.8		A

Note: Intersections with only two-way stops have no overall LOS identified.

3.2.10.4 Arterial Analysis

Arterial analysis was performed for Rockville Pike, West Cedar Lane, and Jones Bridge Road, comparing the alternative to the No Build condition. The greatest change between the No Build condition and Build Alternative 7 was a 3 percent increase along Rockville Pike northbound during the PM peak hour. Based upon this analysis, Alternative 7 would not require PAMR-RAM external intersection mitigation. Tables 66 and 67 show the 2018 Build Alternative 7 arterial analyses.

Table 66: 2018 AM Peak Hour Build Alternative 7 Arterial Analysis

		AM Peak Hour						
		Alt 7			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	11.3	11:36	E	11.5	11:25	E	2%
	Southbound	20.7	6:30	C	21.1	6:22	C	2%
Jones Bridge Road	Eastbound	20.5	5:1	C	20.7	4:59	C	1%
	Westbound	16.8	6:9	D	17.1	6:01	D	2%
West Cedar Lane	Eastbound	15.4	2:49	D	15.4	2:49	D	0%
	Westbound	16.9	2:34	D	16.9	2:34	D	0%

Table 67: 2018 PM Peak Hour Build Alternative 7 Arterial Analysis

		PM Peak Hour						
		Alt 7			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	15.5	8:24	D	16.0	8:11	D	3%
	Southbound	17.5	7:40	D	17.7	7:36	D	1%
Jones Bridge Road	Eastbound	16.7	6:11	D	17.1	6:02	D	2%
	Westbound	16.6	6:13	D	16.7	6:12	D	1%
West Cedar Lane	Eastbound	12.8	3:24	E	12.8	3:23	E	0%
	Westbound	17.4	2:30	D	17.4	2:30	D	0%

3.2.10.5 Internal Intersection Analysis

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal intersections. The only notable change between Alternative 7 and the No Build condition would be at the #28 South Palmer Road at Grier Road intersection changing from a LOS B to C, resulting from the new trips exiting the new USU Alternative 1 parking structure and heading toward Gates #2 and #4. Based on this analysis, there would be no significant impact to the internal roadway intersections for this alternative. Tables 68A and 68B show the 2018 Build Alternative 7 internal intersection analysis and Figures 59A and 59B show the 2018 Build Alternative 7 internal intersection LOS.

Table 68A: 2018 Build Alternative 7 Internal Intersection Analysis

		AM Peak Hour			
		Build Alt. 7		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	9.8	A	10.3	B
	Eastbound	10.3	B	10.9	B
	Westbound	8.5	A	8.7	A
	Northbound	8.6	A	9.0	A
	Southbound	9.5	A	9.6	A
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	16.1	C	17.6	C
	Westbound	12.3	B	12.8	B
	Northbound Left	3.5	A	3.1	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	9.7	A	10.5	B
	Northbound	8.7	A	9.2	A
	Southbound	10.5	B	11.5	B
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	8.8	A	9.1	A
	Westbound	8.2	A	8.1	A
	Northbound	9.2	A	9.4	A
	Southbound	8.2	A	8.8	A
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	9.5	A	9.7	A
	Eastbound	7.9	A	8.1	A
	Northbound	9.9	A	10.1	B
	Southbound	8.5	A	9.0	A
23. R.B. Brown Drive & South Palmer Road	Overall	10.5	B	9.8	A
	Eastbound	11.2	B	10.3	B
	Westbound	9.1	A	8.7	A
	Southbound	9.4	A	9.1	A
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	9.6	A	9.6	A
	Eastbound	10.0	A	10.0	A
	Westbound	8.6	A	8.6	A
	Northbound	9.5	A	9.5	A
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	9.0	A	9.0	A
	Eastbound	7.5	A	7.5	A
	Westbound	8.1	A	8.1	A
	Northbound	9.4	A	9.4	A
	Southbound	8.7	A	8.7	A
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	9.5	A	9.5	A
	Westbound	8.6	A	8.6	A
	Northbound	10.1	B	10.1	B
	Southbound	8.9	A	8.9	A
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	10.3	B	9.5	A
	Eastbound	9.6	A	8.1	A
	Westbound	11.2	B	10.4	B
	Northbound	9.3	A	8.9	A
	Southbound	0.0	A	0.0	A
28. University Road/Grier Road & South Palmer Road	Overall	10.9	B	8.7	A
	Eastbound	11.5	B	8.4	A
	Westbound	10.5	B	9.1	A
	Northbound	10.9	B	9.0	A
	Southbound	7.7	A	6.9	A
29. University Road & South Palmer Road	Westbound	8.0	A	8.0	A
	Northbound	8.0	A	7.9	A

Table 68B: 2018 Build Alternative 7 Internal Intersection Analysis

		PM Peak Hour			
		Build Alt. 7		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	15.9	C	16.5	C
	Eastbound	9.6	A	9.7	A
	Westbound	15.4	C	15.6	C
	Northbound	19.3	C	20.5	C
	Southbound	10.0	A	10.0	B
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	*	F	*	F
	Westbound	*	F	*	F
	Northbound Left	0.6	A	0.6	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.7	A	8.8	A
	Northbound	8.9	A	9.0	A
	Southbound	8.5	A	8.5	A
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	11.1	B	11.3	B
	Westbound	10.7	B	10.9	B
	Northbound	9.4	A	9.5	A
	Southbound	12.1	B	12.3	B
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	9.4	A	9.4	A
	Eastbound	7.8	A	7.8	A
	Northbound	8.2	A	8.3	A
	Southbound	10.0	A	10.0	B
23. R.B. Brown Drive & South Palmer Road	Overall	12.5	B	10.6	B
	Eastbound	9.3	A	8.9	A
	Westbound	14.1	B	10.7	B
	Southbound	12.6	B	11.4	B
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	10.7	B	10.7	B
	Eastbound	10.0	B	10.0	B
	Westbound	11.4	B	11.4	B
	Northbound	10.7	B	10.7	B
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	10.2	B	10.2	B
	Eastbound	8.4	A	8.4	A
	Westbound	9.8	A	9.8	A
	Northbound	9.7	A	9.7	A
	Southbound	11.0	B	11.0	B
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	15.0	B	15.0	B
	Westbound	16.0	C	16.0	C
	Northbound	11.5	B	11.5	B
	Southbound	16.2	C	16.2	C
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	13.0	B	10.7	B
	Eastbound	11.6	B	10.3	B
	Westbound	14.8	B	11.0	B
	Northbound	12.1	B	10.8	B
	Southbound	9.2	A	8.6	A
28. University Road/Grier Road & South Palmer Road	Overall	16.4	C	12.5	B
	Eastbound	19.5	C	13.7	B
	Westbound	13.8	B	9.2	A
	Northbound	10.2	B	8.9	A
	Southbound	15.1	C	11.9	B
29. University Road & South Palmer Road	Westbound	7.3	A	7.1	A
	Northbound	7.6	A	7.1	A

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no overall LOS identified.

Figure 59A: 2018 AM Peak Hour Build Alternative 7 Internal Intersection LOS

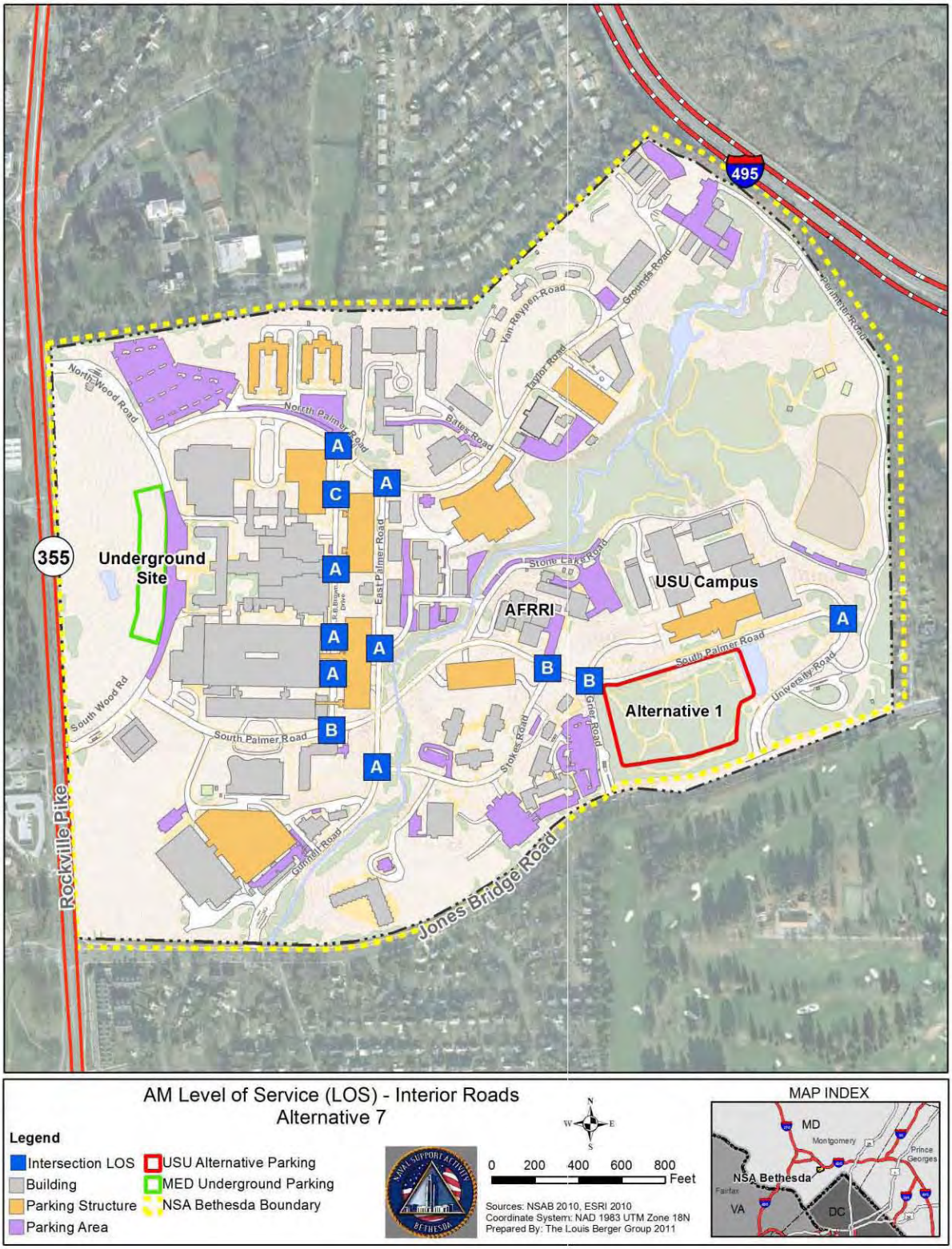
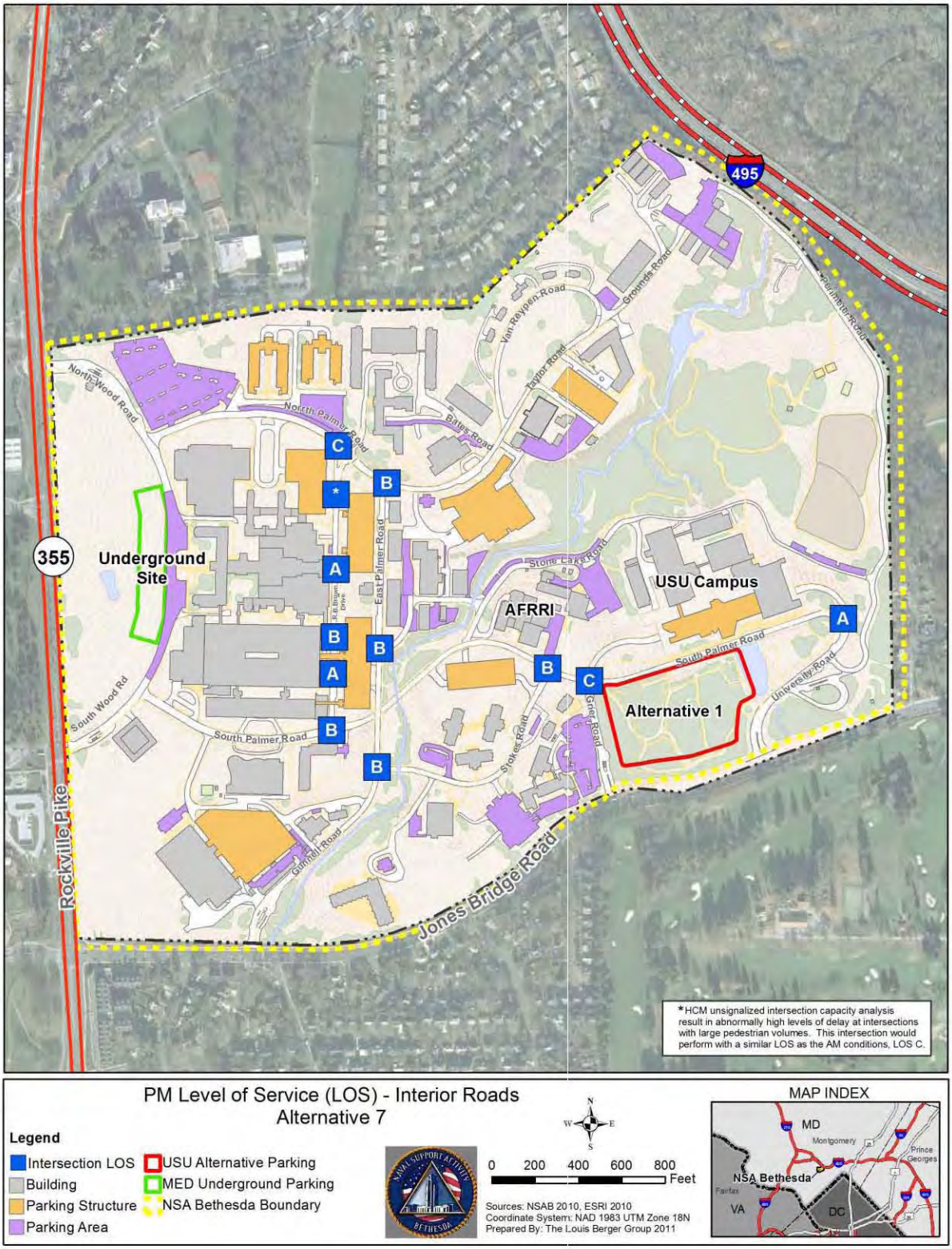


Figure 59B: 2018 PM Peak Hour Build Alternative 7 Internal Intersection LOS



3.2.10.6 Bicycle and Pedestrian Impacts

This alternative would include the placement of two new parking structures, resulting in increased pedestrian activity between the parking structures and destination buildings. The new underground parking structure would be located next to the main Medical Building with no significant impacts expected as pedestrians would be able to walk directly into the building without crossing any roadways.

The new USU Alternative 1 parking structure would be placed across the street from the USU Campus; therefore, the new pedestrian activity would cross three intersections: South Palmer Road at Grier Road, South Palmer Road at Stokes Road, and South Palmer Road at R.B. Brown Drive. For the Medical Development, this would result in 48 new pedestrian trips during the AM peak hour and 31 new pedestrian trips during the PM peak hour, which includes staff shifted from G-Lot. For the USU Expansion, this would result in 154 new pedestrian trips during the AM peak hour and 184 new pedestrian trips during the PM peak hour.

The Medical Building pedestrian trips are included in the internal HCM analysis in Tables 68A and 68B. The USU pedestrian trips are not included as the location of the optimum pedestrian crossing has not been identified. However, the USU trips were temporarily added to the South Palmer Road at Stokes Road intersection, with the intersection continuing to perform at the same overall LOS in both peak periods as calculated in Tables 68A and 68B.

Existing 5-foot plus sidewalks connect the new parking structure serving Building F with the Medical Buildings via South Palmer Road. Based on the 270 new employees included in the trip generation and adequate existing sidewalks serving these pedestrian trips, this alternative would have no significant pedestrian or bicycle impacts. Figure 38 shows the sidewalk connections for this Build Alternative.

3.2.11 ***Build Alternative 8***

This alternative would include the construction of a new 500-space parking structure in the industrial/warehouse area to serve Building C and the construction of a 400-space parking structure known as USU Alternative 1. The 500-space parking structure would be located north of Grounds Road, adjacent to the existing New Lot-Z, with the entrance and exit ramps connecting to Grounds Road.

The new USU Alternative 1 parking structure would be located across from the USU campus, south of South Palmer Road, with the entrance and exit ramps connecting to South Palmer Road.

3.2.11.1 Trip Generation

The trips generated for this alternative would be the same as Alterative 1, see Section 3.2.4.1

3.2.11.2 Trip Distribution

The trip distribution for this alternative would be similar to Alternative 3, with the 500-staff spaces shifted from Buildings 54 and 55 to the new 500-space parking structure in the warehouse site. The difference in this alternative occurs because the 270 new employees would be headed to and from the new USU Alternative 1 parking structure across the street from the USU, instead of N-Lot.

The Build Alternative 8 trip distribution would consist of combining the shift in staff from Buildings 54 and 55 to the new warehouse site parking structure, and the trips generated from the 270 new employee trips destined for the new USU Alternative 1 parking structure.

The internal installation generated or shifted trips follow the updated trip distribution pattern based upon the 2008 NNMC Transportation Study (Figure 26).

The distribution patterns for the shifted staff trips from Buildings 54 and 55 would follow the following paths:

- From the north: Continue past R.B. Brown Drive on North Palmer Road then continue onto Taylor Road/Grounds Road.

- To the north: Turn right into Grounds Road/Taylor Road, then continue straight on North Palmer Road past R.B. Brown Drive.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, and turn right onto Taylor Road/Grounds Road.

- To the south: Turn right onto Grounds Road/Taylor Road, then turn left onto East Palmer Road, follow to Gunnell Road and exit through Gate #3, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and follow through to Grounds Road.

- To the east: Turn left onto Grounds Road, Follow onto Perimeter Road, then turn left onto University Road, exit though Gate #5, and turn left onto Jones Bridge Road.

The result of these new distribution patterns would remove trips from R.B. Brown Drive and South Palmer Road, and Rockville Pike between South Wood Road and Jones Bridge Road.

During the AM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto South Wood Road, enter through Gate #2, and turn right onto South Palmer Road.

- To the north: Turn left onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Grier Road, enter through Gate #4, and turn right onto South Palmer Road.

- To the south: Turn right onto South Palmer Road, turn right onto University Road, exit through Gate #5, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto Grier Road, enter through Gate #4, and turn right onto South Palmer Road.

- To the east: Turn right onto South Palmer Road, turn right onto University Road, exit though Gate #5, and turn left onto Jones Bridge Road.

During the PM peak hour, new staff trips would follow the following paths:

- From the north: Turn left onto South Wood Road, enter through Gate #2, and turn right onto South Palmer Road.

- To the north: Turn left onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto University Road, enter through Gate #5, and turn left onto South Palmer Road.

- To the south: Turn left onto South Palmer Road, turn left onto Grier Road, exit through Gate #4, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, and turn left onto South Palmer Road.

- To the east: Turn left onto South Palmer Road, turn left onto Grier Road, exit though Gate #4, and turn left onto Jones Bridge Road.

Figures 60A, 60B, and 60C show the 2018 Build Alternative 8 trip distribution.

Figure 60A: 2018 Alternative 8 Trip Distribution

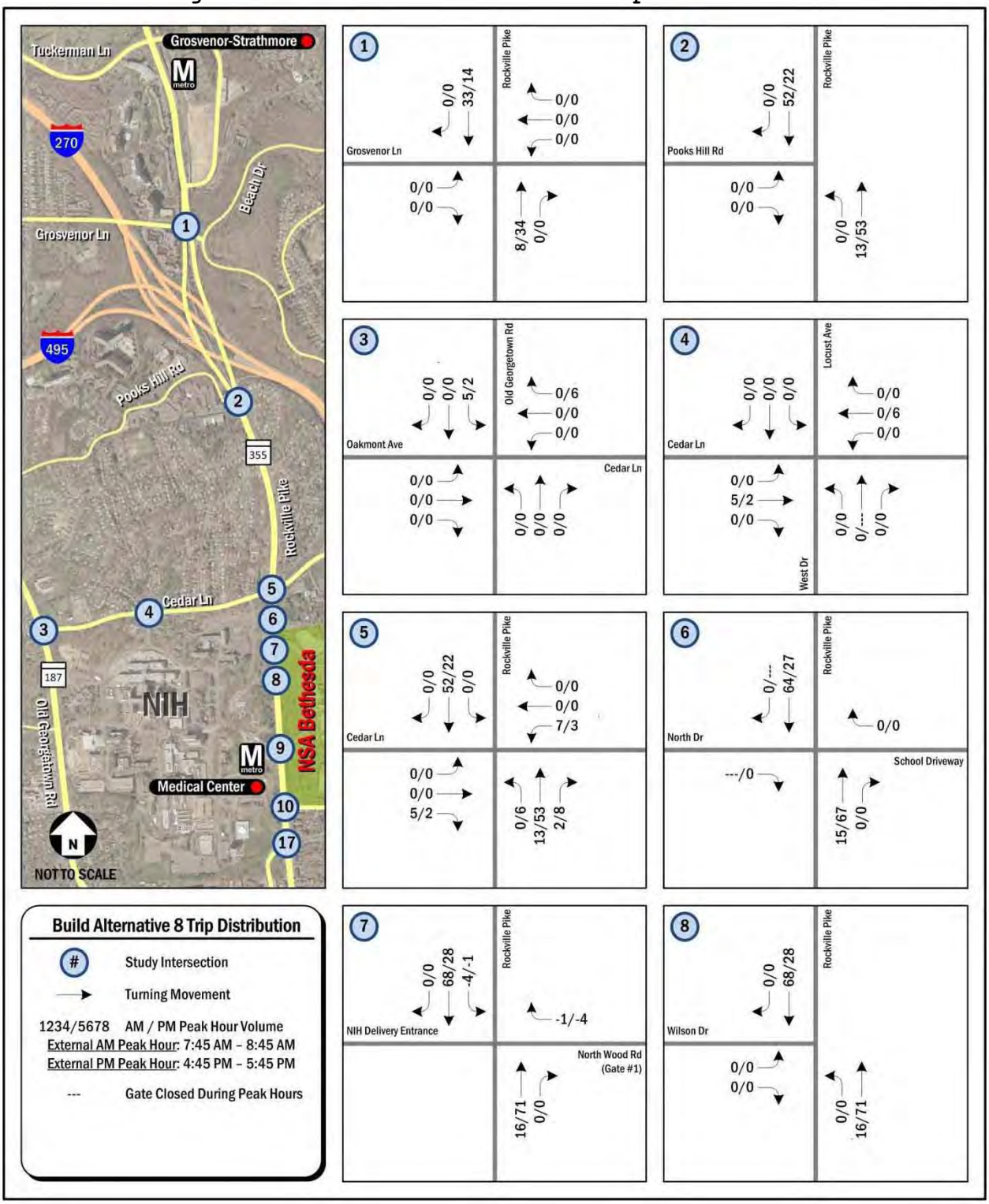


Figure 60B: 2018 Alternative 8 Trip Distribution

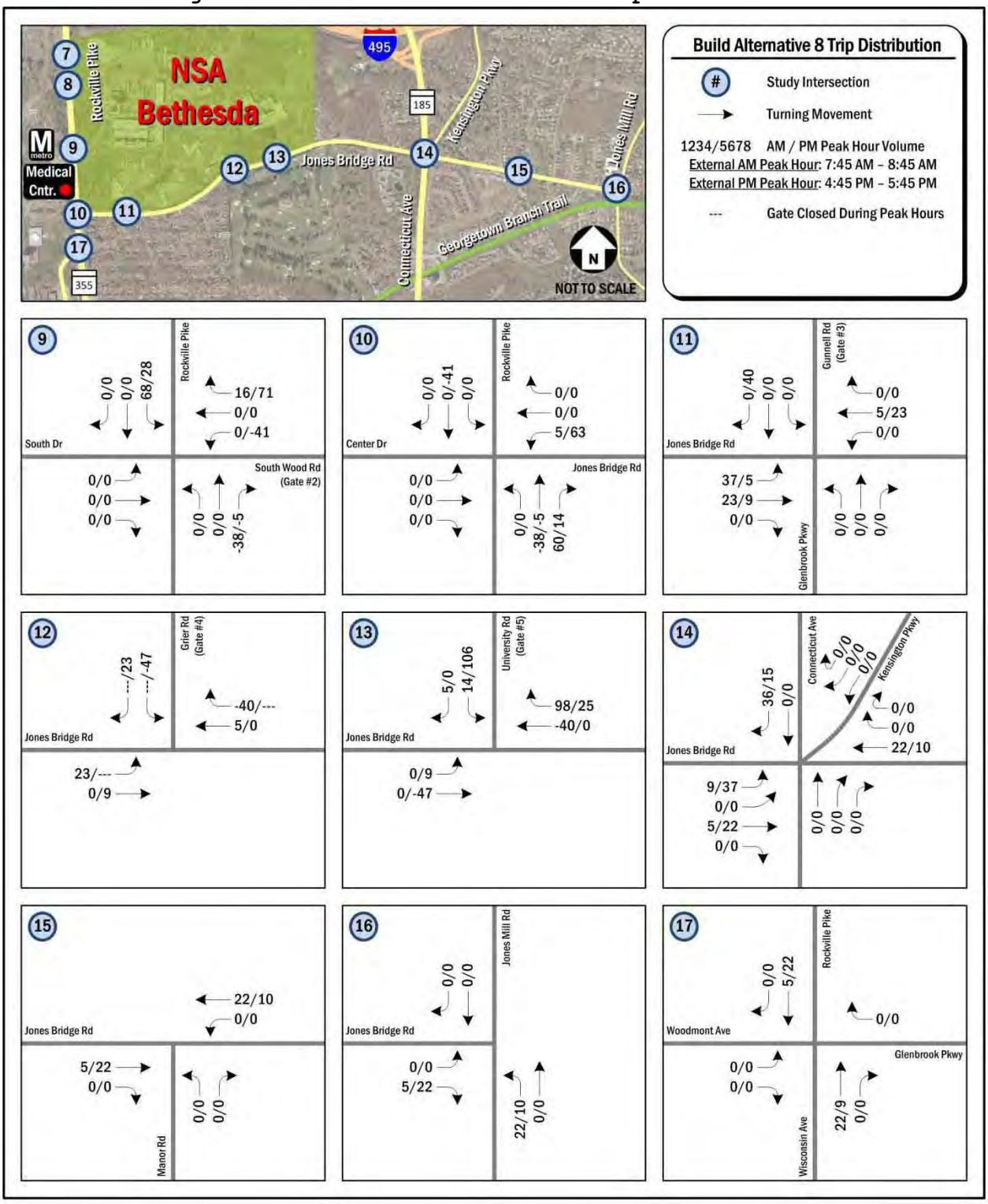
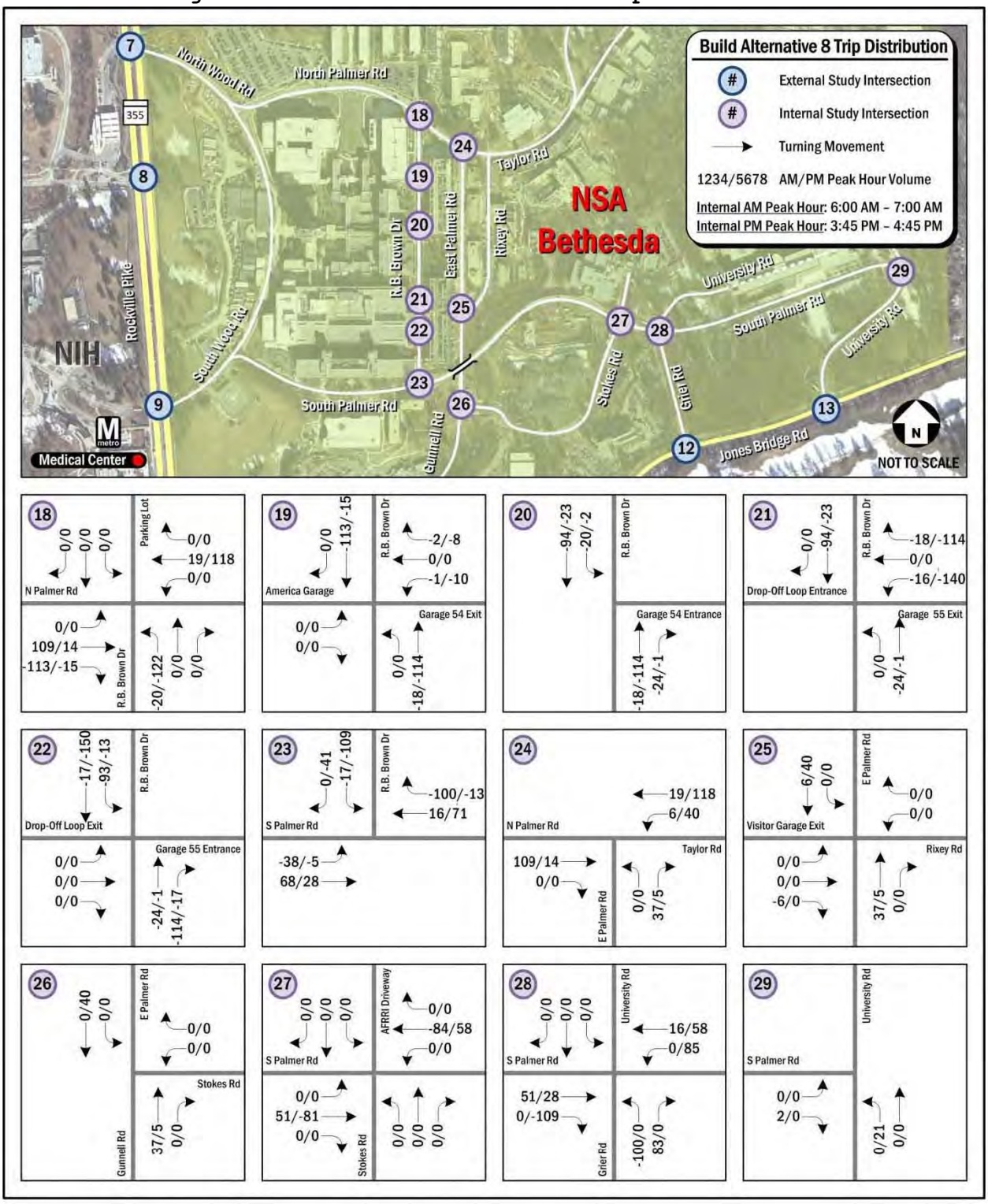


Figure 60C: 2018 Alternative 8 Trip Distribution



3.2.11.3 External Intersection Analysis

The 2018 Build Alternative 8 includes all projects listed in the No Build condition. Figure 29C shows 2018 Build Alternatives 2 through 5 and 7 through 10 internal lane utilization and traffic control.

Critical Lane Volume Analysis

The CLV analysis was conducted for the 16 external signalized intersections to compare to the No Build condition. According to the analysis, the #9 Rockville Pike at South Wood Road (Gate #2) intersection would change from a LOS of B to C during the AM peak hour. Based upon these results, the external signalized intersections would have no significant traffic impacts from implementing Alternative 8. Table 69 shows the 2018 Build Alternative 8 CLV external analysis. Figures 61A and 61B show the 2018 Build Alternative 8 CLV intersection LOS.

Table 69: 2018 Build Alternative 8 CLV External Analysis

		Build Alternative 8				No Build Condition			
		AM Peak Hr.		*PM Peak Hr.*		*AM Peak Hr.*		*PM Peak Hr.*	
		CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS
1.	**Rockville Pike & Grosvenor Lane**	1,385	D	1,341	D	1,373	D	1,336	D
2.	**Rockville Pike & Pooks Hill Road**	1,359	D	1,399	D	1,343	D	1,379	D
3.	**Old Georgetown Road & Oakmont Avenue/Cedar Lane**	1,437	D	1,538	E	1,437	D	1,536	E
4.	**Locust Avenue/West Drive & Cedar Lane**	465	A	941	A	489	A	939	A
5.	**Rockville Pike & Cedar Lane**	1,552	E	1,242	C	1,529	E	1,236	C
6.	**Rockville Pike & North Drive/School Driveway**	*un-signalized*		*un-signalized*		*un-signalized*		*un-signalized*	
7.	**Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)**	845	A	1,058	B	843	A	1,033	B
8.	**Rockville Pike & Wilson Drive**	983	A	970	A	958	A	948	A
9.	**Rockville Pike & South Drive/South Wood Road (Gate #2)**	1,178	C	1,110	B	1,121	B	1,039	B
10.	**Rockville Pike & Center Drive/Jones Bridge Road**	704	A	840	A	715	A	808	A
11.	**Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road**	840	A	1,052	B	801	A	1,024	B
12.	**Grier Road (Gate #4) & Jones Bridge Road**	718	A	1,062	B	692	A	1,104	B
13.	**University Road (Gate #5) & Jones Bridge Road**	728	A	1,110	B	729	A	1,023	B
14.	**Connecticut Avenue & Jones Bridge Road & Kensington Parkway**	1,507	E	1,755	F	1,490	E	1,735	F
15.	**Manor Road & Jones Bridge Road**	761	A	1,031	B	739	A	1,009	B
16.	**Jones Bridge Road & Jones Mill Road**	1,061	B	1,084	B	1,039	B	1,062	B
17.	**Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway**	773	A	942	A	771	A	938	A

Figure 61A: 2018 AM Peak Hour Build Alternative 8 CLV Intersection LOS

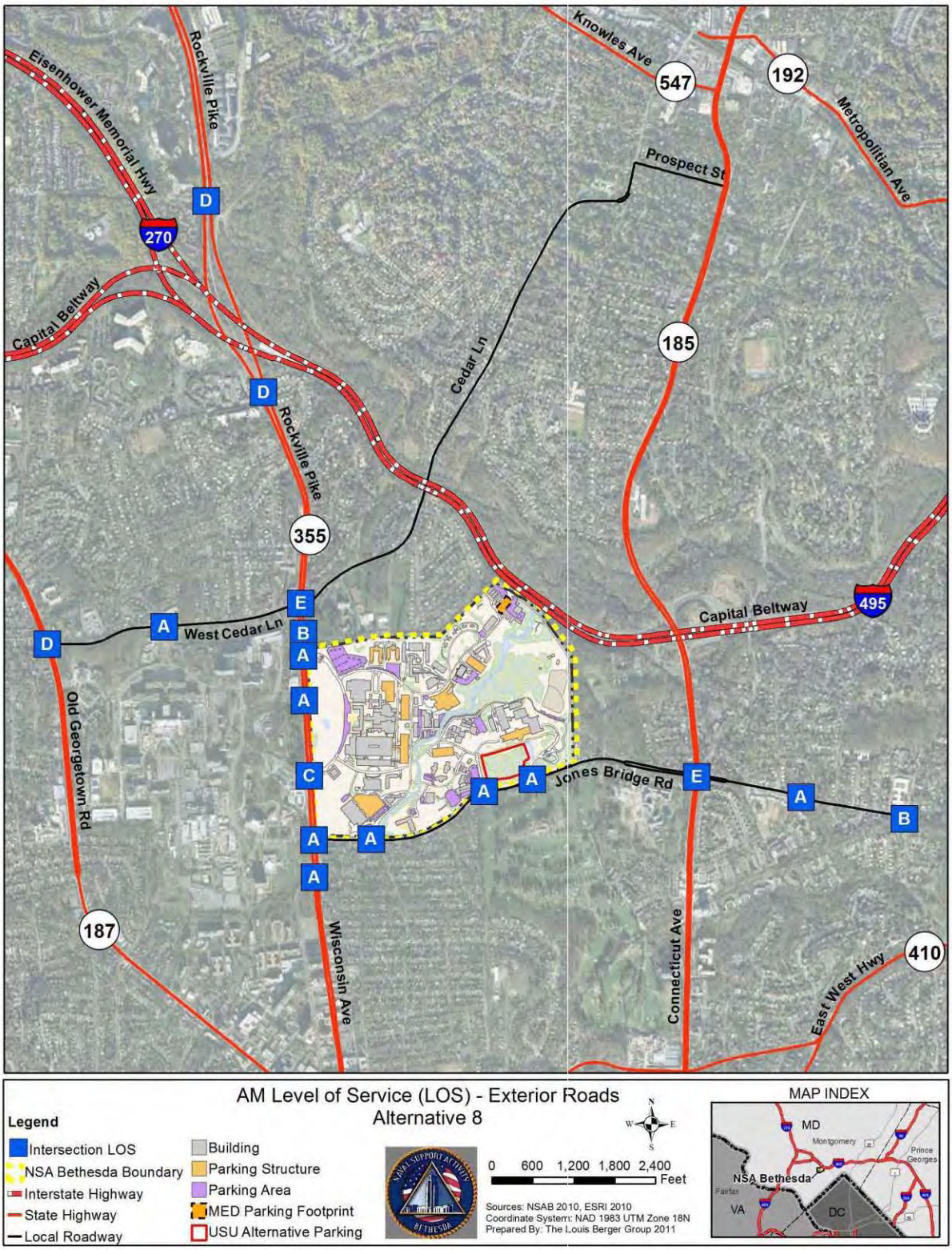
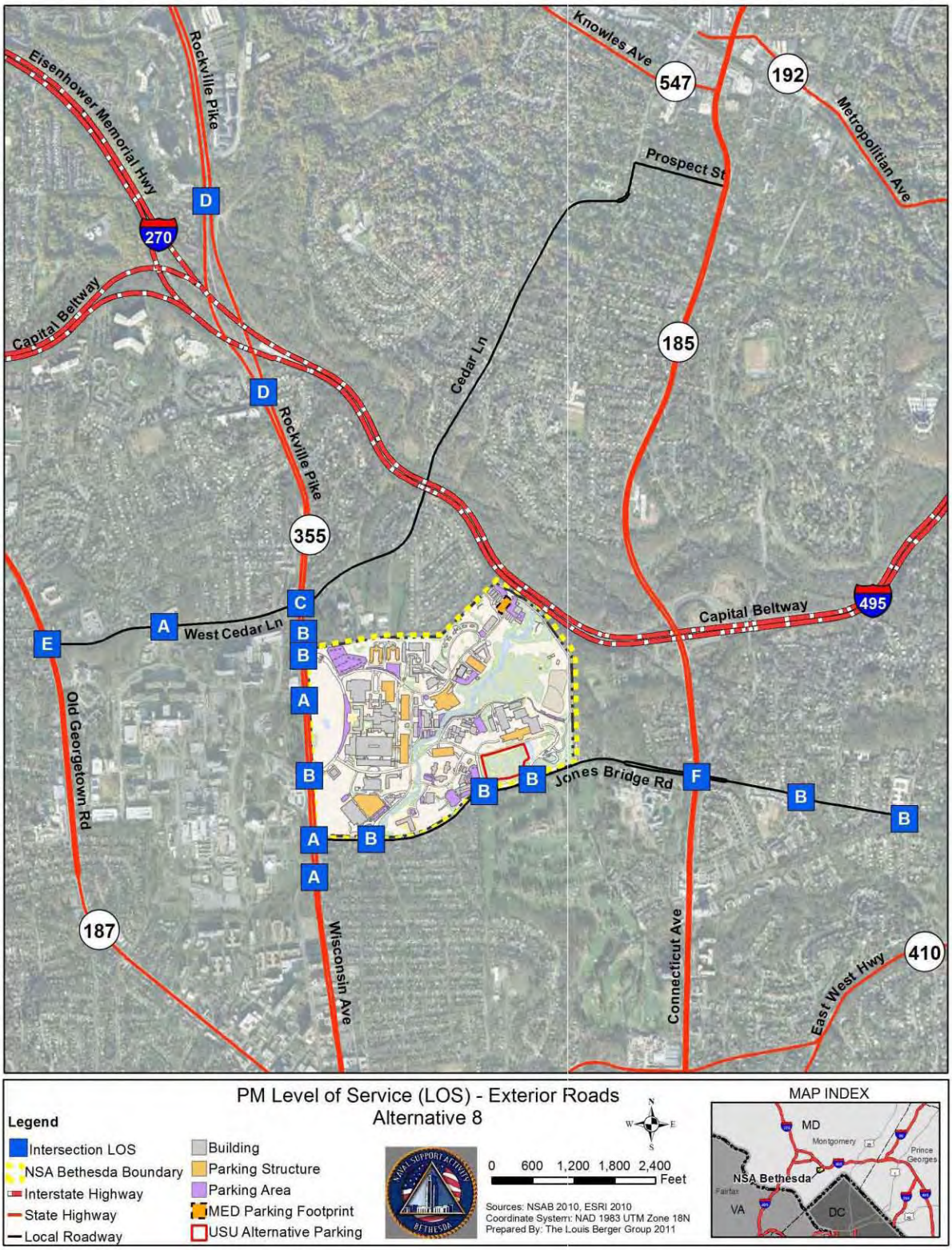


Figure 61B: 2018 PM Peak Hour Build Alternative 8 CLV Intersection LOS



Highway Capacity Manual Intersection Analysis

The HCM analysis was conducted as a secondary comparison to the CLV analysis between the No Build condition and Build Alternatives for the external intersections. When comparing Build Alternative 8 with the No Build condition, the AM peak hour did not experience any change in LOS. For the PM Peak hour, intersection #2 Rockville Pike at Pooks Hill Road would change from a LOS of C to D, #9 Rockville Pike at South Wood Road would change from a LOS of B to C, and #15 Jones Bridge Road at Manor Road would change from a LOS of B to C. Since the CLV process was not used to evaluate unsignalized intersections, HCM analysis was used to provide a No Build condition comparison for intersection #6 Rockville Pike at North Drive/School Driveway, which showed no significant impacts. Tables 70A and 70B show the 2018 Build Alternative 8 HCM external analysis.

Table 70A: 2018 AM Peak Hour Build Alternative 8 HCM External Analysis

	HCM Analysis	AM Peak Hour					
		Alternative 8			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	45.0	1.03	D	45.6	1.02	D
	Eastbound	69.8		E	69.8		E
	Westbound	70.4		E	70.3		E
	Northbound	20.7		C	15.4		B
	Southbound	46.6		D	43.2		D
2. Rockville Pike & Pooks Hill Road	Overall	223.2	1.64	F	219.9	1.63	F
	Eastbound	83.4		F	83.4		F
	Northbound	341.6		F	335.9		F
	Southbound	22.0		C	21.3		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.5	0.89	B
	Eastbound	23.9		C	23.9		C
	Westbound	37.4		D	37.4		D
	Northbound	14.1		B	14.1		B
	Southbound	18.5		B	18.5		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.3	0.40	B	15.2	0.39	B
	Eastbound	19.8		B	19.6		B
	Westbound	11.8		B	11.8		B
	Northbound	14.7		B	14.7		B
	Southbound	15.1		B	15.1		B
5. Rockville Pike & Cedar Lane	Overall	43.8	0.99	D	41.8	0.98	D
	Eastbound	86.0		F	82.1		F
	Westbound	61.9		E	61.1		E
	Northbound	14.6		B	14.4		B
	Southbound	42.4		D	39.3		D
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.8		B	11.7		B
	Westbound	9.8		A	9.8		A
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	7.6	0.64	A	7.8	0.62	A
	Westbound	21.2		C	21.2		C
	Northbound	18.2		B	18.3		B
	Southbound	3.0		A	3.2		A
8. Rockville Pike & Wilson Drive	Overall	2.1	0.60	A	2.1	0.59	A
	Eastbound	60.9		E	60.9		E
	Northbound	1.9		A	1.9		A
	Southbound	0.9		A	0.8		A
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	12.9	0.76	B	12.7	0.76	B
	Eastbound	67.1		E	63.5		E
	Westbound	52.7		D	52.1		D
	Northbound	13.1		B	13.2		B
	Southbound	6.3		A	6.6		A
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	32.5	0.84	C	32.3	0.84	C
	Eastbound	54.3		D	54.3		D
	Westbound	99.6		F	97.3		F
	Northbound	17.4		B	18.0		B
	Southbound	6.6		A	6.9		A

Table 70A: 2018AM Peak Hour Build Alternative 8 HCM External Analysis (continued)

	HCM Analysis	AM Peak Hour					
		Alternative 8			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	12.7	0.63	B	12.3	0.63	B
	Eastbound	3.6		A	3.3		A
	Westbound	15.6		B	14.7		B
	Northbound	22.0		C	22.0		C
	Southbound	24.5		C	24.5		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	4.7	0.53	A	3.8	0.51	A
	Eastbound	2.7		A	2.1		A
	Westbound	5.8		A	4.7		A
	Southbound	0.0		A	0.0		A
13. University Road (Gate #5) & Jones Bridge Road	Overall	7.7	0.54	A	6.4	0.51	A
	Eastbound	5.1		A	4.5		A
	Westbound	7.9		A	7.1		A
	Southbound	24.0		C	24.6		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	52.1	1.04	D	49.4	1.01	D
	Eastbound	59.4		E	55.7		E
	Westbound	44.7		D	42.2		D
	Northbound	24.0		C	24.0		C
	Southbound	63.1		E	58.9		E
	Southwestbound	82.6		F	82.6		F
15. Manor Road & Jones Bridge Road	Overall	15.6	0.57	B	15.1	0.56	B
	Eastbound	18.1		B	18.0		B
	Westbound	16.1		B	15.3		B
	Northbound	10.8		B	10.8		B
16. Jones Bridge Road & Jones Mill Road	Overall	45.4	0.77	D	42.3	0.76	D
	Eastbound	30.5		C	30.2		C
	Northbound	53.8		D	46.8		D
	Southbound	46.5		D	46.5		D
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	19.3	0.71	B	19.5	0.71	B
	Eastbound	48.7		D	48.7		D
	Westbound	41.2		D	41.2		D
	Northbound	5.5		A	5.4		A
	Southbound	3.3		C	3.3		C

Note: Intersections with only two-way stops have no overall LOS identified.

Table 70B: 2018 PM Peak Hour Build Alternative 8 HCM External Analysis

	HCM Analysis	PM Peak Hour					
		Alternative 8			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density (Veh/ hr)	LOS
1. Rockville Pike & Grosvenor Lane	Overall	60.1	1.01	E	58.9	1.01	E
	Eastbound	48.4		D	48.4		D
	Westbound	88.7		F	88.7		F
	Northbound	30.9		C	30.3		C
	Southbound	72.2		E	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	35.8	1.01	D	33.1	0.99	C
	Eastbound	65.4		E	65.4		E
	Northbound	40.7		D	35.7		D
	Southbound	23.7		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.2	0.84	B	19.1	0.83	B
	Eastbound	31.9		C	31.9		C
	Westbound	37.2		D	37.3		D
	Northbound	20.2		C	20.2		C
	Southbound	13.3		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	30.4	0.73	C	30.2	0.73	C
	Eastbound	39.9		D	39.5		D
	Westbound	7.5		A	7.5		A
	Northbound	24.8		C	24.8		C
	Southbound	26.7		C	26.7		C
5. Rockville Pike & Cedar Lane	Overall	38.4	0.97	D	36.4	0.97	D
	Eastbound	57.4		E	57.4		E
	Westbound	65.5		E	63.5		E
	Northbound	30.9		C	26.5		C
	Southbound	31.9		C	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.1		B	11.0		B
	Westbound	10.7		B	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.5	0.72	A	8.6	0.70	A
	Westbound	39.8		D	39.9		D
	Northbound	9.8		A	9.9		A
	Southbound	0.9		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	12.3	0.64	B	12.3	0.63	B
	Eastbound	44.6		D	44.6		D
	Northbound	5.0		A	4.8		A
	Southbound	10.7		B	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	21.8	0.78	C	18.7	0.72	B
	Eastbound	64.7		E	52.8		D
	Westbound	33.7		C	35.8		D
	Northbound	16.1		B	13.5		B
	Southbound	19.0		B	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	59.4	0.94	E	59.9	0.94	E
	Eastbound	58.2		E	58.2		E
	Westbound	44.2		D	42.8		D
	Northbound	77.5		E	78.3		E
	Southbound	44.5		D	45.4		D

Table 70B: 2018 PM Peak Hour Build Alternative 8 HCM External Analysis (continued)

	HCM Analysis	PM Peak Hour					
		Alternative 8			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density (Veh/ hr)	LOS	Delay	Density (Veh/ hr)	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.1	0.75	B	14.0	0.75	B
	Eastbound	11.3		B	11.2		B
	Westbound	13.1		B	12.9		B
	Northbound	13.8		B	13.8		B
	Southbound	23.1		C	23.9		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	12.0	0.75	B	13.6	0.79	B
	Eastbound	11.0		B	12.1		B
	Westbound	5.4		A	5.2		A
	Southbound	27.4		C	32.7		C
13. University Road (Gate #5) & Jones Bridge Road	Overall	9.8	0.73	A	10.7	0.67	B
	Eastbound	9.0		A	11.2		B
	Westbound	9.3		A	9.3		A
	Southbound	24.0		C	21.0		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	71.2	1.10	E	68.7	1.10	E
	Eastbound	102.7		F	92.8		F
	Westbound	118.7		F	119.7		F
	Northbound	76.1		E	76.1		E
	Southbound	18.8		B	18.9		B
	Southwestbound	126.1		F	126.1		F
15. Manor Road & Jones Bridge Road	Overall	21.4	0.73	C	19.7	0.71	B
	Eastbound	32.0		C	28.9		C
	Westbound	4.1		A	3.7		A
	Northbound	21.9		C	21.9		C
16. Jones Bridge Road & Jones Mill Road	Overall	24.4	0.73	C	23.5	0.71	C
	Eastbound	12.9		B	13.0		B
	Northbound	41.2		D	38.5		D
	Southbound	20.0		C	20.0		C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	12.7	0.70	B	12.6	0.69	B
	Eastbound	12.8		B	12.8		B
	Westbound	9.2		A	9.2		A
	Northbound	18.3		B	18.1		B
	Southbound	7.9		A	7.8		A

Note: Intersections with only two-way stops have no overall LOS identified.

3.2.11.4 Arterial Analysis

Arterial analysis was performed for Rockville Pike, West Cedar Lane, and Jones Bridge Road, comparing the alternative to the No Build condition. The greatest change between the No Build condition and Build Alternative 8 was a 3 percent increase along Rockville Pike northbound during the PM peak hour. Based upon this analysis, Alternative 8 would not require PAMR-RAM external intersection mitigation. Tables 71 and 72 show the 2018 Build Alternative 8 arterial analyses.

Table 71: 2018 AM Peak Hour Build Alternative 8 Arterial Analysis

		AM Peak Hour						
		Alt 8			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	11.3	11:35	E	11.5	11:25	E	2%
	Southbound	20.7	6:30	C	21.1	6:22	C	2%
Jones Bridge Road	Eastbound	20.5	5:1	C	20.7	4:59	C	1%
	Westbound	16.7	6:10	D	17.1	6:01	D	2%
West Cedar Lane	Eastbound	15.4	2:49	D	15.4	2:49	D	0%
	Westbound	16.9	2:34	D	16.9	2:34	D	0%

Table 72: 2018 PM Peak Hour Build Alternative 8 Arterial Analysis

		PM Peak Hour						
		Alt 8			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	15.6	8:24	D	16.0	8:11	D	3%
	Southbound	17.5	7:41	D	17.7	7:36	D	1%
Jones Bridge Road	Eastbound	17.1	6:02	D	17.1	6:02	D	0%
	Westbound	16.6	6:13	D	16.7	6:12	D	1%
West Cedar Lane	Eastbound	12.8	3:24	E	12.8	3:23	E	0%
	Westbound	17.4	2:30	D	17.4	2:30	D	0%

3.2.11.5 Internal Intersection Analysis

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal intersections. During the AM peak hour intersection #19 R.B. Brown Drive at America Garage approach would change from a LOS of C to D, reflecting the increase in pedestrian traffic crossing at this intersection, walking between the Medical Center and warehouse parking facility. During the PM peak hour, the #26 South Palmer Road at Stokes Road intersection would changing from a LOS B to C, resulting from the shifted trips exiting the new warehouse site parking structure and heading toward Gate #3. Based on this analysis, there would be no significant impact to the internal roadway intersections for this alternative. Tables 73A and 73B show the 2018 Build Alternative 8 internal intersection analysis compared to the No Build condition and Figures 62A and 62B show the 2018 Build Alternative 8 internal intersection LOS.

Table 73A: 2018 Build Alternative 8 Internal Intersection Analysis

			AM Peak Hour			
			Build Alt. 8		*No Build*	
		Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18.	**Parking Lot/R.B. Brown Drive & North Palmer Road**	Overall	12.4	B	10.3	B
		Eastbound	13.9	B	10.9	B
		Westbound	8.7	A	8.7	A
		Northbound	8.7	A	9.0	A
		Southbound	9.7	A	9.6	A
19.	**R.B. Brown Drive & America Garage/Garage 54 Exit**	Eastbound	25.9	D	17.6	C
		Westbound	16.2	C	12.8	B
		Northbound Left	3.4	A	3.1	A
20.	**R.B. Brown Drive & Garage 54 Entrance**	Overall	8.9	A	10.5	B
		Northbound	8.4	A	9.2	A
		Southbound	9.4	A	11.5	B
21.	**R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit**	Overall	8.3	A	9.1	A
		Westbound	7.4	A	8.1	A
		Northbound	8.6	A	9.4	A
		Southbound	7.7	A	8.8	A
22.	**R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance**	Overall	8.2	A	9.7	A
		Eastbound	7.5	A	8.1	A
		Northbound	8.5	A	10.1	B
		Southbound	7.7	A	9.0	A
23.	**R.B. Brown Drive & South Palmer Road**	Overall	9.7	A	9.8	A
		Eastbound	10.1	B	10.3	B
		Westbound	8.3	A	8.7	A
		Southbound	8.9	A	9.1	A
24.	**East Palmer Road & North Palmer Road/Taylor Road**	Overall	12.0	B	9.6	A
		Eastbound	13.4	B	10.0	A
		Westbound	9.5	A	8.6	A
		Northbound	11.0	B	9.5	A
25.	**East Palmer Road & Visitor Garage Exit/Rixey Road**	Overall	9.4	A	9.0	A
		Eastbound	0.0	A	7.5	A
		Westbound	8.2	A	8.1	A
		Northbound	9.9	A	9.4	A
		Southbound	8.8	A	8.7	A
26.	**East Palmer Road/Gunnell Road & Stokes Road**	Overall	10.0	B	9.5	A
		Westbound	8.7	A	8.6	A
		Northbound	10.7	B	10.1	B
		Southbound	9.0	A	8.9	A
27.	**AFRRI Driveway/Stokes Road & South Palmer Road**	Overall	9.0	A	9.5	A
		Eastbound	8.6	A	8.1	A
		Westbound	9.5	A	10.4	B
		Northbound	8.8	A	8.9	A
		Southbound	0.0	A	0.0	A
28.	**University Road/Grier Road & South Palmer Road**	Overall	9.1	A	8.7	A
		Eastbound	9.4	A	8.4	A
		Westbound	9.5	A	9.1	A
		Northbound	8.4	A	9.0	A
		Southbound	7.2	A	6.9	A
29.	**University Road & South Palmer Road**	Westbound	8.0	A	8.0	A
		Northbound	7.9	A	7.9	A

Table 73B: 2018 Build Alternative 8 Internal Intersection Analysis

		PM Peak Hour			
		Build Alt. 8		*No Build*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	17.7	C	16.5	C
	Eastbound	9.5	A	9.7	A
	Westbound	23.2	C	15.6	C
	Northbound	13.6	B	20.5	C
	Southbound	10.1	B	10.0	B
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	*	F	*	F
	Westbound	*	F	*	F
	Northbound Left	0.9	A	0.6	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.0	A	8.8	A
	Northbound	7.9	A	9.0	A
	Southbound	8.1	A	8.5	A
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	9.1	A	11.3	B
	Westbound	7.4	A	10.9	B
	Northbound	8.2	A	9.5	A
	Southbound	9.5	A	12.3	B
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	8.0	A	9.4	A
	Eastbound	7.3	A	7.8	A
	Northbound	7.9	A	8.3	A
	Southbound	8.1	A	10.0	B
23. R.B. Brown Drive & South Palmer Road	Overall	9.8	A	10.6	B
	Eastbound	8.2	A	8.9	A
	Westbound	11.0	B	10.7	B
	Southbound	8.9	A	11.4	B
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	14.9	B	10.7	B
	Eastbound	11.3	B	10.0	B
	Westbound	18.5	C	11.4	B
	Northbound	12.1	B	10.7	B
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	10.8	B	10.2	B
	Eastbound	8.6	A	8.4	A
	Westbound	10.1	B	9.8	A
	Northbound	9.9	A	9.7	A
	Southbound	11.9	B	11.0	B
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	16.6	C	15.0	B
	Westbound	16.8	C	16.0	C
	Northbound	11.9	B	11.5	B
	Southbound	19.1	C	16.2	C
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	11.3	B	10.7	B
	Eastbound	9.3	A	10.3	B
	Westbound	12.6	B	11.0	B
	Northbound	10.9	B	10.8	B
	Southbound	8.6	A	8.6	A
28. University Road/Grier Road & South Palmer Road	Overall	13.0	B	12.5	B
	Eastbound	13.1	B	13.7	B
	Westbound	12.3	B	9.2	A
	Northbound	9.5	A	8.9	A
	Southbound	13.2	B	11.9	B
29. University Road & South Palmer Road	Westbound	7.2	A	7.1	A
	Northbound	7.5	A	7.1	A

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no overall LOS identified.

Figure 62A: 2018 AM Peak Hour Build Alternative 8 Internal Intersection LOS

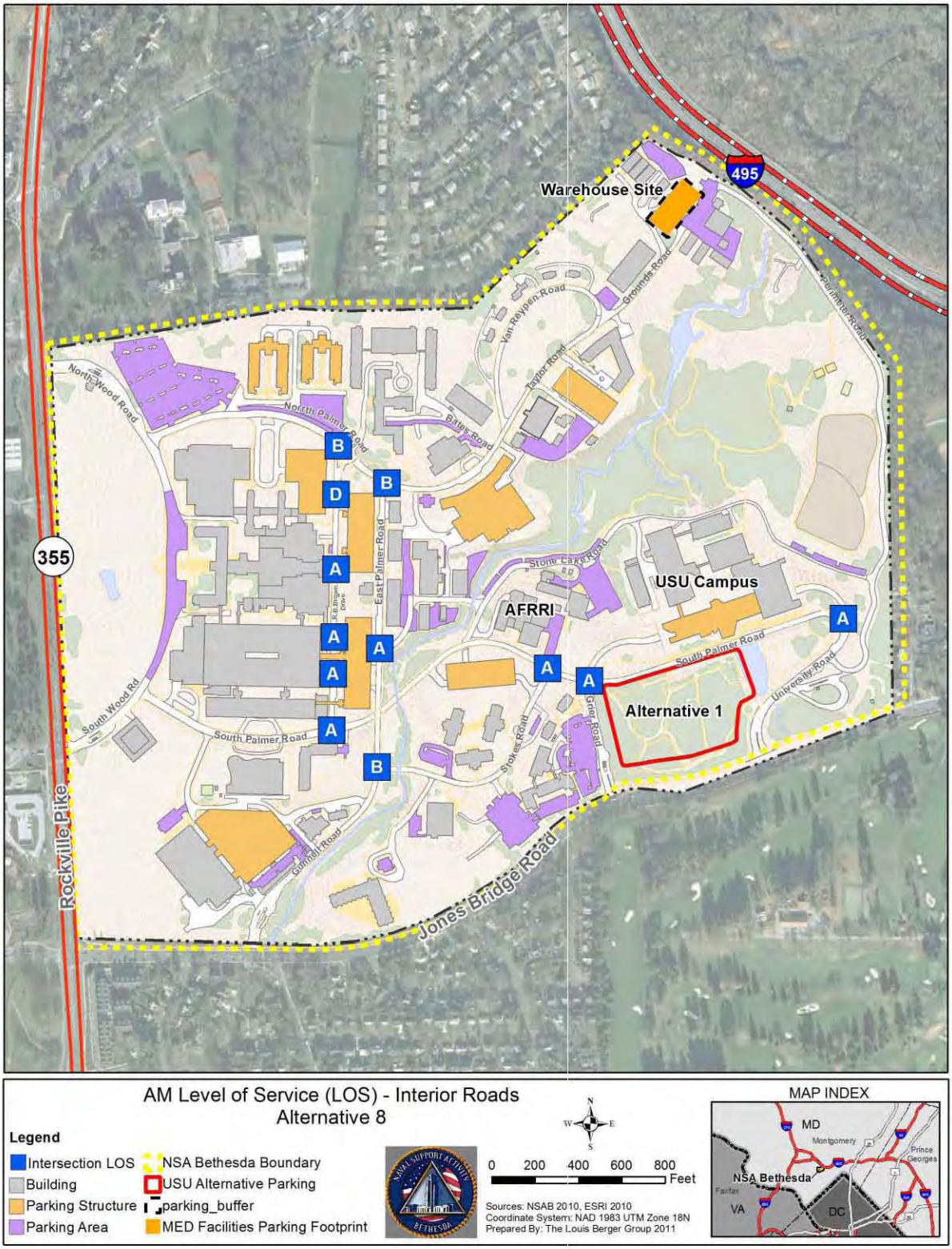
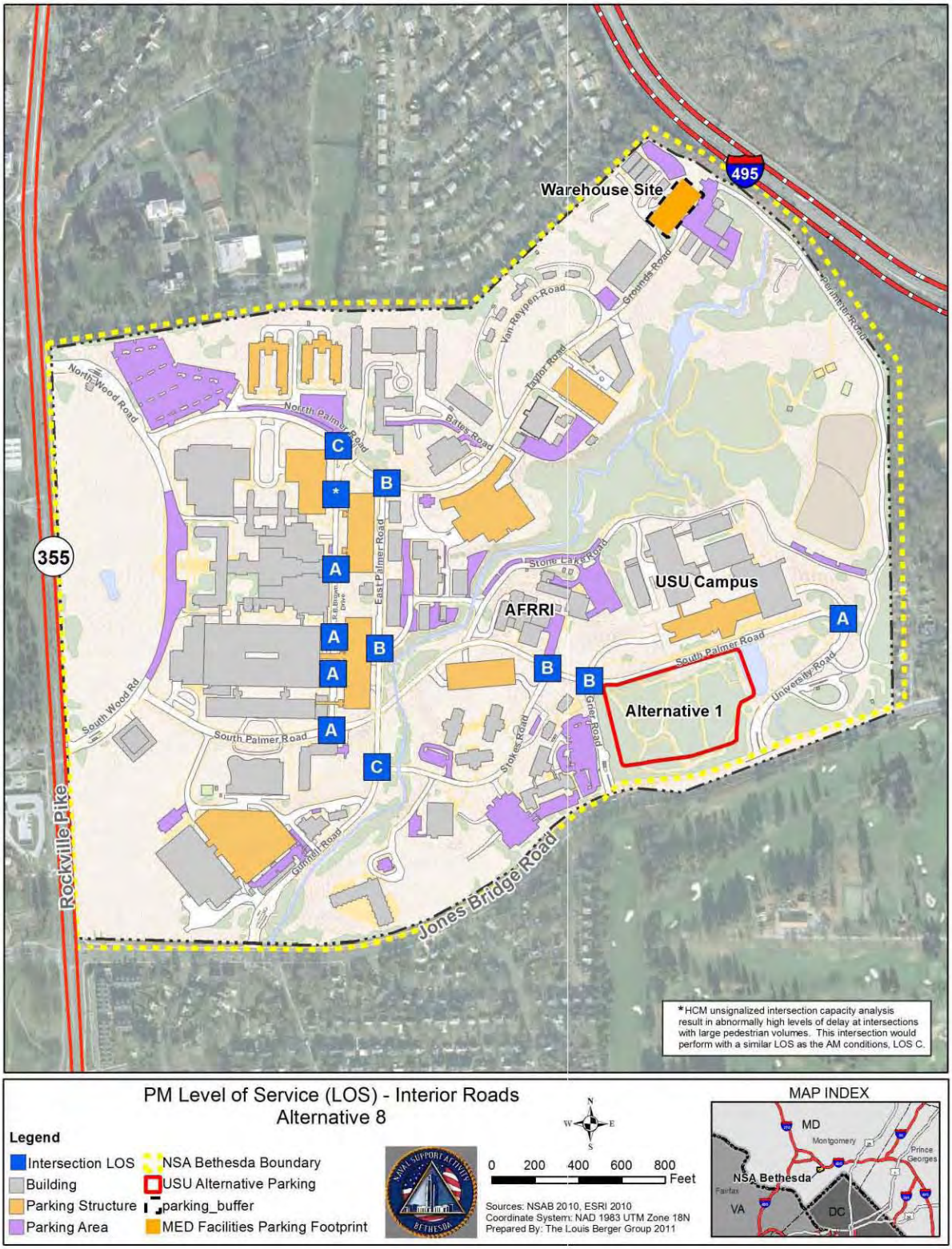


Figure 62B: 2018 PM Peak Hour Build Alternative 8 Internal Intersection LOS



3.2.11.6 Bicycle and Pedestrian Impacts

This alternative would include the placement of two new parking structures, resulting in increased pedestrian activity between the parking structures and destination buildings. The new parking structure serving Building C would be located off of Grounds Road in the warehouse/industrial area of NSA Bethesda. Therefore, new pedestrian trips would be created between the parking structure and Medical Buildings. Specifically, there would be 285 pedestrian trips during the AM peak hour and 297 pedestrian trips during the PM peak hour.

The new USU Alternative 1 parking structure would be placed across the street from the USU Campus; therefore, the new pedestrian activity would cross three intersections, South Palmer Road at Grier Road, South Palmer Road at Stokes Road, and South Palmer Road at Brown Drive. For the Medical Development, this would result in 22 new pedestrian trips during the AM peak hour and 24 new pedestrian trips during the PM peak hour, which includes the shifted Z-Lot trips. For the USU Expansion, this would result in 152 new pedestrian trips during the AM peak hour and 184 new pedestrian trips during the PM peak hour.

The Medical Building pedestrian trips are included in the internal HCM analysis in Tables 73A and 73B. The USU pedestrian trips are not included as the location of the optimum pedestrian crossing has not been identified. However, the USU trips were temporarily added to the South Palmer Road at Stokes Road intersection, with the intersection continuing to perform at the same overall LOS in both peak periods as calculated in Tables 73A and 73B.

Existing 5-foot plus sidewalks connect both new parking structures with the Medical Buildings via South Palmer Road or Grounds Road/ Taylor Road/North Palmer Road. Based on the 270 new employees included in the trip generation and adequate existing sidewalks serving these pedestrian trips, this alternative would have no significant pedestrian or bicycle impacts. Figure 45 shows the sidewalk connections for this Build Alternative.

3.2.12 ***Build Alternative 9***

This alternative would include the construction of a new 500-space parking structure replacing H-Lot to serve Building C and the construction of a 400-space parking structure known as USU Alternative 1. The 500-space parking structure would be located in the existing H-Lot next to the Navy Lodge, with the entrance and exit ramps connecting to Stokes Road.

The new USU Alternative 1 parking structure would be located across from the USU campus, south of South Palmer Road, with the entrance and exit ramps connecting to South Palmer Road.

3.2.12.1 Trip Generation

The trips generated for this alternative would be the same as Alterative 1, see Section 3.2.4.1

3.2.12.2 Trip Distribution

The trip distribution for this alternative would follow the same assumptions discussed in Alternative 4, with the exception that the N-Lot spaces would not impact this alternative. The shifted trips from Buildings 54 and 55 would distribute between the two new parking facilities the same as Build Alternative 4 (Table 46), with 22 percent of trips shifted to the new USU Alternative 1 parking structure and 78 percent of trips shifted to the new parking structure located in H-Lot.

The Build Alternative 9 trip distribution would consist of combining the shift in staff from Buildings 54 and 55 to both new parking structures, and the trips generated from the 236 new employee trips, destined for the new USU Alternative 1 parking structure. It is also assumed that the 110-space H-Lot would be relocated into the new 500-space parking structure, resulting in no trips added or removed.

The internal installation generated or shifted trips follow the updated trip distribution pattern based upon the 2008 NNMC Transportation Study (Figure 26).

The distribution patterns for the shifted staff trips from Buildings 54 and 55 would follow the following paths:

- From the north: Turn left onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Stokes Road.

- To the north: Turn left onto Stokes Road, turn left onto Gunnell Road, exit through Gate #3, turn right into Jones Bridge Road, turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Gunnell Road, enter through Gate #3, turn right onto Stokes Road.

- To the south: Turn left onto Stokes Road, turn left onto Gunnell Road, exit through Gate #3, turn right onto Jones Bridge Road, turn left onto Rockville Pike southbound.

- From the east (AM peak hour): Turn right onto Grier Road, enter through Gate #4, turn left onto South Palmer Road, turn left onto Stokes Road.

- From the east (PM peak hour): Turn right onto University Road, enter through Gate #5, turn left onto South Palmer Road, turn left onto Stokes Road.

- To the east (AM peak hour): Turn right onto Stokes Road, turn right onto South Palmer Road, turn right onto University Road, exit through Gate #5, and turn left onto Jones Bridge Road.

- To the east (PM peak hour): Turn right onto Stokes Road, turn right onto South Palmer Road, turn right onto Grier Road, exit through Gate #4, and turn left onto Jones Bridge Road.

The result of these new distribution patterns would remove trips from R.B. Brown Drive and South Palmer Road (west of Stokes Road), and North Palmer Road.

During the AM peak hour, the new staff trips would follow the following paths:

- From the north: Turn left onto South Wood Road, enter through Gate #2, and turn right onto South Palmer Road.

- To the north: Turn left onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto Grier Road, enter through Gate #4, and turn right onto South Palmer Road.

- To the south: Turn right onto South Palmer Road, turn right onto University Road, exit through Gate #5, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto Grier Road, enter through Gate #4, and turn right onto South Palmer Road.

- To the east: Turn right onto South Palmer Road, turn right onto University Road, exit though Gate #5, and turn left onto Jones Bridge Road.

During the PM peak hour, the new staff trips would follow the following paths:

- From the north: Turn left onto South Wood Road, enter through Gate #2, and turn right onto South Palmer Road.

- To the north: Turn left onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.

- From the south: Turn right onto Jones Bridge Road, turn left onto University Road, enter through Gate #5, and turn left onto South Palmer Road.

- To the south: Turn left onto South Palmer Road, turn left onto Grier Road, exit through Gate #4, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.

- From the east: Turn right onto University Road, enter through Gate #5, and turn left onto South Palmer Road.

- To the east: Turn left onto South Palmer Road, turn left onto Grier Road, exit though Gate #4, and turn left onto Jones Bridge Road.

Figures 63A, 63B, and 63C show the 2018 Build Alternative 9 trip distribution.

Figure 63A: 2018 Alternative 9 Trip Distribution

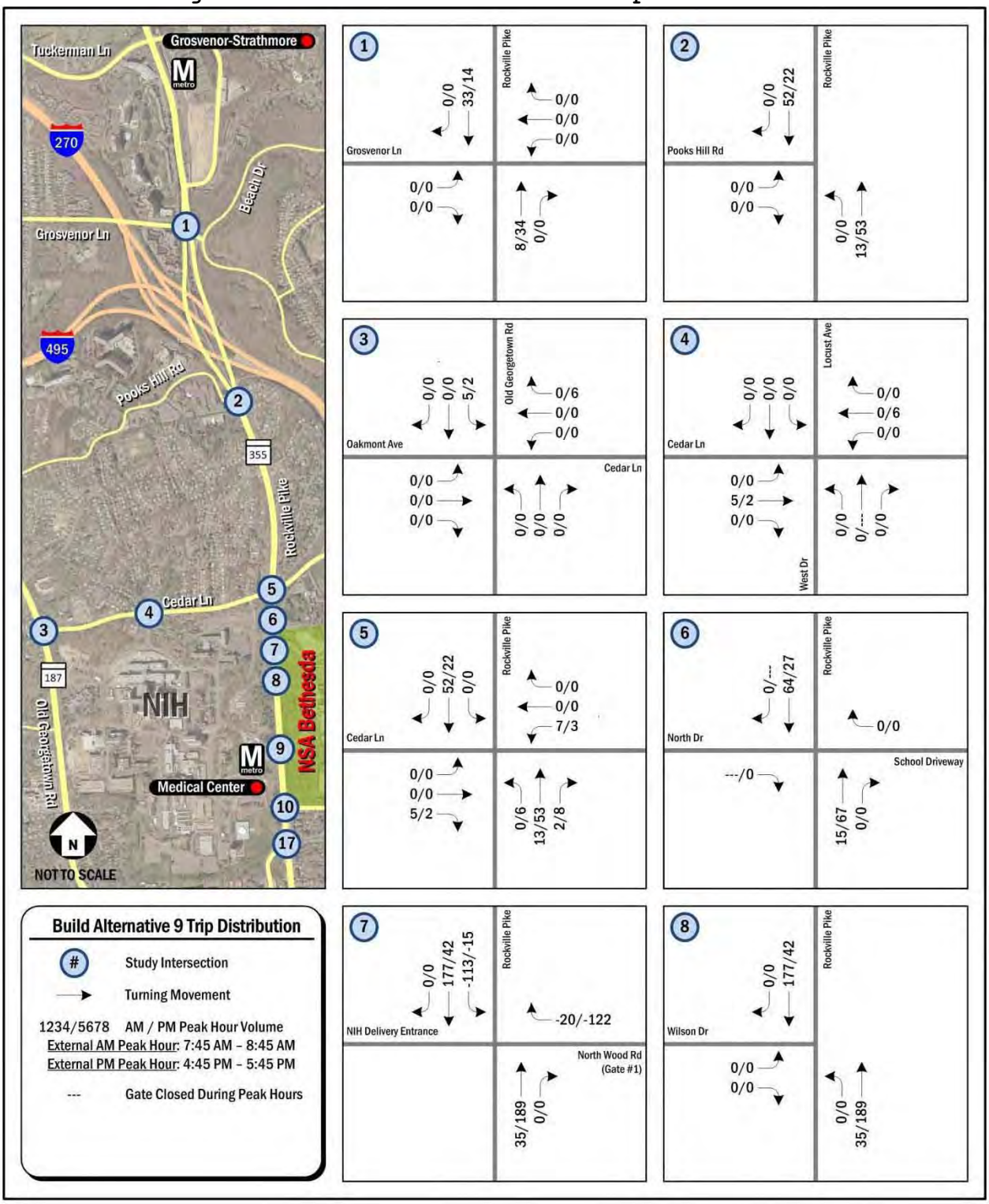


Figure 63B: 2018 Alternative 9 Trip Distribution

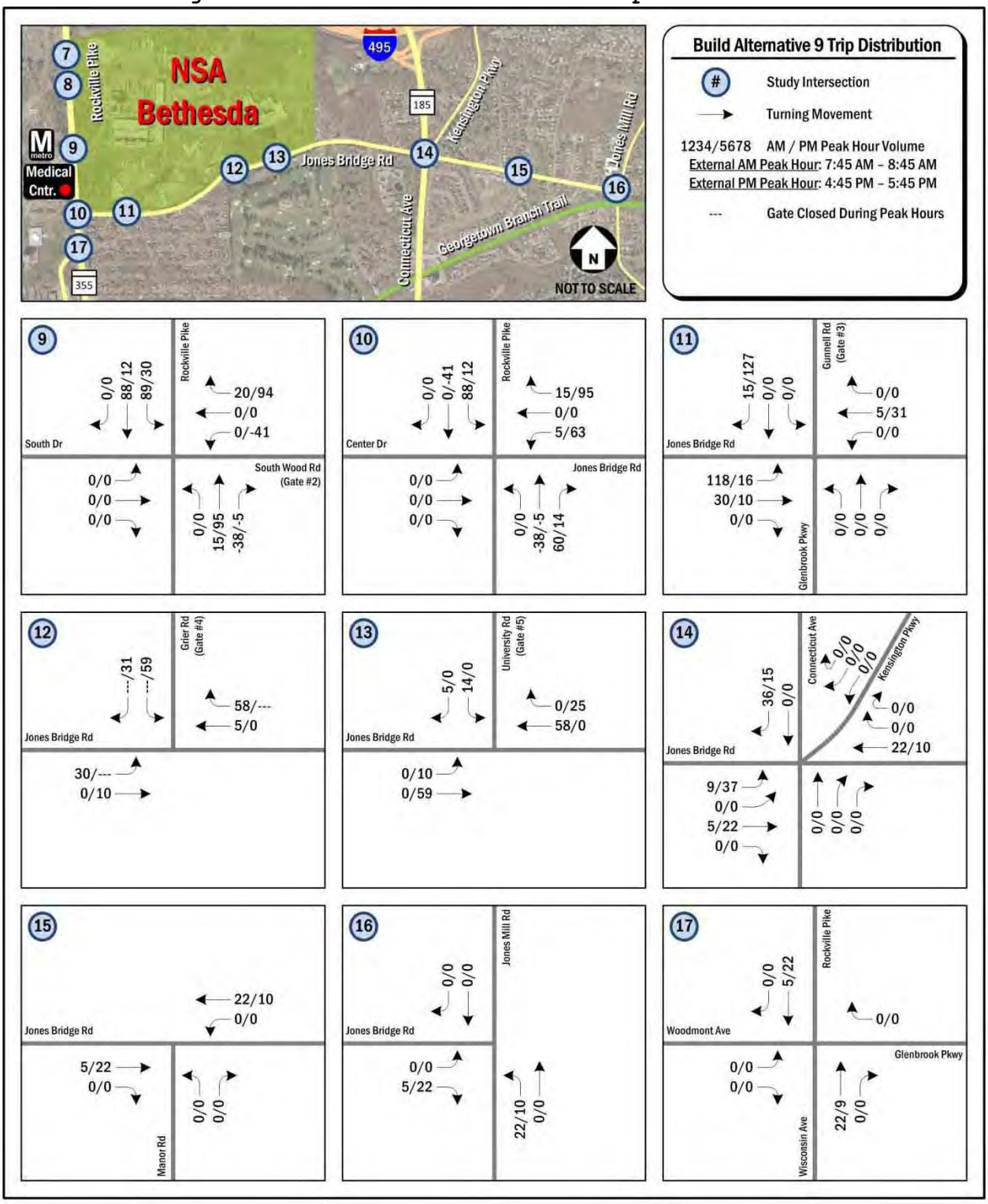
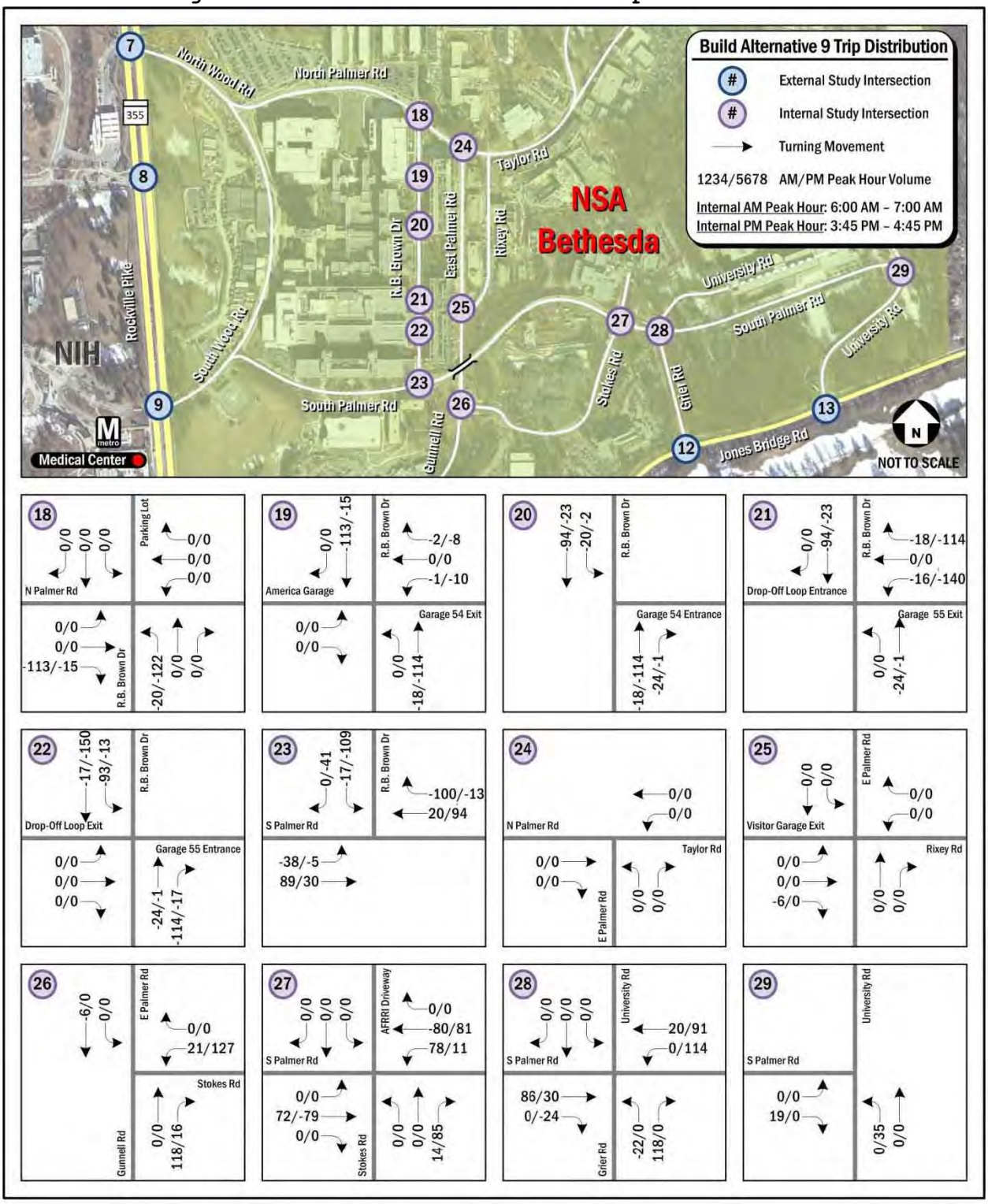


Figure 63C: 2018 Alternative 9 Trip Distribution



3.2.12.3 External Intersection Analysis

The 2018 Build Alternative 9 includes all projects listed in the No Build condition. The addition of a new exit ramp from the New USU

parking facility in N-Lot would add more trips to the existing ramp connecting to South Palmer Road at Grier Road intersection. Figure 29C shows the 2018 Build Alternatives 2 through 5 and 7 through 10 internal lane utilization and traffic control.

Critical Lane Volume Analysis

The CLV analysis was conducted for the 16 external signalized intersections to compare to the No Build condition. According to the analysis, intersection #8 Rockville Pike at Wilson Drive would change from a LOS A to B and #9 Rockville Pike at South Wood Road (Gate #2) would change from a LOS of B to C during the AM peak hour. The #8 Rockville Pike at Wilson Drive intersection would change from a LOS A to B and #12 Jones Bridge Road at Grier Road (Gate #4) would change from a LOS B to C during the PM peak hour. Based upon these results, the external signalized intersections would have no significant traffic impacts from implementing Alternative 9. Table 74 shows the 2018 Build Alternative 9 CLV external analysis. Figures 64A and 64B show the 2018 Build Alternative 9 CLV intersection LOS.

Table 74: 2018 Build Alternative 9 CLV External Analysis

		Build Alternative 9				No Build Condition			
		AM Peak Hr.		*PM Peak Hr.*		*AM Peak Hr.*		*PM Peak Hr.*	
		CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS
1.	**Rockville Pike & Grosvenor Lane**	1,384	D	1,341	D	1,373	D	1,336	D
2.	**Rockville Pike & Pooks Hill Road**	1,359	D	1,399	D	1,343	D	1,379	D
3.	**Old Georgetown Road & Oakmont Avenue/Cedar Lane**	1,437	D	1,538	E	1,437	D	1,536	E
4.	**Locust Avenue/West Drive & Cedar Lane**	465	A	941	A	489	A	939	A
5.	**Rockville Pike & Cedar Lane**	1,554	E	1,242	C	1,529	E	1,236	C
6.	**Rockville Pike & North Drive/School Driveway**	*un-signalized*		*un-signalized*		*un-signalized*		*un-signalized*	
7.	**Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)**	743	A	1,058	B	843	A	1,033	B
8.	**Rockville Pike & Wilson Drive**	1,001	B	1,014	B	958	A	948	A
9.	**Rockville Pike & South Drive/South Wood Road (Gate #2)**	1,235	C	1,137	B	1,121	B	1,039	B
10.	**Rockville Pike & Center Drive/Jones Bridge Road**	704	A	840	A	715	A	808	A
11.	**Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road**	921	A	1,064	B	801	A	1,024	B
12.	**Grier Road (Gate #4) & Jones Bridge Road**	725	A	1,169	C	692	A	1,104	B
13.	**University Road (Gate #5) & Jones Bridge Road**	780	A	1,060	B	729	A	1,023	B
14.	**Connecticut Avenue & Jones Bridge Road & Kensington Parkway**	1,507	E	1,755	F	1,490	E	1,735	F
15.	**Manor Road & Jones Bridge Road**	761	A	1,031	B	739	A	1,009	B
16.	**Jones Bridge Road & Jones Mill Road**	1,061	B	1,084	B	1,039	B	1,062	B
17.	**Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway**	773	A	942	A	771	A	938	A

Figure 64A: 2018 AM Peak Hour Build Alternative 9 CLV Intersection LOS

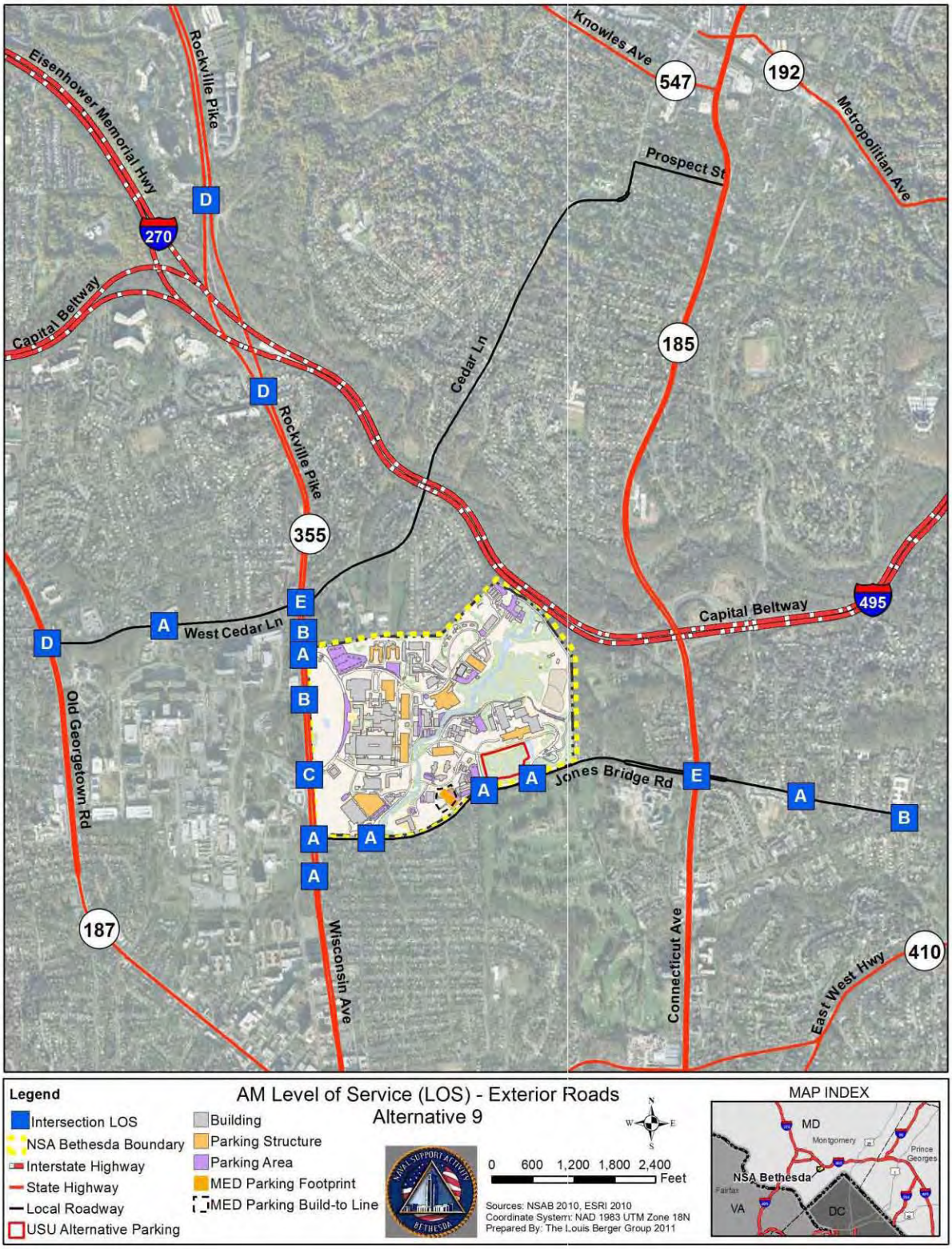
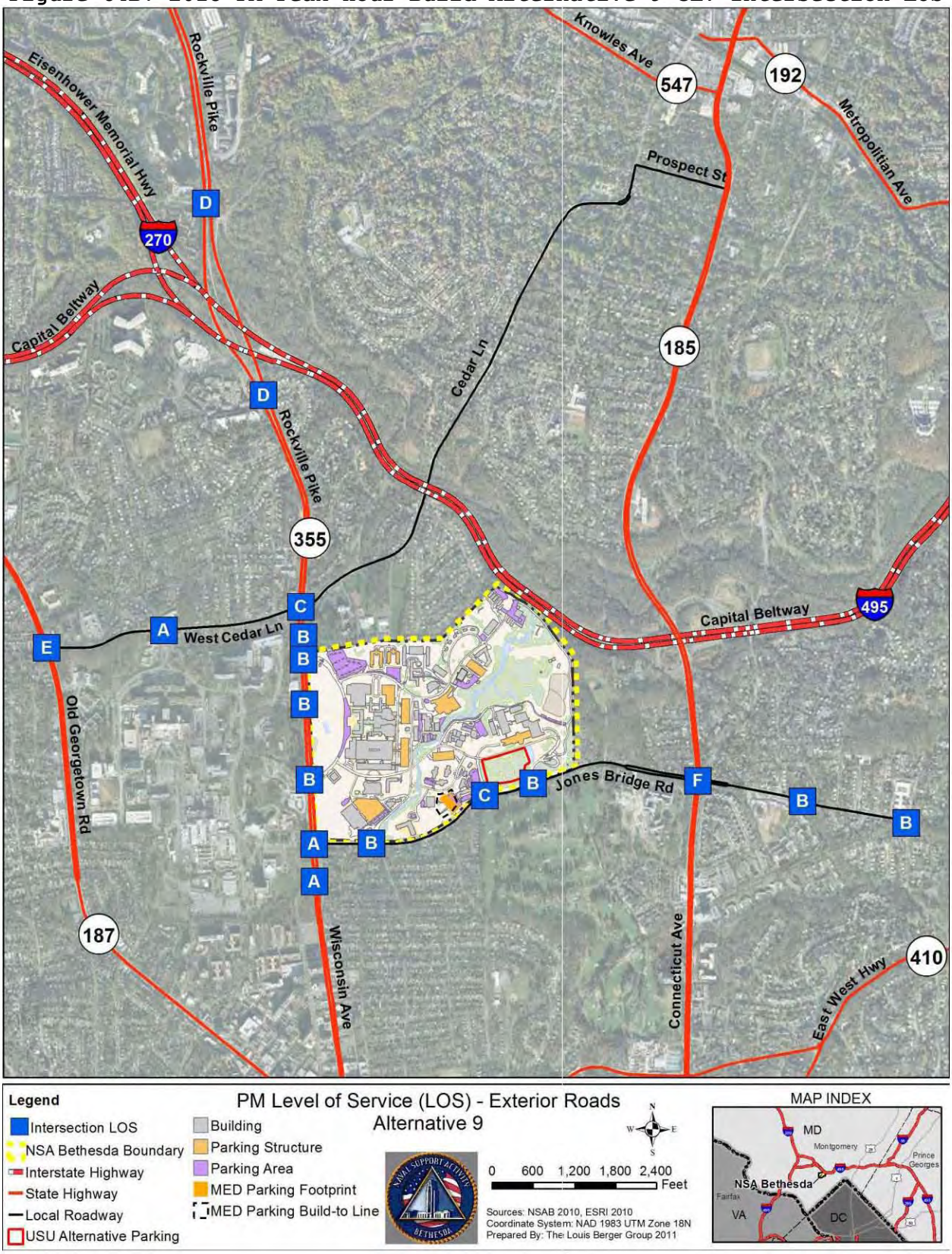


Figure 64B: 2018 PM Peak Hour Build Alternative 9 CLV Intersection LOS



Highway Capacity Manual Intersection Analysis

The HCM analysis was conducted as a secondary comparison to the CLV analysis between the No Build condition and Build Alternatives for the external intersections. When comparing Build Alternative 9 with the No Build condition, the #17 Wisconsin Avenue at Woodmont Avenue intersection would change from a LOS of B to C during the AM peak hour. This is due to the traffic analysis software calculating the LOS based upon the increase of traffic flows at the #10 Rockville Pike at Jones Bridge Road intersection, thus adding less than 1 second of delay to intersection #17. In addition, the No Build condition LOS calculated for intersection #17 would be on the LOS B/C line; therefore, the fraction of a second in added delay above the No Build condition would assign a LOS of C.

For the PM peak hour, LOS changes would occur at the following intersections: #2 Rockville Pike at Pooks Hill Road (C to D), #9 Rockville Pike at South Wood Road (Gate #2) (B to C), and #15 Jones Bridge Road at Manor Road (B to C). Since the CLV process was not used to evaluate unsignalized intersections, HCM analysis was used to provide a No Build condition comparison for intersection #6 Rockville Pike at North Drive/School Driveway, which showed no significant impacts. Tables 75A and 75B show the 2018 Build Alternative 9 HCM analysis for the external intersections compared to the No Build condition.

Table 75A: 2018 AM Peak Hour Build Alternative 9 HCM External Analysis

	HCM Analysis	AM Peak Hour					
		Alternative 9			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	45.0	1.03	D	45.6	1.02	D
	Eastbound	69.8		E	69.8		E
	Westbound	70.4		E	70.3		E
	Northbound	20.7		C	15.4		B
	Southbound	46.6		D	43.2		D
2. Rockville Pike & Pooks Hill Road	Overall	223.2	1.64	F	219.9	1.63	F
	Eastbound	83.4		F	83.4		F
	Northbound	341.6		F	335.9		F
	Southbound	22.0		C	21.3		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.5	0.89	B
	Eastbound	23.9		C	23.9		C
	Westbound	37.4		D	37.4		D
	Northbound	14.1		B	14.1		B
	Southbound	18.5		B	18.5		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.3	0.40	B	15.2	0.39	B
	Eastbound	19.8		B	19.6		B
	Westbound	11.8		B	11.8		B
	Northbound	14.7		B	14.7		B
	Southbound	15.1		B	15.1		B
5. Rockville Pike & Cedar Lane	Overall	43.9	1.00	D	41.8	0.98	D
	Eastbound	86.5		F	82.1		F
	Westbound	62.7		E	61.1		E
	Northbound	13.9		B	14.4		B
	Southbound	42.4		D	39.3		D
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.8		B	11.7		B
	Westbound	9.8		A	9.8		A
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	7.8	0.65	A	7.8	0.62	A
	Westbound	20.8		C	21.2		C
	Northbound	21.6		C	18.3		B
	Southbound	2.0		A	3.2		A
8. Rockville Pike & Wilson Drive	Overall	2.2	0.61	A	2.1	0.59	A
	Eastbound	60.9		E	60.9		E
	Northbound	1.9		A	1.9		A
	Southbound	0.9		A	0.8		A
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	14.5	0.79	B	12.7	0.76	B
	Eastbound	68.4		E	63.5		E
	Westbound	52.8		D	52.1		D
	Northbound	17.2		B	13.2		B
	Southbound	7.1		A	6.6		A
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	33.2	0.82	C	32.3	0.84	C
	Eastbound	54.3		D	54.3		D
	Westbound	98.1		F	97.3		F
	Northbound	21.7		C	18.0		B
	Southbound	6.4		A	6.9		A

Table 75A: 2018 AM Peak Hour Build Alternative 9 HCM External Analysis (continued)

	HCM Analysis	AM Peak Hour					
		Alternative 9			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	15.5	0.68	B	12.3	0.63	B
	Eastbound	4.4		A	3.3		A
	Westbound	20.2		C	14.7		B
	Northbound	22.0		C	22.0		C
	Southbound	24.3		C	24.5		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	5.0	0.53	A	3.8	0.51	A
	Eastbound	2.7		A	2.1		A
	Westbound	6.2		A	4.7		A
	Southbound	0.0		A	0.0		A
13. University Road (Gate #5) & Jones Bridge Road	Overall	8.2	0.57	A	6.4	0.51	A
	Eastbound	5.2		A	4.5		A
	Westbound	8.7		A	7.1		A
	Southbound	24.0		C	24.6		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	52.1	1.04	D	49.4	1.01	D
	Eastbound	59.4		E	55.7		E
	Westbound	44.7		D	42.2		D
	Northbound	24.0		C	24.0		C
	Southbound	63.1		E	58.9		E
	Southwestbound	82.6		F	82.6		F
15. Manor Road & Jones Bridge Road	Overall	15.6	0.57	B	15.1	0.56	B
	Eastbound	18.1		B	18.0		B
	Westbound	16.1		B	15.3		B
	Northbound	10.8		B	10.8		B
16. Jones Bridge Road & Jones Mill Road	Overall	45.4	0.77	D	42.3	0.76	D
	Eastbound	30.5		C	30.2		C
	Northbound	53.8		D	46.8		D
	Southbound	46.5		D	46.5		D
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	20.8	0.71	C	19.5	0.71	B
	Eastbound	48.7		D	48.7		D
	Westbound	41.2		D	41.2		D
	Northbound	5.5		A	5.4		A
	Southbound	3.9		C	3.3		C

Note: Intersections with only two-way stops have no overall LOS identified.

Table 75B: 2018 PM Peak Hour Build Alternative 9 HCM External Analysis

	HCM Analysis	PM Peak Hour					
		Alternative 9			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density (Veh/ hr)	LOS
1. Rockville Pike & Grosvenor Lane	Overall	60.1	1.01	E	58.9	1.01	E
	Eastbound	48.4		D	48.4		D
	Westbound	88.7		F	88.7		F
	Northbound	30.9		C	30.3		C
	Southbound	72.2		E	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	35.8	1.01	D	33.1	0.99	C
	Eastbound	65.4		E	65.4		E
	Northbound	40.7		D	35.7		D
	Southbound	23.7		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.2	0.84	B	19.1	0.83	B
	Eastbound	31.9		C	31.9		C
	Westbound	37.2		D	37.3		D
	Northbound	20.2		C	20.2		C
	Southbound	13.3		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	30.4	0.73	C	30.2	0.73	C
	Eastbound	39.9		D	39.5		D
	Westbound	7.5		A	7.5		A
	Northbound	24.8		C	24.8		C
	Southbound	26.7		C	26.7		C
5. Rockville Pike & Cedar Lane	Overall	38.2	0.97	D	36.4	0.97	D
	Eastbound	57.4		E	57.4		E
	Westbound	65.5		E	63.5		E
	Northbound	30.4		C	26.5		C
	Southbound	31.9		C	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.1		B	11.0		B
	Westbound	11.1		B	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	7.6	0.75	A	8.6	0.70	A
	Westbound	36.7		D	39.9		D
	Northbound	10.1		B	9.9		A
	Southbound	0.8		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	12.3	0.66	B	12.3	0.63	B
	Eastbound	44.6		D	44.6		D
	Northbound	5.1		A	4.8		A
	Southbound	10.9		B	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	23.3	0.81	C	18.7	0.72	B
	Eastbound	67.9		E	52.8		D
	Westbound	33.2		C	35.8		D
	Northbound	17.8		B	13.5		B
	Southbound	20.5		C	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	59.5	0.95	E	59.9	0.94	E
	Eastbound	57.6		E	58.2		E
	Westbound	43.7		D	42.8		D
	Northbound	77.5		E	78.3		E
	Southbound	46.2		D	45.4		D

Table 75B: 2018 PM Peak Hour Build Alternative 9 HCM External Analysis (continued)

	HCM Analysis	PM Peak Hour					
		Alternative 9			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density (Veh/ hr)	LOS	Delay	Density (Veh/ hr)	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.6	0.75	B	14.0	0.75	B
	Eastbound	11.5		B	11.2		B
	Westbound	14.5		B	12.9		B
	Northbound	13.7		B	13.8		B
	Southbound	21.8		C	23.9		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	17.2	0.84	B	13.6	0.79	B
	Eastbound	13.5		B	12.1		B
	Westbound	5.4		A	5.2		A
	Southbound	43.9		D	32.7		C
13. University Road (Gate #5) & Jones Bridge Road	Overall	13.9	0.69	B	10.7	0.67	B
	Eastbound	15.4		B	11.2		B
	Westbound	9.3		A	9.3		A
	Southbound	20.1		C	21.0		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	70.7	1.10	E	68.7	1.10	E
	Eastbound	100.7		F	92.8		F
	Westbound	118.7		F	119.7		F
	Northbound	76.1		E	76.1		E
	Southbound	18.8		B	18.9		B
	Southwestbound	126.1		F	126.1		F
15. Manor Road & Jones Bridge Road	Overall	21.4	0.73	C	19.7	0.71	B
	Eastbound	32.0		C	28.9		C
	Westbound	4.1		A	3.7		A
	Northbound	21.9		C	21.9		C
16. Jones Bridge Road & Jones Mill Road	Overall	24.4	0.73	C	23.5	0.71	C
	Eastbound	12.9		B	13.0		B
	Northbound	41.2		D	38.5		D
	Southbound	20.0		C	20.0		C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	12.7	0.70	B	12.6	0.69	B
	Eastbound	12.8		B	12.8		B
	Westbound	9.2		A	9.2		A
	Northbound	18.3		B	18.1		B
	Southbound	7.9		A	7.8		A

Note: Intersections with only two-way stops have no overall LOS identified.

3.2.12.4 Arterial Analysis

An arterial analysis was performed for Rockville Pike, West Cedar Lane, and Jones Bridge Road, comparing the alternative to the No Build condition. The greatest change between the No Build condition and Build Alternative 9 was a 4 percent increase in volume along Jones Bridge Road westbound during the AM peak hour. Based upon this analysis, Alternative 9 would not require PAMR-RAM external intersection mitigation. Tables 76 and 77 show the 2018 Build Alternative 9 arterial analyses.

Table 76: 2018 AM Peak Hour Build Alternative 9 Arterial Analysis

		AM Peak Hour						
		Alt 9			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	11.1	11:48	E	11.5	11:25	E	3%
	Southbound	20.7	6:30	C	21.1	6:22	C	2%
Jones Bridge Road	Eastbound	20.5	5:1	C	20.7	4:59	C	1%
	Westbound	16.5	6:16	D	17.1	6:01	D	4%
West Cedar Lane	Eastbound	15.4	2:49	D	15.4	2:49	D	0%
	Westbound	16.9	2:34	D	16.9	2:34	D	0%

Table 77: 2018 PM Peak Hour Build Alternative 9 Arterial Analysis

		PM Peak Hour						
		Alt 9			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	15.5	8:25	D	16.0	8:11	D	3%
	Southbound	17.4	7:42	D	17.7	7:36	D	2%
Jones Bridge Road	Eastbound	16.6	6:12	D	17.1	6:02	D	3%
	Westbound	16.5	6:14	D	16.7	6:12	D	1%
West Cedar Lane	Eastbound	12.8	3:24	E	12.8	3:23	E	0%
	Westbound	17.4	2:30	D	17.4	2:30	D	0%

3.2.12.5 Internal Intersection Analysis

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal intersections. For this alternative, there were no significant changes in LOS during the AM peak hour. During the PM peak hour intersection #26 East Palmer Road at Stokes Road would change from a LOS of B to D, reflecting the increase in traffic to and from the new parking structure in H-Lot en route to Gate #3, and #28 South Palmer Road at Grier Road intersection would change from a LOS B to C, reflecting the new trips exiting the new USU Alternative 1 parking structure. Based on this analysis, there would be no significant impact to the internal roadway intersections for this alternative, as there would be no failing LOS. Tables 78A and 78B show the 2018 Build Alternative 9 internal intersection analysis compared to the No Build condition and Figures 65A and 65B show the 2018 Build Alternative 9 internal intersection LOS.

Table 78A: 2018 Build Alternative 9 Internal HCM Intersection Analysis

		AM Peak Hour			
		Build Alt. 9		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	9.6	A	10.3	B
	Eastbound	10.2	B	10.9	B
	Westbound	8.4	A	8.7	A
	Northbound	8.4	A	9.0	A
	Southbound	9.4	A	9.6	A
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	14.7	B	17.6	C
	Westbound	11.6	B	12.8	B
	Northbound Left	3.4	A	3.1	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.9	A	10.5	B
	Northbound	8.4	A	9.2	A
	Southbound	9.4	A	11.5	B
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	8.3	A	9.1	A
	Westbound	7.4	A	8.1	A
	Northbound	8.6	A	9.4	A
	Southbound	7.7	A	8.8	A
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	8.2	A	9.7	A
	Eastbound	7.5	A	8.1	A
	Northbound	8.5	A	10.1	B
	Southbound	7.7	A	9.0	A
23. R.B. Brown Drive & South Palmer Road	Overall	9.7	A	9.8	A
	Eastbound	10.2	B	10.3	B
	Westbound	8.2	A	8.7	A
	Southbound	8.6	A	9.1	A
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	9.6	A	9.6	A
	Eastbound	10.0	A	10.0	A
	Westbound	8.6	A	8.6	A
	Northbound	9.5	A	9.5	A
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	9.0	A	9.0	A
	Eastbound	0.0	A	7.5	A
	Westbound	8.1	A	8.1	A
	Northbound	9.3	A	9.4	A
	Southbound	8.7	A	8.7	A
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	11.2	B	9.5	A
	Westbound	9.3	A	8.6	A
	Northbound	12.3	B	10.1	B
	Southbound	9.2	A	8.9	A
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	10.1	B	9.5	A
	Eastbound	9.2	A	8.1	A
	Westbound	11.0	B	10.4	B
	Northbound	9.3	A	8.9	A
	Southbound	0.0	A	0.0	A
28. University Road/Grier Road & South Palmer Road	Overall	10.9	B	8.7	A
	Eastbound	11.3	B	8.4	A
	Westbound	10.6	B	9.1	A
	Northbound	11.0	B	9.0	A
	Southbound	7.7	A	6.9	A
29. University Road & South Palmer Road	Westbound	8.0	A	8.0	A
	Northbound	8.0	A	7.9	A

Table 78B: 2018 Build Alternative 9 Internal HCM Intersection Analysis

		PM Peak Hour			
		Build Alt. 9		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	12.1	B	16.5	C
	Eastbound	8.9	A	9.7	A
	Westbound	13.3	B	15.6	C
	Northbound	12.4	B	20.5	C
	Southbound	9.5	A	10.0	B
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	*	F	*	F
	Westbound	*	F	*	F
	Northbound Left	0.9	A	0.6	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.0	A	8.8	A
	Northbound	7.9	A	9.0	A
	Southbound	8.1	A	8.5	A
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	9.1	A	11.3	B
	Westbound	7.4	A	10.9	B
	Northbound	8.2	A	9.5	A
	Southbound	9.5	A	12.3	B
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	8.0	A	9.4	A
	Eastbound	7.3	A	7.8	A
	Northbound	7.9	A	8.3	A
	Southbound	8.1	A	10.0	B
23. R.B. Brown Drive & South Palmer Road	Overall	10.3	B	10.6	B
	Eastbound	8.3	A	8.9	A
	Westbound	11.7	B	10.7	B
	Southbound	9.0	A	11.4	B
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	10.7	B	10.7	B
	Eastbound	10.0	B	10.0	B
	Westbound	11.4	B	11.4	B
	Northbound	10.7	B	10.7	B
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	10.2	B	10.2	B
	Eastbound	8.4	A	8.4	A
	Westbound	9.8	A	9.8	A
	Northbound	9.7	A	9.7	A
	Southbound	11.0	B	11.0	B
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	29.0	D	15.0	B
	Westbound	41.2	E	16.0	C
	Northbound	14.3	B	11.5	B
	Southbound	21.7	C	16.2	C
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	14.0	B	10.7	B
	Eastbound	10.0	B	10.3	B
	Westbound	15.9	C	11.0	B
	Northbound	13.7	B	10.8	B
	Southbound	9.1	A	8.6	A
28. University Road/Grier Road & South Palmer Road	Overall	16.8	C	12.5	B
	Eastbound	19.0	C	13.7	B
	Westbound	16.0	C	9.2	A
	Northbound	10.4	B	8.9	A
	Southbound	15.6	C	11.9	B
29. University Road & South Palmer Road	Westbound	7.3	A	7.1	A
	Northbound	7.7	A	7.1	A

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no overall LOS identified.

Figure 65A: 2018 AM Peak Hour Build Alternative 9 Internal Intersection LOS

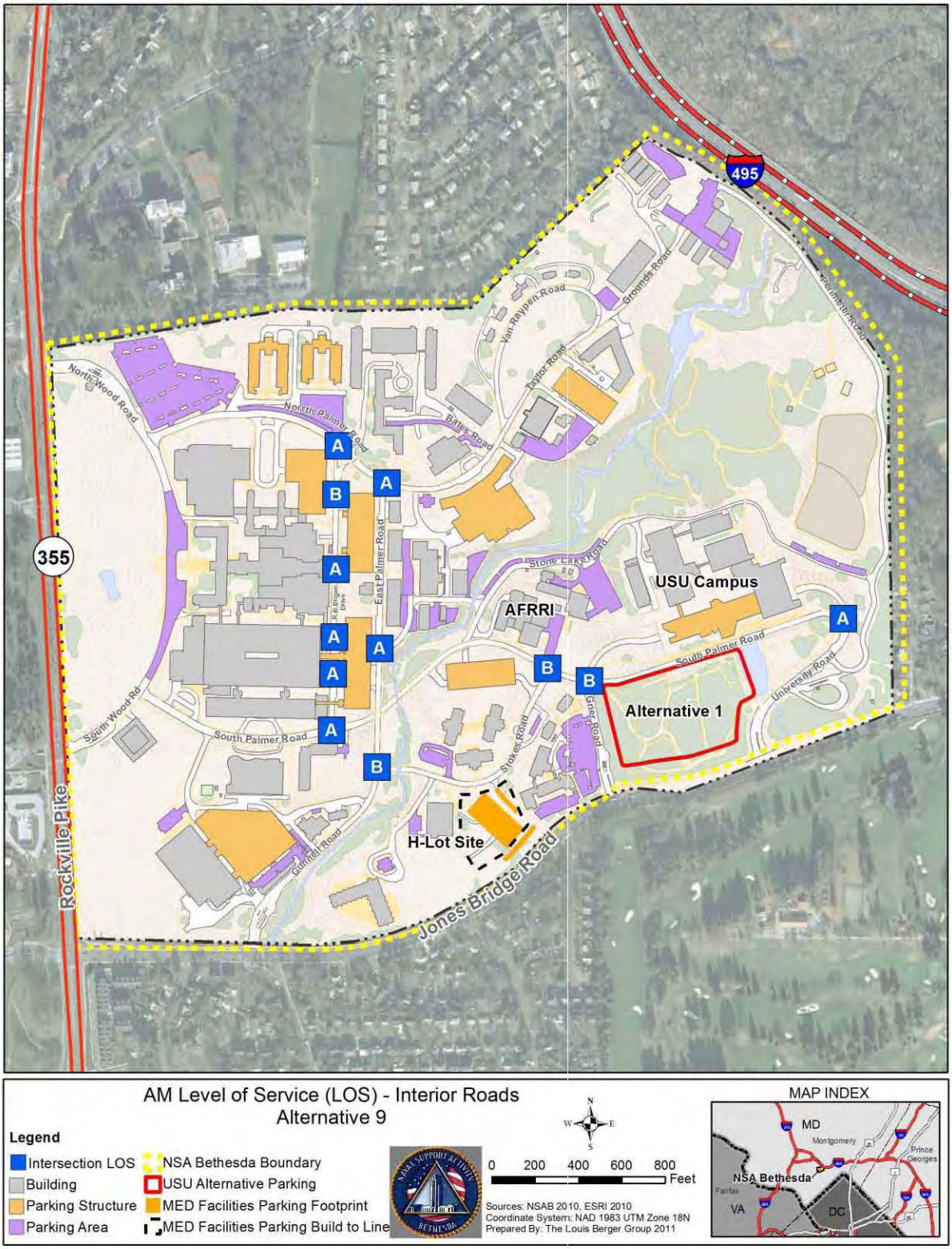
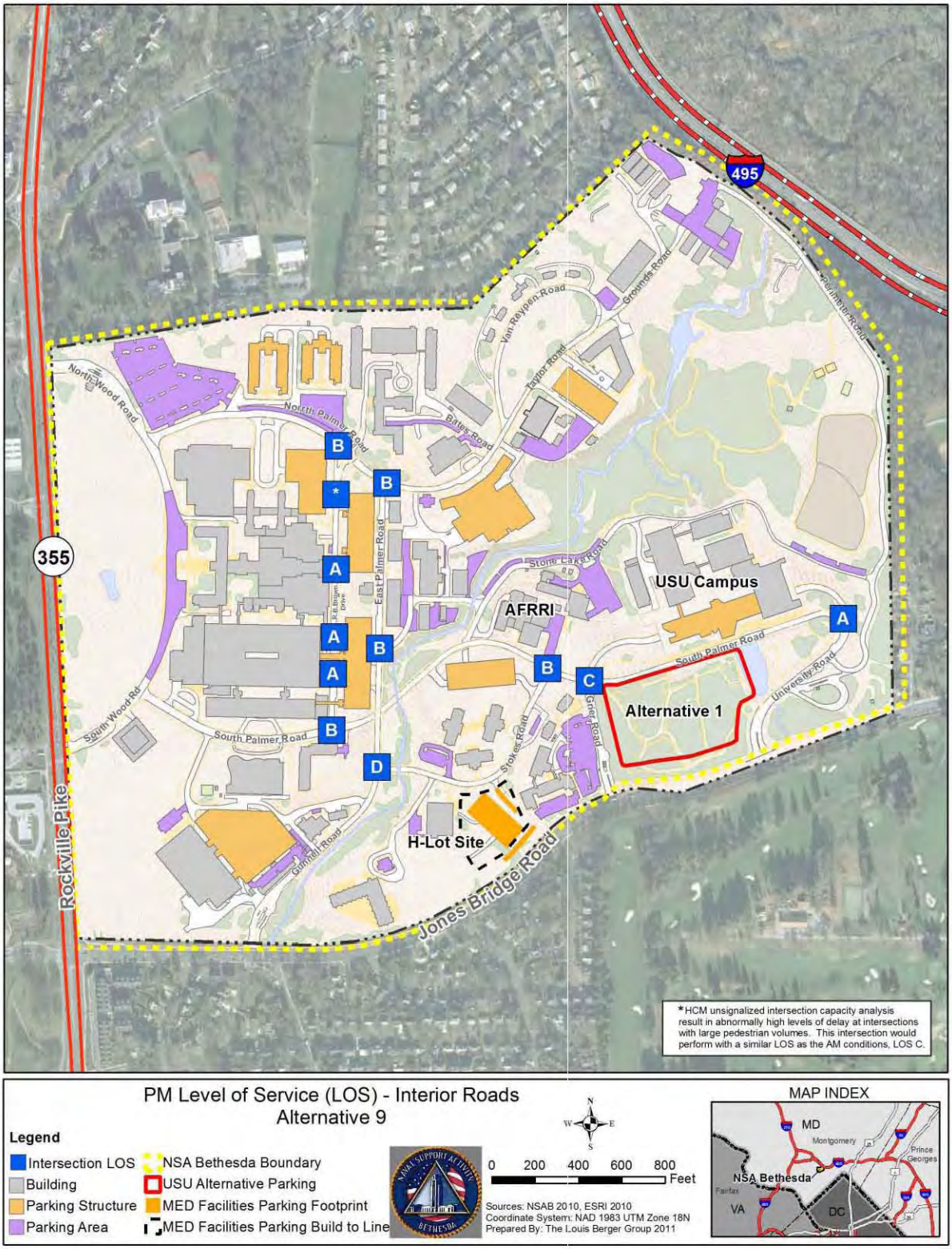


Figure 65B: 2018 PM Peak Hour Build Alternative 9 Internal Intersection LOS



3.2.12.6 Bicycle and Pedestrian Impacts

This alternative would include the development of two new parking structures, resulting in increased pedestrian activity between the parking structures and destination buildings. The new parking structure serving Building C would be located off of Stokes Road in the Navy Lodge area of NSA Bethesda; therefore, new pedestrian trips would be created between the parking structure and Medical Buildings. Specifically, there would be 230 pedestrian trips during the AM peak hour and 239 pedestrian trips during the PM peak hour.

The new USU Alternative 1 parking structure would be placed across the street from the USU Campus; therefore, the new pedestrian activity would cross three intersections, South Palmer Road at Grier Road, South Palmer Road at Stokes Road, and South Palmer Road at Brown Drive. For the Medical Development, this would result in 81 new pedestrian trips during the AM peak hour and 83 new pedestrian trips during the PM peak hour. For the USU Expansion, this would result in 161 new pedestrian trips during the AM peak hour and 193 new pedestrian trips during the PM peak hour.

The Medical Building pedestrian trips are included in the internal HCM analysis in Tables 78A and 78B. The USU pedestrian trips are not included as the location of the optimum pedestrian crossing has not been identified. However, the USU trips were temporarily added to the South Palmer Road at Stokes Road intersection, with the intersection continuing to perform at the same overall LOS in both peak periods as calculated in Tables 78A and 78B.

Existing 5-foot plus sidewalks connect both new parking structures with the Medical Buildings via South Palmer Road and Stokes Road. Any other new pedestrian or bicycle activity generated from the 34 employees not included in the original Alternative 9 trip generation would be able to use the new Metro tunnel connecting the Medical Center Metro station with the Gate #2 entrance or park their bicycle at any of the four bike storage racks serving the Medical Facility or two racks serving the USU. Based on the No Build condition including the existing bicycle racks and sidewalks, this alternative would have no pedestrian or bicycle impacts. Figure 49 shows the sidewalk connections for this Build Alternative.

3.2.13 ***Build Alternative 10***

This alternative would include the construction of a new 500-space parking structure in the Taylor Road Facilities to serve Building C and the construction of a 400-space parking structure known as USU Alternative 1. The 500-space parking structure would be located next to the planned Sanctuary Hall (WWTL) parking facility along Taylor Road, with the entrance and exit ramps connecting to Taylor Road.

The new USU Alternative 1 parking structure would be located across from the USU campus, south of South Palmer Road, with entrance and exit ramps connecting to South Palmer Road.

3.2.13.1 Trip Generation

The trips generated for this alternative would be the same as Alterative 1, see Section 3.2.4.1

3.2.13.2 Trip Distribution

The trip distribution for this alternative would be similar to Alternative 5 (see section 3.2.8.2), except the new trips would be destined to the new USU Alternative 1 parking structure south of the USU campus along South Palmer Road. No existing parking areas would be significantly impacted from this alternative, thus all shifted staff trips would be destined to the Taylor Road facilities.

The Build Alternative 10 trip distribution would consist of combining the shift in staff from Buildings 54 and 55 to the new Taylor Road facilities parking structure and the trips generated from the 270 new employee trips destined for the new USU Alternative 1 parking structure.

The internal installation generated or shifted trips follow the updates trip distribution pattern based upon the 2008 NNMC Transportation Study (Figure 26). The distribution patterns for the shifted staff trips from Buildings 54 and 55 would follow the following paths:

- From the north: Continue past R.B. Brown Drive on North Palmer Road then continue onto Taylor Road.
- To the north: Turn left into Taylor Road, then continue straight on North Palmer Road past R.B. Brown Drive.
- From the south: Turn right Enter through Gate #3, follow Gunnell Road to East Palmer Road, and turn right onto Taylor Road.
- To the south: Turn left onto Taylor Road, turn left onto East Palmer Road, follow to Gunnell Road and exit through Gate #3, and turn right onto Jones Bridge Road.
- From the east: Turn right onto University Road, enter through Gate #5, turn right onto Perimeter Road, and follow through to Grounds Road Taylor Road.
- To the east: Turn right onto Taylor Road/Grounds Road, follow onto Perimeter Road, turn left onto University Road, exit though Gate #5, and turn left onto Jones Bridge Road.

The result of these new distribution patterns would remove trips from R.B. Brown Drive and South Palmer Road.

During the AM peak hour, the new staff trips would follow the following paths:

- From the north: Turn left onto South Wood Road, enter through Gate #2, and turn right onto South Palmer Road.
- To the north: Turn left onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.
- From the south: Turn right onto Jones Bridge Road, turn left onto Grier Road, enter through Gate #4, and turn right onto South Palmer Road.
- To the south: Turn right onto South Palmer Road, turn right onto University Road, exit through Gate #5, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.
- From the east: Turn right onto Grier Road, enter through Gate #4, and turn right onto South Palmer Road.
- To the east: Turn right onto South Palmer Road, turn right onto University Road, exit though Gate #5, and turn left onto Jones Bridge Road.

During the PM peak hour, the new staff trips would follow the following paths:

- From the north: Turn left onto South Wood Road, enter through Gate #2, and turn right onto South Palmer Road.
- To the north: Turn left onto South Palmer Road, turn left onto South Wood Road, exit through Gate #2, and turn right onto Rockville Pike northbound.
- From the south: Turn right onto Jones Bridge Road, turn left onto University Road, enter through Gate #5, and turn left onto South Palmer Road.
- To the south: Turn left onto South Palmer Road, turn left onto Grier Road, exit through Gate #4, turn right onto Jones Bridge Road, and turn left onto Rockville Pike.
- From the east: Turn right onto University Road, enter through Gate #5, and turn left onto South Palmer Road.
- To the east: Turn left onto South Palmer Road, turn left onto Grier Road, exit though Gate #4, and turn left onto Jones Bridge Road.

Figures 66A, 66B, and 66C show the 2018 Build Alternative 10 trip distribution.

Figure 66A: 2018 Alternative 10 Trip Distribution

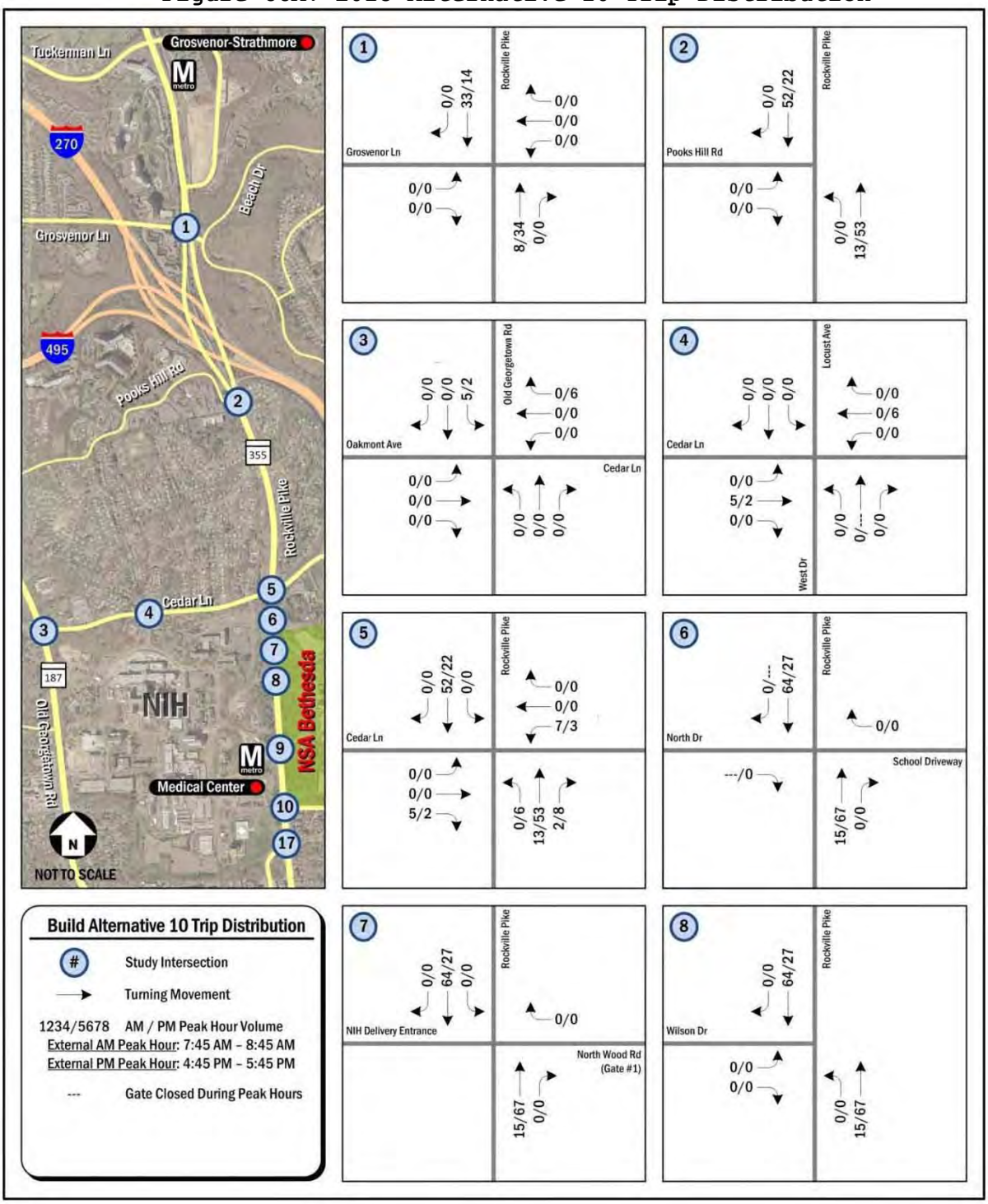


Figure 66B: 2018 Alternative 10 Trip Distribution

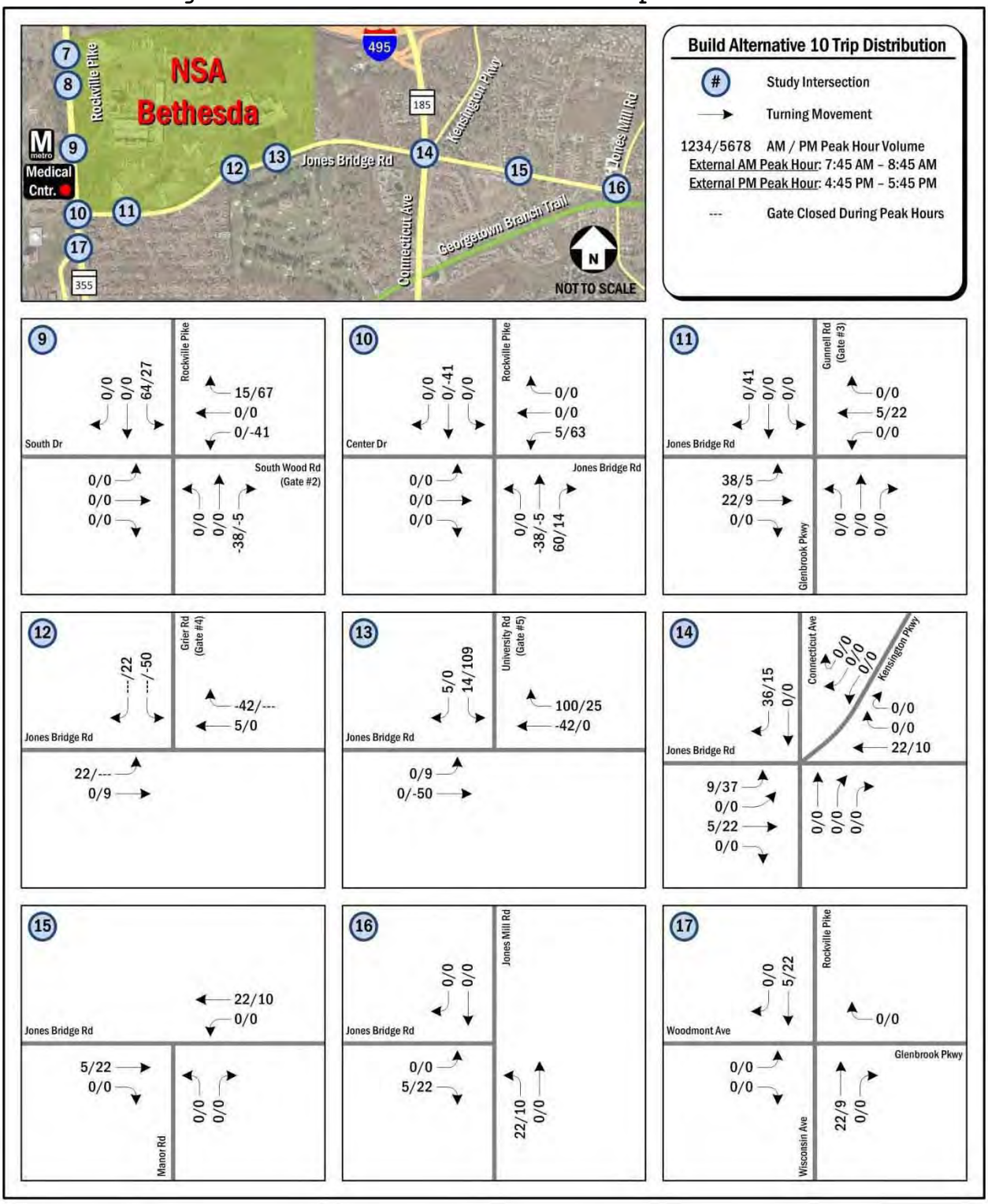
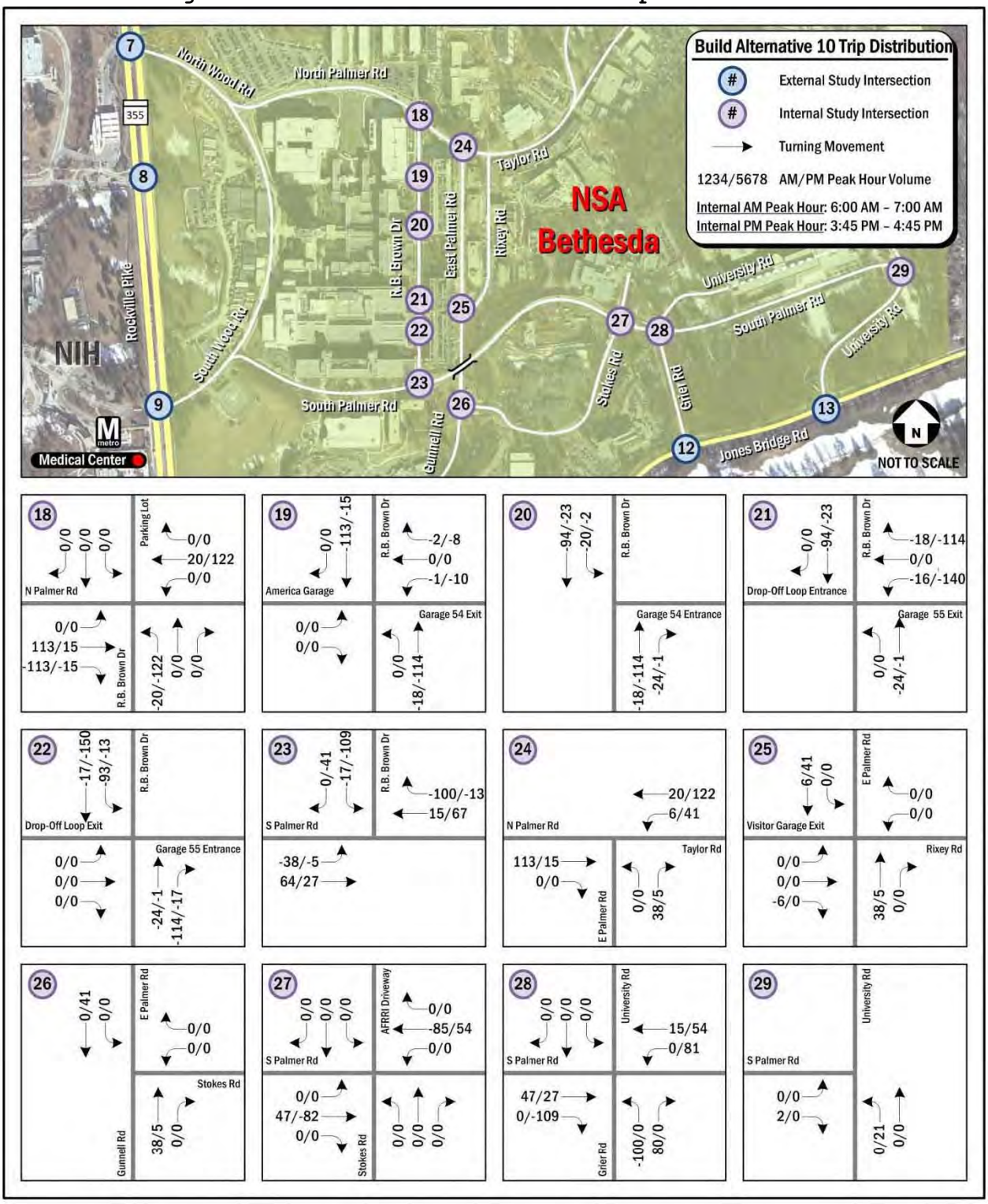


Figure 66C: 2018 Alternative 10 Trip Distribution



3.2.13.3 External Intersection Analysis

The 2018 Build Alternative 10 includes all projects listed in the No Build condition. Figure 29C shows the 2018 Build Alternatives 2 through 5 and 7 through 10 internal lane utilization and traffic control.

Critical Lane Volume Analysis

The CLV analysis was conducted for the 16 external signalized intersections to compare to the No Build condition. According to the analysis, the #9 Rockville Pike at South Wood Road (Gate #2) intersection would change from a LOS of B to C during the AM peak hour. Based upon these results, the external signalized intersections would have no significant traffic impacts from implementing Alternative 10. Table 79 shows the 2018 Build Alternative 10 CLV external analysis. Figures 67A and 67B show the 2018 Build Alternative 10 CLV intersection LOS.

Table 79: 2018 Build Alternative 10 CLV External Analysis

		Build Alternative 10				No Build Condition			
		AM Peak Hr.		*PM Peak Hr.*		*AM Peak Hr.*		*PM Peak Hr.*	
		CLV	LOS	CLV	LOS	CLV	LOS	CLV	LOS
1.	**Rockville Pike & Grosvenor Lane**	1,385	D	1,341	D	1,373	D	1,336	D
2.	**Rockville Pike & Pooks Hill Road**	1,359	D	1,399	D	1,343	D	1,379	D
3.	**Old Georgetown Road & Oakmont Avenue/Cedar Lane**	1,437	D	1,538	E	1,437	D	1,536	E
4.	**Locust Avenue/West Drive & Cedar Lane**	465	A	941	A	489	A	939	A
5.	**Rockville Pike & Cedar Lane**	1,554	E	1,242	C	1,529	E	1,236	C
6.	**Rockville Pike & North Drive/School Driveway**	*un-signalized*		*un-signalized*		*un-signalized*		*un-signalized*	
7.	**Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)**	848	A	1,058	B	843	A	1,033	B
8.	**Rockville Pike & Wilson Drive**	982	A	968	A	958	A	948	A
9.	**Rockville Pike & South Drive/South Wood Road (Gate #2)**	1,174	C	1,106	B	1,121	B	1,039	B
10.	**Rockville Pike & Center Drive/Jones Bridge Road**	704	A	840	A	715	A	808	A
11.	**Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road**	841	A	1,052	B	801	A	1,024	B
12.	**Grier Road (Gate #4) & Jones Bridge Road**	717	A	1,059	B	692	A	1,104	B
13.	**University Road (Gate #5) & Jones Bridge Road**	727	A	1,111	B	729	A	1,023	B
14.	**Connecticut Avenue & Jones Bridge Road & Kensington Parkway**	1,507	E	1,755	F	1,490	E	1,735	F
15.	**Manor Road & Jones Bridge Road**	761	A	1,031	B	739	A	1,009	B
16.	**Jones Bridge Road & Jones Mill Road**	1,061	B	1,084	B	1,039	B	1,062	B
17.	**Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway**	773	A	942	A	771	A	938	A

Highway Capacity Manual Intersection Analysis

The HCM analysis was conducted as a secondary comparison to the CLV analysis between the No Build condition and Build Alternatives for the external intersections. When comparing Build Alternative 10 with the No Build condition, the AM peak hour did not experience a change in LOS. Changes that would occur at intersections in the PM Peak hour would be: #2 Rockville Pike at Pooks Hill Road would change from a LOS of C to D, #9 Rockville Pike at South Wood Road would change from a LOS of B to C, and #15 Jones Bridge Road at Manor Road would change from a LOS of B to C. Since the CLV process was not used to evaluate unsignalized intersections, HCM analysis was used to provide a No Build condition comparison for the #6 Rockville Pike at North Drive/School Driveway intersection, which showed no significant impacts. Tables 80A and 80B show the 2018 Build Alternative 10 HCM analysis for the external intersections compared to the No Build condition.

Figure 67A:2018 AM Peak Hour Build Alternative 10 CLV Intersection LOS

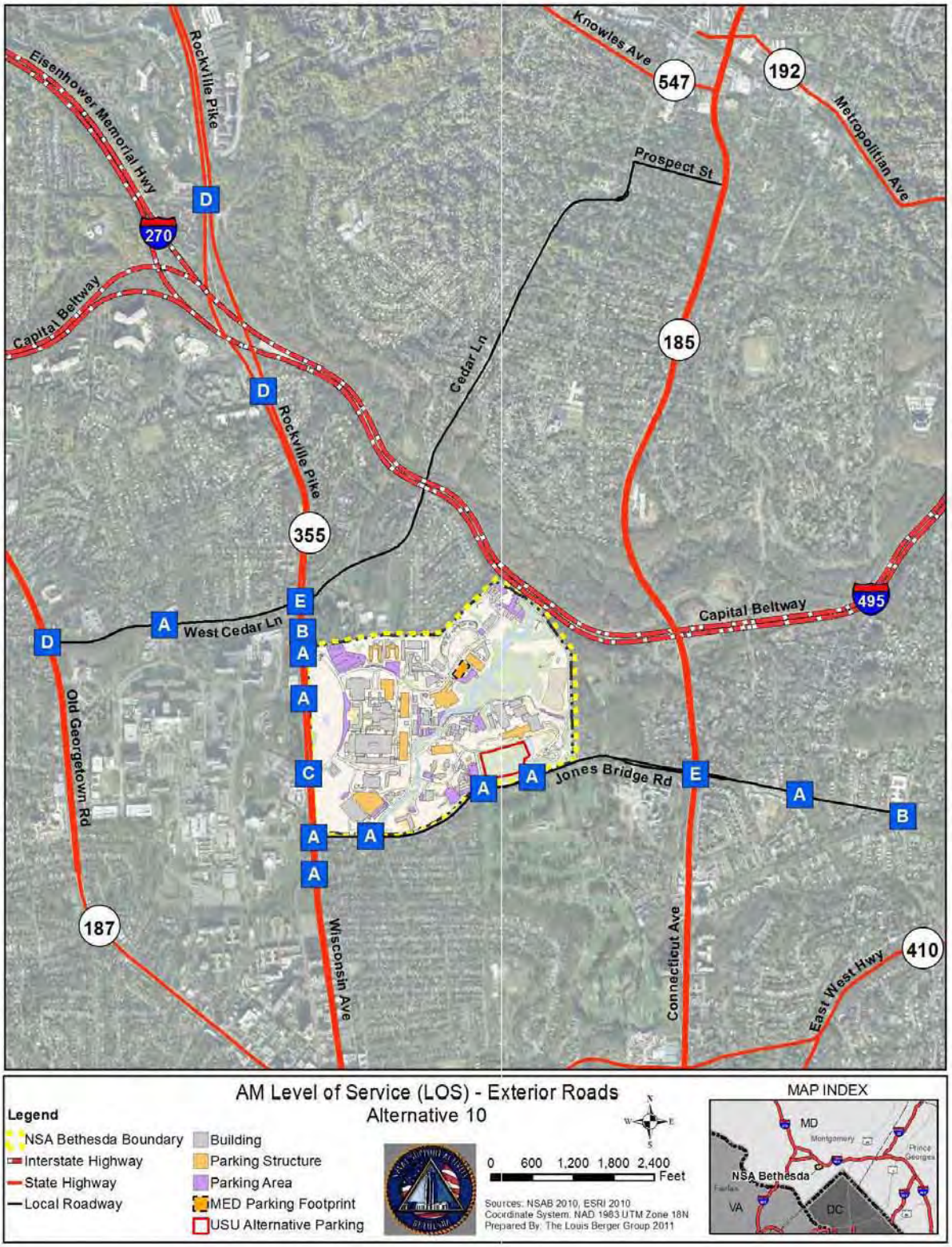


Figure 67B:2018 PM Peak Hour Build Alternative 10 CLV Intersection LOS

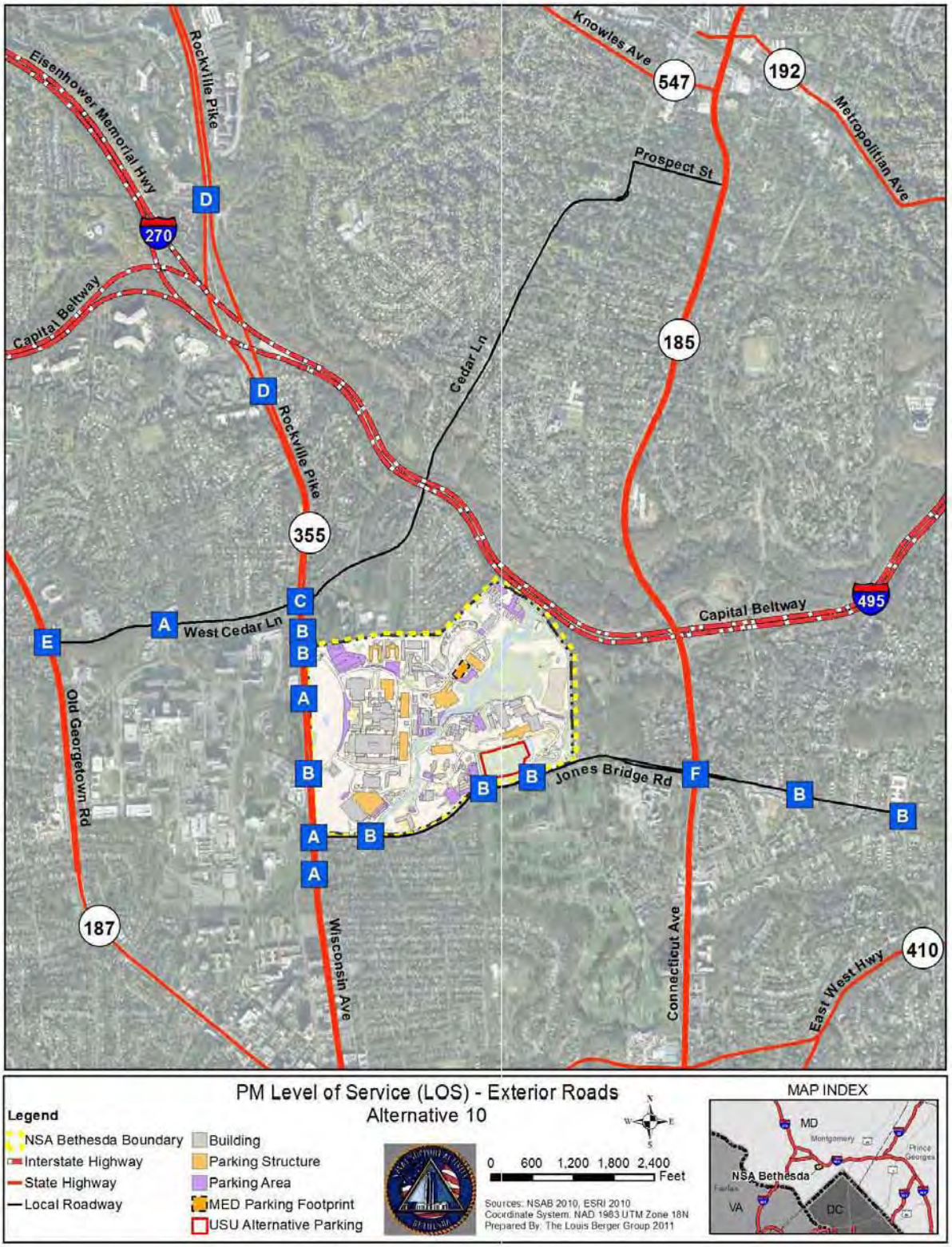


Table 80A:2018 AM Peak Hour Build Alternative 10 HCM External Analysis

	HCM Analysis	AM Peak Hour					
		Alternative 10			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density Volume/ Cap.	LOS
1. Rockville Pike & Grosvenor Lane	Overall	45.0	1.03	D	45.6	1.02	D
	Eastbound	69.8		E	69.8		E
	Westbound	70.4		E	70.3		E
	Northbound	20.7		C	15.4		B
	Southbound	46.6		D	43.2		D
2. Rockville Pike & Pooks Hill Road	Overall	223.2	1.64	F	219.9	1.63	F
	Eastbound	83.4		F	83.4		F
	Northbound	341.6		F	335.9		F
	Southbound	22.0		C	21.3		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.5	0.89	B	19.5	0.89	B
	Eastbound	23.9		C	23.9		C
	Westbound	37.4		D	37.4		D
	Northbound	14.1		B	14.1		B
	Southbound	18.5		B	18.5		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	15.3	0.40	B	15.2	0.39	B
	Eastbound	19.8		B	19.6		B
	Westbound	11.8		B	11.8		B
	Northbound	14.7		B	14.7		B
	Southbound	15.1		B	15.1		B
5. Rockville Pike & Cedar Lane	Overall	44.1	1.00	D	41.8	0.98	D
	Eastbound	86.5		F	82.1		F
	Westbound	62.7		E	61.1		E
	Northbound	14.7		B	14.4		B
	Southbound	42.4		D	39.3		D
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.8		B	11.7		B
	Westbound	9.8		A	9.8		A
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	7.6	0.63	A	7.8	0.62	A
	Westbound	21.2		C	21.2		C
	Northbound	18.2		B	18.3		B
	Southbound	3.1		A	3.2		A
8. Rockville Pike & Wilson Drive	Overall	2.1	0.60	A	2.1	0.59	A
	Eastbound	60.9		E	60.9		E
	Northbound	1.9		A	1.9		A
	Southbound	0.9		A	0.8		A
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	12.8	0.76	B	12.7	0.76	B
	Eastbound	66.9		E	63.5		E
	Westbound	52.6		D	52.1		D
	Northbound	13.1		B	13.2		B
	Southbound	6.4		A	6.6		A
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	32.5	0.84	C	32.3	0.84	C
	Eastbound	54.3		D	54.3		D
	Westbound	99.6		F	97.3		F
	Northbound	17.4		B	18.0		B
	Southbound	6.6		A	6.9		A

Table 80A:2018 AM Peak Hour Build Alternative 10 HCM External Analysis (continued)

	HCM Analysis	AM Peak Hour					
		Alternative 10			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Delay	Density Volume/ Cap.	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	13.8	0.63	B	12.3	0.63	B
	Eastbound	3.6		A	3.3		A
	Westbound	17.3		B	14.7		B
	Northbound	22.0		C	22.0		C
	Southbound	24.5		C	24.5		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	4.7	0.53	A	3.8	0.51	A
	Eastbound	2.7		A	2.1		A
	Westbound	5.8		A	4.7		A
	Southbound	0.0		A	0.0		A
13. University Road (Gate #5) & Jones Bridge Road	Overall	7.6	0.54	A	6.4	0.51	A
	Eastbound	5.1		A	4.5		A
	Westbound	7.9		A	7.1		A
	Southbound	24.0		C	24.6		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	52.1	1.04	D	49.4	1.01	D
	Eastbound	59.4		E	55.7		E
	Westbound	44.7		D	42.2		D
	Northbound	24.0		C	24.0		C
	Southbound	63.1		E	58.9		E
	Southwestbound	82.6		F	82.6		F
15. Manor Road & Jones Bridge Road	Overall	15.6	0.57	B	15.1	0.56	B
	Eastbound	18.1		B	18.0		B
	Westbound	16.1		B	15.3		B
	Northbound	10.8		B	10.8		B
16. Jones Bridge Road & Jones Mill Road	Overall	45.4	0.77	D	42.3	0.76	D
	Eastbound	30.5		C	30.2		C
	Northbound	53.8		D	46.8		D
	Southbound	46.5		D	46.5		D
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	19.4	0.71	B	19.5	0.71	B
	Eastbound	48.7		D	48.7		D
	Westbound	41.2		D	41.2		D
	Northbound	5.5		A	5.4		A
	Southbound	3.3		C	3.3		C

Note: Intersections with only two-way stops have no overall LOS identified.

Table 80B:2018 PM Peak Hour Build Alternative 10 HCM External Analysis

	HCM Analysis	PM Peak Hour					
		Alternative 10			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density Volume/ Cap.	LOS	Approach Delay (s/veh)	Density (Veh/ hr)	LOS
1. Rockville Pike & Grosvenor Lane	Overall	60.1	1.01	E	58.9	1.01	E
	Eastbound	48.4		D	48.4		D
	Westbound	88.7		F	88.7		F
	Northbound	30.9		C	30.3		C
	Southbound	72.2		E	69.8		E
2. Rockville Pike & Pooks Hill Road	Overall	35.8	1.01	D	33.1	0.99	C
	Eastbound	65.4		E	65.4		E
	Northbound	40.7		D	35.7		D
	Southbound	23.7		C	23.5		C
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	Overall	19.2	0.84	B	19.1	0.83	B
	Eastbound	31.9		C	31.9		C
	Westbound	37.2		D	37.3		D
	Northbound	20.2		C	20.2		C
	Southbound	13.3		B	13.1		B
4. Locust Avenue/West Drive & Cedar Lane	Overall	30.4	0.73	C	30.2	0.73	C
	Eastbound	39.9		D	39.5		D
	Westbound	7.5		A	7.5		A
	Northbound	24.8		C	24.8		C
	Southbound	26.7		C	26.7		C
5. Rockville Pike & Cedar Lane	Overall	38.4	0.97	D	36.4	0.97	D
	Eastbound	57.4		E	57.4		E
	Westbound	65.5		E	63.5		E
	Northbound	30.9		C	26.5		C
	Southbound	31.9		C	31.8		C
6. Rockville Pike & North Drive/School Driveway	Eastbound	11.1		B	11.0		B
	Westbound	10.7		B	10.5		B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	Overall	8.5	0.72	A	8.6	0.70	A
	Westbound	40.0		D	39.9		D
	Northbound	9.8		A	9.9		A
	Southbound	0.9		A	0.9		A
8. Rockville Pike & Wilson Drive	Overall	12.3	0.64	B	12.3	0.63	B
	Eastbound	44.6		D	44.6		D
	Northbound	5.0		A	4.8		A
	Southbound	10.7		B	10.5		B
9. Rockville Pike & South Drive/ South Wood Road (Gate #2)	Overall	21.6	0.78	C	18.7	0.72	B
	Eastbound	63.2		E	52.8		D
	Westbound	33.7		C	35.8		D
	Northbound	15.9		B	13.5		B
	Southbound	18.8		B	16.3		B
10. Rockville Pike & Center Drive/ Jones Bridge Road	Overall	59.4	0.94	E	59.9	0.94	E
	Eastbound	58.2		E	58.2		E
	Westbound	44.2		D	42.8		D
	Northbound	77.5		E	78.3		E
	Southbound	44.5		D	45.4		D

Table 80B:2018 PM Peak Hour Build Alternative 10 HCM External Analysis (continued)

	HCM Analysis	PM Peak Hour					
		Alternative 10			*No Build Condition*		
	Approach	Approach Delay (s/veh)	Density (Veh/ hr)	LOS	Delay	Density (Veh/ hr)	LOS
11. Gunnell Rd (Gate #3)/ Glenbrook Parkway & Jones Bridge Road	Overall	14.1	0.75	B	14.0	0.75	B
	Eastbound	11.3		B	11.2		B
	Westbound	13.1		B	12.9		B
	Northbound	13.8		B	13.8		B
	Southbound	23.1		C	23.9		C
12. Grier Road (Gate #4) & Jones Bridge Road	Overall	11.9	0.75	B	13.6	0.79	B
	Eastbound	10.9		B	12.1		B
	Westbound	5.3		A	5.2		A
	Southbound	27.2		C	32.7		C
13. University Road (Gate #5) & Jones Bridge Road	Overall	9.7	0.74	A	10.7	0.67	B
	Eastbound	8.9		A	11.2		B
	Westbound	9.3		A	9.3		A
	Southbound	24.1		C	21.0		C
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	Overall	71.2	1.10	E	68.7	1.10	E
	Eastbound	102.7		F	92.8		F
	Westbound	118.7		F	119.7		F
	Northbound	76.1		E	76.1		E
	Southbound	18.8		B	18.9		B
	Southwestbound	126.1		F	126.1		F
15. Manor Road & Jones Bridge Road	Overall	21.4	0.73	C	19.7	0.71	B
	Eastbound	32.0		C	28.9		C
	Westbound	4.1		A	3.7		A
	Northbound	21.9		C	21.9		C
16. Jones Bridge Road & Jones Mill Road	Overall	24.4	0.73	C	23.5	0.71	C
	Eastbound	12.9		B	13.0		B
	Northbound	41.2		D	38.5		D
	Southbound	20.0		C	20.0		C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	Overall	12.7	0.70	B	12.6	0.69	B
	Eastbound	12.8		B	12.8		B
	Westbound	9.2		A	9.2		A
	Northbound	18.3		B	18.1		B
	Southbound	7.9		A	7.8		A

Note: Intersections with only two-way stops have no overall LOS identified.

3.2.13.4 Arterial Analysis

Arterial analysis was performed for Rockville Pike, West Cedar Lane, and Jones Bridge Road, comparing the alternative to the No Build condition. The greatest change between the No Build condition and Build Alternative 10 was a 3 percent increase along Jones Bridge Road westbound during the AM peak hour and Rockville Pike northbound during the PM peak hour. Based upon this analysis, Alternative 10 would not require PAMR-RAM external intersection mitigation. Tables 81 and 82 show the 2018 Build Alternative 10 arterial analyses.

Table 81: 2018 AM Peak Hour Build Alternative 10 Arterial Analysis

		AM Peak Hour						
		Alt 10			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	11.3	11:35	E	11.5	11:25	E	2%
	Southbound	20.7	6:30	C	21.1	6:22	C	2%
Jones Bridge Road	Eastbound	20.5	5:1	C	20.7	4:59	C	1%
	Westbound	16.6	6:12	D	17.1	6:01	D	3%
West Cedar Lane	Eastbound	15.4	2:49	D	15.4	2:49	D	0%
	Westbound	16.9	2:34	D	16.9	2:34	D	0%

Table 82: 2018 PM Peak Hour Build Alternative 10 Arterial Analysis

		PM Peak Hour						
		Alt 10			No Build Condition			
Arterial	**Direction**	**Speed**	**Time**	**LOS**	**Speed**	**Time**	**LOS**	**% Dif**
Rockville Pike	Northbound	15.6	8:23	D	16.0	8:11	D	3%
	Southbound	17.5	7:40	D	17.7	7:36	D	1%
Jones Bridge Road	Eastbound	17.1	6:2	D	17.1	6:02	D	0%
	Westbound	16.6	6:13	D	16.7	6:12	D	1%
West Cedar Lane	Eastbound	12.8	3:24	E	12.8	3:23	E	0%
	Westbound	17.4	2:30	D	17.4	2:30	D	0%

3.2.13.5 Internal Intersection Analysis

The internal intersection analysis follows the same process as the HCM analysis performed for the external conditions, focusing on the internal intersections. During the AM peak hour, #19 R.B. Brown Drive at America Garage intersection approach would change from a LOS of C to D, reflecting the increase in pedestrian traffic crossing at this intersection, walking between the Medical Center and warehouse parking facility. During the PM peak hour, #24 East Palmer Road at North Palmer Road and #26 South Palmer Road at Stokes Road intersections would change from a LOS B to C, resulting from the staff shifted trips exiting the new Taylor Road facilities parking structure and heading toward Gates #1 and #3. Based on this analysis, there would be no significant impact to the internal roadway intersections for this alternative. Tables 83A and 83B show the 2018 Build Alternative 10 internal HCM analysis and Figures 68A and 68B show the 2018 Build Alternative 10 internal intersection LOS.

Table 83A:2018 Build Alternative 10 Internal HCM Intersection Analysis

		AM Peak Hour			
		Build Alt. 10		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	12.5	B	10.3	B
	Eastbound	14.1	B	10.9	B
	Westbound	8.7	A	8.7	A
	Northbound	8.7	A	9.0	A
	Southbound	9.7	A	9.6	A
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	26.5	D	17.6	C
	Westbound	16.4	C	12.8	B
	Northbound Left	3.4	A	3.1	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.9	A	10.5	B
	Northbound	8.4	A	9.2	A
	Southbound	9.4	A	11.5	B
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	8.3	A	9.1	A
	Westbound	7.4	A	8.1	A
	Northbound	8.6	A	9.4	A
	Southbound	7.7	A	8.8	A
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	8.2	A	9.7	A
	Eastbound	7.5	A	8.1	A
	Northbound	8.5	A	10.1	B
	Southbound	7.7	A	9.0	A
23. R.B. Brown Drive & South Palmer Road	Overall	9.5	A	9.8	A
	Eastbound	9.8	A	10.3	B
	Westbound	7.8	A	8.7	A
	Southbound	8.5	A	9.1	A
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	12.2	B	9.6	A
	Eastbound	13.6	B	10.0	A
	Westbound	9.5	A	8.6	A
	Northbound	11.0	B	9.5	A
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	9.4	A	9.0	A
	Eastbound	0.0	A	7.5	A
	Westbound	8.2	A	8.1	A
	Northbound	9.9	A	9.4	A
	Southbound	8.8	A	8.7	A
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	10.0	B	9.5	A
	Westbound	8.7	A	8.6	A
	Northbound	10.8	B	10.1	B
	Southbound	9.0	A	8.9	A
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	9.0	A	9.5	A
	Eastbound	8.5	A	8.1	A
	Westbound	9.4	A	10.4	B
	Northbound	8.8	A	8.9	A
	Southbound	0.0	A	0.0	A
28. University Road/Grier Road & South Palmer Road	Overall	9.0	A	8.7	A
	Eastbound	9.3	A	8.4	A
	Westbound	9.4	A	9.1	A
	Northbound	8.4	A	9.0	A
	Southbound	7.1	A	6.9	A
29. University Road & South Palmer Road	Westbound	8.0	A	8.0	A
	Northbound	7.9	A	7.9	A

Table 83B:2018 Build Alternative 10 Internal HCM Intersection Analysis

		PM Peak Hour			
		Build Alt. 10		*No Build Condition*	
	Approach	Approach Delay (s/veh)	LOS	Approach Delay (s/veh)	LOS
18. Parking Lot/R.B. Brown Drive & North Palmer Road	Overall	18.1	C	16.5	C
	Eastbound	9.5	A	9.7	A
	Westbound	23.8	C	15.6	C
	Northbound	13.6	B	20.5	C
	Southbound	10.1	B	10.0	B
19. R.B. Brown Drive & America Garage/Garage 54 Exit	Eastbound	*	F	*	F
	Westbound	*	F	*	F
	Northbound Left	0.9	A	0.6	A
20. R.B. Brown Drive & Garage 54 Entrance	Overall	8.0	A	8.8	A
	Northbound	7.9	A	9.0	A
	Southbound	8.1	A	8.5	A
21. R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	Overall	9.1	A	11.3	B
	Westbound	7.4	A	10.9	B
	Northbound	8.2	A	9.5	A
	Southbound	9.5	A	12.3	B
22. R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	Overall	8.0	A	9.4	A
	Eastbound	7.3	A	7.8	A
	Northbound	7.9	A	8.3	A
	Southbound	8.1	A	10.0	B
23. R.B. Brown Drive & South Palmer Road	Overall	9.7	A	10.6	B
	Eastbound	8.2	A	8.9	A
	Westbound	10.9	B	10.7	B
	Southbound	8.9	A	11.4	B
24. East Palmer Road & North Palmer Road/Taylor Road	Overall	15.2	C	10.7	B
	Eastbound	11.4	B	10.0	B
	Westbound	18.9	C	11.4	B
	Northbound	12.1	B	10.7	B
25. East Palmer Road & Visitor Garage Exit/Rixey Road	Overall	10.8	B	10.2	B
	Eastbound	8.6	A	8.4	A
	Westbound	10.1	B	9.8	A
	Northbound	9.9	A	9.7	A
	Southbound	12.0	B	11.0	B
26. East Palmer Road/Gunnell Road & Stokes Road	Overall	16.7	C	15.0	B
	Westbound	16.8	C	16.0	C
	Northbound	11.9	B	11.5	B
	Southbound	19.2	C	16.2	C
27. AFRRI Driveway/Stokes Road & South Palmer Road	Overall	11.1	B	10.7	B
	Eastbound	9.2	A	10.3	B
	Westbound	12.4	B	11.0	B
	Northbound	10.8	B	10.8	B
	Southbound	8.6	A	8.6	A
28. University Road/Grier Road & South Palmer Road	Overall	12.8	B	12.5	B
	Eastbound	13.0	B	13.7	B
	Westbound	12.0	B	9.2	A
	Northbound	9.4	A	8.9	A
	Southbound	13.1	B	11.9	B
29. University Road & South Palmer Road	Westbound	7.2	A	7.1	A
	Northbound	7.5	A	7.1	A

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

Note: Intersections with only two-way stops have no overall LOS identified.

Figure 68A: 2018 AM Peak Hour Build Alternative 10 Internal Intersection LOS

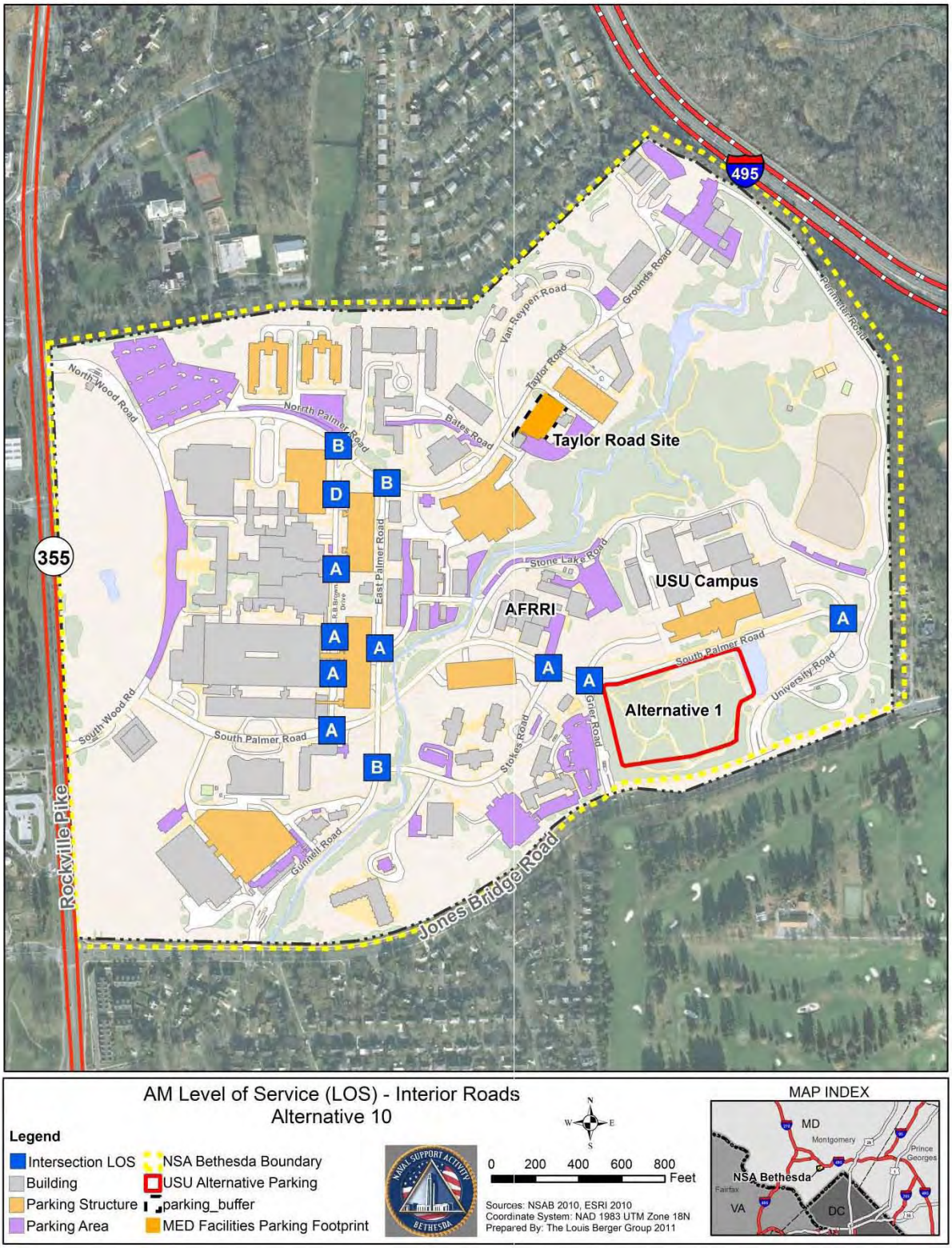
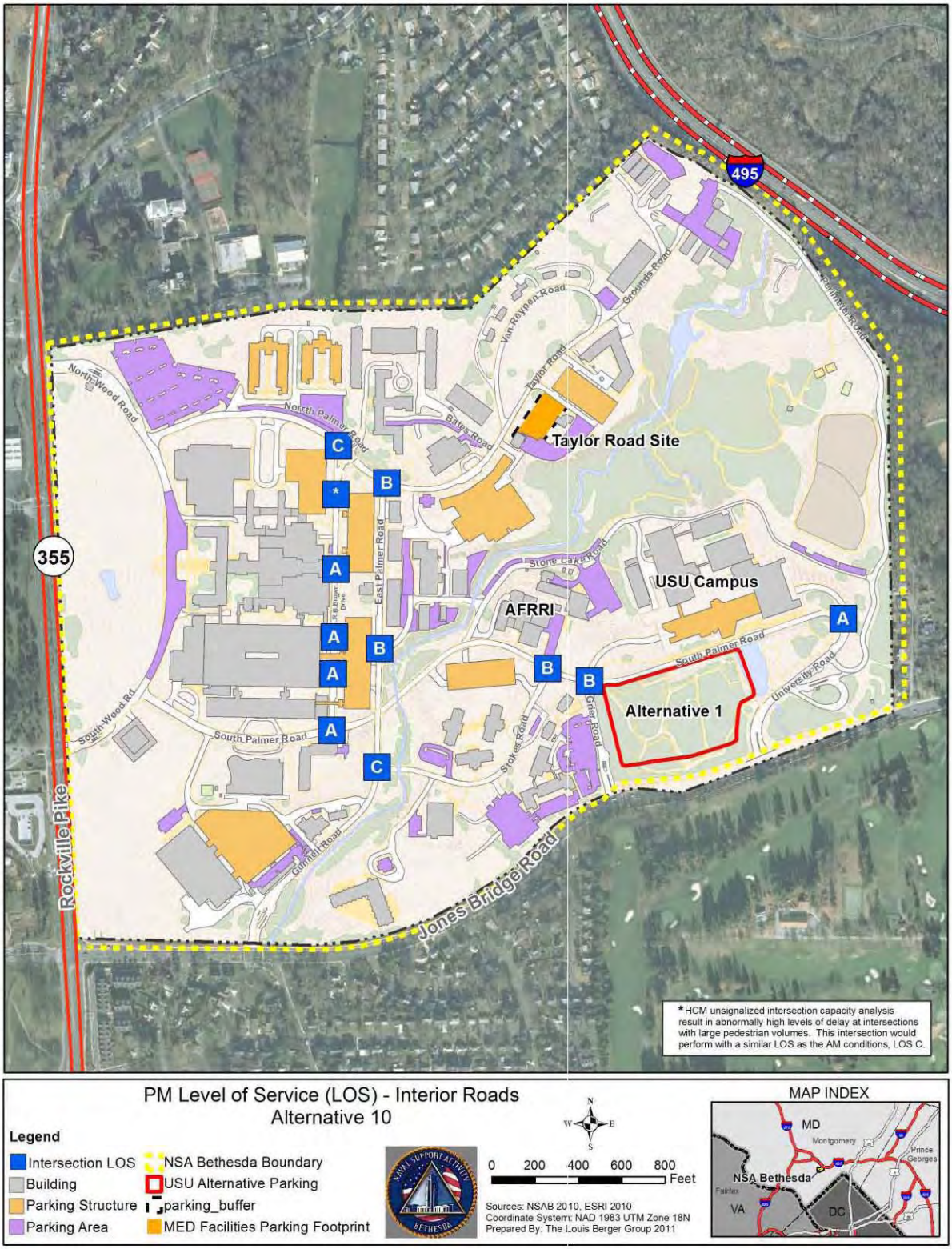


Figure 68B: 2018 PM Peak Hour Build Alternative 10 Internal Intersection LOS



3.2.13.6 Bicycle and Pedestrian Impacts

This alternative would include the placement of two new parking structures, resulting in increased pedestrian activity between the parking structures and destination buildings. The new parking structure serving Building C would be located off of Taylor Road in the Taylor Road Facilities of NSA Bethesda; therefore, new pedestrian trips would be created between the parking structure and Medical Buildings. Specifically, there would be 287 pedestrian trips during the AM peak hour and 301 pedestrian trips during the PM peak hour.

The new USU Alternative 1 parking structure would be placed across the street from the USU Campus; therefore, the new pedestrian activity would cross three intersections, South Palmer Road at Grier Road, South Palmer Road at Stokes Road, and South Palmer Road at Brown Drive. For the Medical Development, this would result in 17 new pedestrian trips during the AM peak hour and 16 new pedestrian trips during the PM peak hour. For the USU Expansion, this would result in 161 new pedestrian trips during the AM peak hour and 193 new pedestrian trips during the PM peak hour.

The Medical Building pedestrian trips are included in the internal HCM analysis. The USU pedestrian trips are not included as the location of the optimum pedestrian crossing has not been identified. However, the USU trips were temporarily added to the South Palmer Road at Stokes Road intersection, with the intersection continuing to perform at the same overall LOS in both peak periods as calculated in Tables 83A and 83B.

Existing 5-foot plus sidewalks connect both new parking structures with the Medical Buildings via South Palmer Road or Grounds Road/ Taylor Road/North Palmer Road. Based on the 270 new employees included in the trip generation and adequate existing sidewalks serving these pedestrian trips, this alternative would have no significant pedestrian or bicycle impacts. Figure 53 shows the sidewalk connections for this Build Alternative.

4.0 Discussion of 2018 Condition Findings

This study focused on the external intersections and arterials, internal intersections and gate counts, internal parking, and bicycle/pedestrian impacts. Together, these systems provide an overall examination of the potential impacts of implementing any of the ten proposed 2018 Build Alternatives to NSA Bethesda and nearby arterials.

4.1 External Intersection Summary

The Critical Lane Volume (CLV) analysis is required by the MSHA and M-NCPPC to determine intersection operations for all external signalized intersections. Since the CLV method is not an accurate method to analyze unsignalized intersections and does not provide traffic delay or density, the study also included the HCM analysis as a secondary analysis method. Based upon the vehicle delay, the HCM analysis determines the LOS, which follows the same lettering as the CLV, but is calculated differently from the CLV and should not be compared to the CLV LOS. The HCM was used as a primary analysis method for the one external unsignalized intersection. For each intersection, the differences between the projected 2018 No Build condition and the given Build Alternative were measured.

For each Build Alternative, 16 external signalized intersections, plus 1 unsignalized intersection were analyzed. The 17 intersections covered three arterials, Rockville Pike, Jones Bridge Road, and West Cedar Lane.

4.1.1 *Critical Lane Volume Analysis*

Based upon the AM peak hour CLV analysis, several intersections LOS would change; however, it is important to note that no intersections would change to a failing LOS. Build Alternative 9 would change from a LOS of A to B at the #8 Rockville Pike at Wilson Drive intersection. This would reflect the combination of new staff trips originating from the north and entering the installation at Gate #2 destined for the new USU Alternative 1 parking structure, and shifted staff trips originating from the north entering the installation at Gate #3 destined for the new parking structure in H-Lot. The #9 Rockville Pike at South Wood Road (Gate #2) intersection would change from a LOS B to C for Build Alternatives 1, 4 and 6 through 10. Build Alternative 1 would include a shift in exiting patient trips from Gate #1 to Gate #2 using the new underground parking structure, thus an increase of traffic at intersection #9. Build Alternatives 4 and 9 would include new staff trips originating from the north entering Gate #3, destined for the new parking structure in H-Lot. Build Alternatives 6 through 10 would include new staff trips originating from the north entering Gate #2, destined for the new USU Alternative 1 parking structure. The LOS for all other external intersections would not change as a result of the proposed actions. Table 84 shows the AM peak hour CLV summary.

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Table 84: AM Peak Hour CLV Summary

Critical Lane Volume – LOS	NB	Alternatives									
		1	2	3	4	5	6	7	8	9	10
1. Rockville Pike & Grosvenor Lane	D	D	D	D	D	D	D	D	D	D	D
2. Rockville Pike & Pooks Hill Road	D	D	D	D	D	D	D	D	D	D	D
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	D	D	D	D	D	D	D	D	D	D	D
4. Locust Avenue/West Drive & Cedar Lane	A	A	A	A	A	A	A	A	A	A	A
5. Rockville Pike & Cedar Lane	E	E	E	E	E	E	E	E	E	E	E
6. Rockville Pike & North Drive/School Driveway*											
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	A	A	A	A	A	A	A	A	A	A	A
8. Rockville Pike & Wilson Drive	A	A	A	A	A	A	A	A	A	**B**	A
9. Rockville Pike & South Drive/South Wood Road (Gate #2)	B	**C**	B	B	**C**	B	**C**	**C**	**C**	**C**	**C**
10. Rockville Pike & Center Drive/Jones Bridge Road	A	A	A	A	A	A	A	A	A	A	A
11. Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road	A	A	A	A	A	A	A	A	A	A	A
12. Grier Road (Gate #4) & Jones Bridge Road	A	A	A	A	A	A	A	A	A	A	A
13. University Road (Gate #5) & Jones Bridge Road	A	A	A	A	A	A	A	A	A	A	A
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	E	E	E	E	E	E	E	E	E	E	E
15. Manor Road & Jones Bridge Road	A	A	A	A	A	A	A	A	A	A	A
16. Jones Bridge Road & Jones Mill Road	B	B	B	B	B	B	B	B	B	B	B
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	A	A	A	A	A	A	A	A	A	A	A

*** HCM used to calculate this unsignalized intersection**

Based upon the PM peak hour CLV analysis, the LOS at several intersections would change; however, it is important to note that no intersections would change to a failing LOS. The #8 Rockville Pike at Wilson Drive intersection would change from a LOS A to B for Build Alternatives 4 and 9, due to the increase in traffic passing through this intersection from both Gate #3, originating from the new H-Lot parking structure and from Gate #2, originating from the new USU alternative parking structures. The #12 Jones Bridge Road at Grier Road (Gate #4) intersection would change from a LOS of B to C for Build Alternatives 1, 2, 4, 6, 7, and 9, reflecting the new staff trips exiting through Gate #4, originating at the new USU parking structures. The LOS for all other external intersections would not change as a result of the proposed actions. Table 85 shows the PM peak hour CLV summary.

Table 85: PM Peak Hour CLV Summary

Critical Lane Volume – LOS	NB	Alternatives									
		1	2	3	4	5	6	7	8	9	10
1. Rockville Pike & Grosvenor Lane	D	D	D	D	D	D	D	D	D	D	D
2. Rockville Pike & Pooks Hill Road	D	D	D	D	D	D	D	D	D	D	D
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	E	E	E	E	E	E	E	E	E	E	E
4. Locust Avenue/West Drive & Cedar Lane	A	A	A	A	A	A	A	A	A	A	A
5. Rockville Pike & Cedar Lane	C	C	C	C	C	C	C	C	C	C	C
6. Rockville Pike & North Drive/School Driveway*											
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	B	B	B	B	B	B	B	B	B	B	B
8. Rockville Pike & Wilson Drive	A	A	A	A	**B**	A	A	A	A	**B**	A
9. Rockville Pike & South Drive/South Wood Road (Gate #2)	B	B	B	B	B	B	B	B	B	B	B
10. Rockville Pike & Center Drive/Jones Bridge Road	A	A	A	A	A	A	A	A	A	A	A
11. Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road	B	B	B	B	B	B	B	B	B	B	B
12. Grier Road (Gate #4) & Jones Bridge Road	B	**C**	**C**	B	**C**	B	**C**	**C**	B	**C**	B
13. University Road (Gate #5) & Jones Bridge Road	B	B	B	B	B	B	B	B	B	B	B
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	F	F	F	F	F	F	F	F	F	F	F
15. Manor Road & Jones Bridge Road	B	B	B	B	B	B	B	B	B	B	B
16. Jones Bridge Road & Jones Mill Road	B	B	B	B	B	B	B	B	B	B	B
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	A	A	A	A	A	A	A	A	A	A	A

*** HCM used to calculate this unsignalized intersection.**

4.1.2 *Highway Capacity Manual (HCM) Analysis*

Based upon HCM analysis conducted for the AM peak hour, the external signalized intersections would not change, except for Build Alternatives 4 and 9. The #17 intersection at Rockville Pike at Woodmont Avenue would change from a LOS B to C. The traffic volumes for these two alternatives do not differ from the other alternatives; however, the volumes do increase at the #10 Rockville Pike at Jones Bridge Road intersection, one intersection north of the #17 intersection. The Rockville Pike southbound to Jones Bridge Road Eastbound move would increase, thus increasing the traffic delay by a half a second along the Rockville Pike southbound approach to the #17 Rockville Pike at Woodmont Avenue intersection. The LOS would change from a LOS of B to C, since the No Build condition LOS of B is just under the threshold to change to a LOS of C; therefore, the half a second change in the southbound approach would place the LOS into the C range. Table 86 shows the AM peak hour HCM summary.

Table 86: AM Peak Hour HCM Summary

Highway Capacity Manual – LOS		NB	Alternatives									
			1	2	3	4	5	6	7	8	9	10
1.	Rockville Pike & Grosvenor Lane	D	D	D	D	D	D	D	D	D	D	D
2.	Rockville Pike & Pooks Hill Road	F	F	F	F	F	F	F	F	F	F	F
3.	Old Georgetown Road & Oakmont Avenue/Cedar Lane	B	B	C	C	C	C	C	C	C	C	C
4.	Locust Avenue/West Drive & Cedar Lane	B	B	B	B	B	B	B	B	B	B	B
5.	Rockville Pike & Cedar Lane	D	D	D	D	D	D	D	D	D	D	D
6.	Rockville Pike & North Drive/School Driveway*	B	B	B	B	B	B	B	B	B	B	B
7.	Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	A	A	A	A	A	A	A	A	A	A	A
8.	Rockville Pike & Wilson Drive	A	A	A	A	A	A	A	A	A	A	A
9.	Rockville Pike & South Drive/South Wood Road (Gate #2)	B	B	B	B	B	B	B	B	B	B	B
10.	Rockville Pike & Center Drive/Jones Bridge Road	C	C	C	C	C	C	C	C	C	C	C
11.	Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road	B	B	B	B	B	B	B	B	B	B	B
12.	Grier Road (Gate #4) & Jones Bridge Road	A	A	A	A	A	A	A	A	A	A	A
13.	University Road (Gate #5) & Jones Bridge Road	A	A	A	A	A	A	A	A	A	A	A
14.	Connecticut Avenue & Jones Bridge Road & Kensington Parkway	D	D	D	D	D	D	D	D	D	D	D
15.	Manor Road & Jones Bridge Road	B	B	B	B	B	B	B	B	B	B	B
16.	Jones Bridge Road & Jones Mill Road	D	D	D	D	D	D	D	D	D	D	D
17.	Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	B	B	B	B	C	B	B	B	B	C	B

Based upon the HCM analysis conducted for the PM peak hour, the following intersections would have LOS changes for all Build Alternatives: #2 Rockville Pike at Pooks Hill Road (LOS C to D), #9 Rockville Pike at South Wood Road (Gate #2) (LOS B to C), and #15 Jones Bridge Road at Manor Road (LOS B to C). The #13 Jones Bridge Road at University Road (Gate #5) intersection would change from a LOS of B to A for Build Alternatives 3, 5, 8,and 10. All other intersections would retain the same LOS as under the No Build condition. Table 87 shows the PM peak hour HCM summary.

The #6 Rockville Pike at North Drive intersection is unsignalized; therefore, the CLV analysis was not used to determine the operation. In this case, the HCM analysis was used as a primary analysis method for the intersection. Based upon the HCM analysis, this intersection would operate with the same LOS between the No Build condition and Build Alternatives (LOS of B) during both peak periods.

Table 87: PM Peak Hour HCM Summary

Highway Capacity Manual – LOS	NB	Alternatives									
		1	2	3	4	5	6	7	8	9	10
1. Rockville Pike & Grosvenor Lane	E	E	E	E	E	E	E	E	E	E	E
2. Rockville Pike & Pooks Hill Road	C	D	D	D	D	D	D	D	D	D	D
3. Old Georgetown Road & Oakmont Avenue/Cedar Lane	B	B	B	B	B	B	B	B	B	B	B
4. Locust Avenue/West Drive & Cedar Lane	C	C	C	C	C	C	C	C	C	C	C
5. Rockville Pike & Cedar Lane	D	D	D	D	D	D	D	D	D	D	D
6. Rockville Pike & North Drive/School Driveway*	B	B	B	B	B	B	B	B	B	B	B
7. Rockville Pike & NIH Delivery Entrance/North Wood Road (Gate #1)	A	A	A	A	A	A	A	A	A	A	A
8. Rockville Pike & Wilson Drive	B	B	B	B	B	B	B	B	B	B	B
9. Rockville Pike & South Drive/South Wood Road (Gate #2)	B	C	C	C	C	C	C	C	C	C	C
10. Rockville Pike & Center Drive/Jones Bridge Road	E	E	E	E	E	E	E	E	E	E	E
11. Gunnell Road (Gate #3)/Glenbrook Pkwy & Jones Bridge Road	B	B	B	B	B	B	B	B	B	B	B
12. Grier Road (Gate #4) & Jones Bridge Road	B	B	B	B	B	B	B	B	B	B	B
13. University Road (Gate #5) & Jones Bridge Road	B	B	B	A	B	A	B	B	A	B	A
14. Connecticut Avenue & Jones Bridge Road & Kensington Parkway	E	E	E	E	E	E	E	E	E	E	E
15. Manor Road & Jones Bridge Road	B	C	C	C	C	C	C	C	C	C	C
16. Jones Bridge Road & Jones Mill Road	C	C	C	C	C	C	C	C	C	C	C
17. Rockville Pike/Wisconsin Avenue & Woodmont Avenue/Glenbrook Parkway	B	B	B	B	B	B	B	B	B	B	B

For all Build Alternatives, all intersections would have a small change in the vehicle delay and density; however, the change was not significant enough to cause the HCM calculated LOS to change to a failing condition. While the LOS at three external intersections changed to a lower LOS, one intersection changed to a higher LOS, reflecting the change in travel patterns to access the various parking structures. The worst change calculated would be a LOS of C, which represents a stable condition according to the HCM. Based upon this summary and in-depth analysis, while there would be some delay associated with overall future conditions in the region (including background developments), no intersections would shift to a failing LOS. Therefore, there would be no significant impact to the external roadway intersections from the Build Alternatives in this EIS.

4.2 Arterial Analysis Summary

The arterial analysis was performed as a requirement for M-NCPPC's Policy Area Mobility Review for Rockville Pike, Jones Bridge Road, and West Cedar Lane. The analysis consisted of calculating the travel speed and travel time from one end of the corridor to the other along

the three corridors and comparing the travel speed between the No Build condition and Build Alternatives.

Based upon the AM peak hour arterial analysis, the greatest difference in travel speeds between the No Build condition and Build Alternatives would be 4 percent for Alternatives 4 and 9 along Jones Bridge Road westbound. Both of these Build Alternatives would have a similar travel pattern, consisting of a shift in travel from Gate #1 to Gate #3 from north of the installation using Rockville Pike and Jones Bridge Road to access the new parking facility serving Building C located in H-Lot. The shift in trips would add more traffic to intersection #10 and #11 (Rockville Pike and Gunnell Road respectively) along Jones Bridge Road, thus extending the green times to accommodate the increased vehicle turning movements and delaying the Jones Bridge Road westbound approaches to these intersections. Table 88 shows the AM peak hour arterial summary.

Table 88: AM Peak Hour Arterial Summary

Arterial Analysis - Percent Difference from No Build Condition Travel Speed		Alternatives									
		1	2	3	4	5	6	7	8	9	10
1. Rockville Pike	Northbound	2%	1%	1%	3%	1%	2%	2%	2%	3%	2%
	Southbound	2%	2%	2%	1%	2%	2%	2%	2%	2%	2%
2. Jones Bridge Road	Eastbound	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%
	Westbound	2%	2%	3%	4%	3%	2%	2%	2%	4%	3%
3. West Cedar Lane	Eastbound	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Westbound	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Based upon the PM peak hour arterial analysis, the greatest difference in travel speeds between the No Build condition and Build Alternatives would be 3 percent for all Build Alternatives along Rockville Pike northbound. This reflects the increase in traffic exiting through Gate #2 from the new USU parking structure sites and heading north toward the Capital Beltway or I-270. In addition, there would be a 3 percent difference in travel time for Build Alternatives 1, 2, and 9. This reflects the Build Alternatives with the greatest amount of new trips exiting through Gate #4 and heading east toward Connecticut Avenue. The higher the volume exiting through Gate #4 to head east on Jones Bridge Road, the longer the delay for the existing eastbound approach at #12 Jones Bridge Road at Grier Road intersection. Table 89 shows the PM peak hour arterial summary.

Table 89: PM Peak Hour Arterial Summary

Arterial Analysis - Percent Difference from No Build Condition Travel Speed		Alternatives									
		1	2	3	4	5	6	7	8	9	10
1. Rockville Pike	Northbound	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
	Southbound	1%	1%	1%	1%	1%	1%	1%	1%	2%	1%
2. Jones Bridge Road	Eastbound	3%	3%	0%	2%	0%	2%	2%	0%	3%	0%
	Westbound	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
3. West Cedar Lane	Eastbound	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Westbound	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

In addition, the travel speeds, the travel times and arterial LOS were also compared between the No Build condition and Build Alternatives with the summaries shown in Tables 90 through 95. The AM and PM peak hour Build Alternative travel speeds would differ from the No Build condition by less than 1 mph (Tables 90 and 91), while the travel times would differ from the No Build condition by a maximum of 15 seconds (Tables 92 and 93). Together, these slight differences would result in no change in the arterial LOS between the No Build condition and Build Alternatives (Tables 94 and 95). After evaluating the three arterials, there would be no significant impact to the external arterials for any of the ten alternatives.

Table 90: 2018 AM Peak Hour Arterial Travel Speeds

Arterial Analysis - Travel Speeds (MPH)		NB	Alternatives									
			1	2	3	4	5	6	7	8	9	10
1. Rockville Pike	Northbound	11.5	11.3	11.4	11.4	11.2	11.4	11.3	11.3	11.3	11.1	11.3
	Southbound	21.1	20.7	20.7	20.7	20.8	20.7	20.7	20.7	20.7	20.7	20.7
2. Jones Bridge Road	Eastbound	20.7	20.6	20.6	20.6	20.6	20.6	20.5	20.5	20.5	20.5	20.5
	Westbound	17.1	16.7	16.7	16.6	16.5	16.6	16.8	16.8	16.7	16.5	16.6
3. West Cedar Lane	Eastbound	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4	15.4
	Westbound	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9

Table 91: 2018 PM Peak Hour Arterial Travel Speeds

Arterial Analysis - Travel Speeds (MPH)		NB	Alternatives									
			1	2	3	4	5	6	7	8	9	10
1. Rockville Pike	Northbound	16.0	15.5	15.6	15.6	15.6	15.6	15.5	15.5	15.6	15.5	15.6
	Southbound	17.7	17.6	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.4	17.5
2. Jones Bridge Road	Eastbound	17.1	16.6	16.6	17.1	16.7	17.1	16.7	16.7	17.1	16.6	17.1
	Westbound	16.7	16.6	16.5	16.5	16.5	16.5	16.6	16.6	16.6	16.5	16.6
3. West Cedar Lane	Eastbound	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
	Westbound	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4	17.4

Table 92: 2018 AM Peak Hour Arterial Travel Times

Arterial Analysis - Travel Time (minutes:seconds)		NB	Alternatives									
			:	2	3	4	5	6	7	8	9	10
1. Rockville Pike	Northbound	11:25	11:36	11:30	11:30	11:42	11:30	11:36	11:36	11:35	11:48	11:35
	Southbound	6:22	6:30	6:30	6:30	6:29	6:30	6:30	6:30	6:30	6:30	6:30
2. Jones Bridge Road	Eastbound	4:59	5:01	5:00	5:01	5:00	5:01	5:01	5:01	5:01	5:01	5:01
	Westbound	6:01	6:10	6:09	6:12	6:14	6:12	6:09	6:09	6:10	6:16	6:12
3. West Cedar Lane	Eastbound	2:49	2:49	2:49	2:49	2:49	2:49	2:49	2:49	2:49	2:49	2:49
	Westbound	2:34	2:34	2:34	2:34	2:34	2:34	2:34	2:34	2:34	2:34	2:34

Table 93: 2018 PM Peak Hour Arterial Travel Times

Arterial Analysis - Travel Time (minutes:seconds)		NB	Alternatives									
			1	2	3	4	5	6	7	8	9	10
1. Rockville Pike	Northbound	8:11	8:25	8:24	8:24	8:23	8:24	8:25	8:24	8:24	8:25	8:23
	Southbound	7:36	7:39	7:40	7:41	7:42	7:41	7:40	7:40	7:41	7:42	7:40
2. Jones Bridge Road	Eastbound	6:02	6:12	6:12	6:02	6:11	6:02	6:12	6:11	6:02	6:12	6:02
	Westbound	6:12	6:14	6:14	6:14	6:14	6:14	6:13	6:13	6:13	6:14	6:13
3. West Cedar Lane	Eastbound	3:23	3:24	3:24	3:24	3:24	3:24	3:24	3:24	3:24	3:24	3:24
	Westbound	2:30	2:30	2:30	2:30	2:30	2:30	2:30	2:30	2:30	2:30	2:30

Table 94: 2018 AM Peak Hour Arterial Level of Service

Arterial Analysis -Level of Service			NB	Alternatives									
				1	2	3	4	5	6	7	8	9	10
1.	Rockville Pike	Northbound	E	E	E	E	E	E	E	E	E	E	E
		Southbound	C	C	C	C	C	C	C	C	C	C	C
2.	Jones Bridge Road	Eastbound	C	C	C	C	C	C	C	C	C	C	C
		Westbound	D	D	D	D	D	D	D	D	D	D	D
3.	West Cedar Lane	Eastbound	D	D	D	D	D	D	D	D	D	D	D
		Westbound	D	D	D	D	D	D	D	D	D	D	D

Table 95: 2018 PM Peak Hour Arterial Level of Service

Arterial Analysis -Level of Service			NB	Alternatives									
				1	2	3	4	5	6	7	8	9	10
1.	Rockville Pike	Northbound	D	D	D	D	D	D	D	D	D	D	D
		Southbound	D	D	D	D	D	D	D	D	D	D	D
2.	Jones Bridge Road	Eastbound	D	D	D	D	D	D	D	D	D	D	D
		Westbound	D	D	D	D	D	D	D	D	D	D	D
3.	West Cedar Lane	Eastbound	E	E	E	E	E	E	E	E	E	E	E
		Westbound	D	D	D	D	D	D	D	D	D	D	D

4.3 Internal Intersection Summary

The HCM method was used to calculate the LOS for 13 internal intersections, including a proposed intersection at South Palmer Road and South Wood Road serving the exit ramp from the underground parking garage. Each alternative shifted travel patterns around NSA Bethesda, lowering the LOS for some intersections, while raising the LOS for others. For each intersection, the difference between the projected 2018 No Build condition and given Build Alternative was measured.

Based on the AM peak hour HCM analysis, Build Alternative 1 and 2 would improve from a LOS of B to A at the #20 R.B. Brown Drive at Garage 54 Entrance intersection, but worsen from a LOS of A to B at the #24 East Palmer Road at North Palmer Road intersection. This would be due to patient trips entering through Gate #1 shifted from R.B. Brown Drive to the new underground garage and new staff trips entering through Gate #1, headed to the new USU Alternative 2 parking structure in N-Lot passing through the #24 intersection.

Build Alternative 3 and 5 would improve from a LOS of B to A at the #20 R.B. Brown Drive at Garage 54 Entrance intersection, but worsen from a LOS of B to C at the #18 R.B. Brown Drive at North Palmer Road

intersection, and LOS A to B at the #24 East Palmer Road at North Palmer Road, #25 East Palmer Road at Rixey Road, and #26 East Palmer Road at Gunnell Road intersections. This would be due to staff trips entering through Gate #1 shifted from R.B. Brown Drive to the new parking structures along Taylor Road and Grounds Road passing through #18 and #24 intersections and new staff trips entering through Gate #1, headed to the new USU Alternative 2 parking structure in N-Lot passing through #18, #24, and #25 intersections. There would also be new trips entering through Gate #3 passing through #25 and #26 intersections. The #19 R.B. Brown Drive and Building 54 Exit intersection would change from a LOS of C to D, reflecting the new staff pedestrian trips crossing at this intersection from the new parking structures on Taylor Road or Grounds Road.

Build Alternative 4 would improve from a LOS of C to B at the #19 R.B. Brown Drive and Building 54 Exit intersection and from a LOS of B to A at the #20 R.B. Brown Drive at Garage 54 Entrance intersection, but worsen from a LOS of A to B at the #24 East Palmer Road at North Palmer Road and #26 East Palmer Road at Gunnell Road intersections. This would be due to staff trips shifted from R.B. Brown Drive to the new parking facility in H-Lot, entering through Gate #3 and passing through the #26 intersection. There would also be new staff trips entering through Gate #1 headed to the new USU Alternative 2 parking structure passing through the #24 intersection.

Build Alternatives 6 and 7 would improve from a LOS of B to A at the #18 R.B. Brown Drive at North Palmer Road and #20 R.B. Brown Drive at Garage 54 Entrance intersections, but worsen from a LOS of A to B at the #23 R.B. Brown Drive at South Palmer Road, #27 Stokes Road at South Palmer Road, and #28 Grier Road at South Palmer Road intersections. This would be due to patient trips entering through Gate #1 shifted to the new underground parking structure and new staff trips entering through Gate #2 and passing through #23, #27, and #28 intersections destined for the USU Alternative 1 parking structure.

Build Alternatives 8 and 10 would improve from a LOS of B to A at the #20 R.B. Brown Drive at Garage 54 Entrance intersection, but worsen from a LOS of A to B at the #24 East Palmer Road at North Palmer Road, and #26 East Palmer Road at Gunnell Road intersections. This would be due to staff trips shifted from R.B. Brown Drive to the new parking structures entering through Gate #1 and destined to Taylor and Grounds Roads passing through the #24 intersection and shifted staff trips entering through Gate #3 and passing through the #26 intersection headed to Taylor and Grounds Roads. The #19 R.B. Brown Drive and Building 54 Exit intersection would change from a LOS of C to D, reflecting the new pedestrian trips crossing at this intersection from the new parking structures on Taylor Road or Grounds Road.

Build Alternative 9 would improve from a LOS of B to A at the #18 R.B. Brown Drive at North Palmer Road and #20 R.B. Brown Drive at Garage 54 Entrance intersections, and LOS of C to B at the #19 R.B. Brown Drive and Building 54 Exit intersection, but worsen from a LOS of A to B at

the #26 East Palmer Road at Gunnell Road, #27 Stokes Road at South Palmer Road, and #28 Grier Road at South Palmer Road intersections. This would be due to staff trips shifted from R.B. Brown Drive to the new parking facility in H-Lot, entering through Gate #3 and passing through the #26 intersection and entering through Gate #4 and passing through the #27 and #28 intersections. Table 96 shows the AM peak hour HCM internal summary.

Table 96: AM Peak Hour Internal Summary

Highway Capacity Manual - LOS		NB	Alternatives									
			1	2	3	4	5	6	7	8	9	10
18.	Parking Lot/R.B. Brown Drive & North Palmer Road	B	B	B	C	B	C	A	A	B	A	B
19.	R.B. Brown Drive & America Garage/Garage 54 Exit	C	C	C	D	B	D	C	C	D	B	D
20.	R.B. Brown Drive & Garage 54 Entrance	B	A	A	A	A	A	A	A	A	A	A
21.	R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	A	A	A	A	A	A	A	A	A	A	A
22.	R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	A	A	A	A	A	A	A	A	A	A	A
23.	R.B. Brown Drive & South Palmer Road	A	A	A	A	A	A	B	B	A	A	A
24.	East Palmer Road & North Palmer Road/Taylor Road	A	B	B	B	B	B	A	A	B	A	B
25.	East Palmer Road & Visitor Garage Exit/Rixey Road	A	A	A	B	A	B	A	A	A	A	A
26.	East Palmer Road/Gunnell Road & Stokes Road	A	A	A	B	B	B	A	A	B	B	B
27.	AFRRI Driveway/Stokes Road & South Palmer Road	A	A	A	A	A	A	B	B	A	B	A
28.	University Road/Grier Road & South Palmer Road	A	A	A	A	A	A	B	B	A	B	A
29.	University Road & South Palmer Road	A	A	A	A	A	A	A	A	A	A	A
31.	South Wood Road & South Palmer Road	--	A	--	--	--	--	A	--	--	--	--

Based on the PM peak hour HCM analysis, Build Alternatives 1 and 2 would worsen from a LOS of B to C at the #26 East Palmer Road at Gunnell Road and #28 Grier Road at South Palmer Road intersections. This would be due new staff trips entering through Gate #3, headed to the new USU Alternative 2 parking structure in N-Lot passing through the #26 intersection and new staff trips exiting through Gate #2, originating from the new USU Alternative 2 parking structure.

Build Alternatives 3 and 5 would improve from a LOS of B to A at the #21 R.B. Brown Drive at Garage 55 Exit and #23 R.B. Brown Drive at South Palmer Road intersection, but worsen from a LOS of B to C at the #24 East Palmer Road at North Palmer Road and #26 East Palmer Road at Gunnell Road intersections. This would be due to staff trips shifted from R.B. Brown Drive to the new parking structures along Taylor Road and Grounds Road, passing through the #24 intersection and exiting

through Gate #1 and shifted staff trips exiting through Gate #3, originating along Taylor and Grounds Roads passing through the #26 intersection.

Build Alternative 4 would improve from a LOS of C to B at the #18 R.B. Brown Drive at North Palmer Road and from a LOS of B to A at the #21 R.B. Brown Drive at Garage 55 Exit intersection, but worsen from a LOS of B to D at the #26 East Palmer Road at Gunnell Road intersection and from a LOS of B to C at the #28 Grier Road at South Palmer Road intersection. This would be due to staff trips shifted from R.B. Brown Drive to the new parking facility in H-Lot, exiting through Gate #3 and passing through the #26 intersection. There would also be new staff trips exiting through Gate #4 originating at the new USU Alternative 2 parking structure passing through the #28 intersection.

Build Alternatives 6 and 7 would worsen from a LOS of B to C at the #28 Grier Road at South Palmer Road intersection as a result of new staff trips exiting through Gates 2 and 4 passing through intersection #28 originating at the USU Alternative 1 parking structure.

Build Alternatives 8 and 10 would improve from a LOS of B to A at the #21 R.B. Brown Drive at Garage 55 Exit and #23 R.B. Brown Drive at South Palmer Road intersection, but worsen from a LOS of B to C at the #26 East Palmer Road at Gunnell Road intersection. This would be due to staff trips shifted from R.B. Brown Drive to the new parking structures along Taylor Road and Grounds Road, exiting through Gate #3 and passing through intersection #26 originating along Taylor and Grounds Roads.

Build Alternative 9 would improve from a LOS of C to B at the #18 R.B. Brown Drive at North Palmer Road intersection and from a LOS of B to A at the #21 R.B. Brown Drive at Garage 55 Exit intersection, but worsen from a LOS of B to D at the #26 East Palmer Road at Gunnell Road intersection and from a LOS of B to C at the #28 Grier Road at South Palmer Road intersection. This would be due to staff trips shifted from R.B. Brown Drive to the new parking facility in H-Lot, exiting through Gate #3 and passing through the #26 intersection. There would also be new staff trips exiting through Gate #4 originating at the new USU Alternative 1 parking structure passing through the #28 intersection. Table 97 shows the PM peak hour HCM internal summary.

While there would be shifts in the LOS for various internal intersections, the lowest LOS would be a D, which is acceptable for an intersection located in an urban area. Based on this analysis, there would be no significant impact to the internal intersections by any of the Build Alternatives.

Table 97: PM Peak Hour HCM Internal Summary

Highway Capacity Manual - LOS		NB	Alternatives									
			1	2	3	4	5	6	7	8	9	10
18.	Parking Lot/R.B. Brown Drive & North Palmer Road	C	C	C	C	**B**	C	C	C	C	**B**	C
19.	R.B. Brown Drive & America Garage/Garage 54 Exit	*	*	*	*	*	*	*	*	*	*	*
20.	R.B. Brown Drive & Garage 54 Entrance	A	A	A	A	A	A	A	A	A	A	A
21.	R.B. Brown Drive & Drop-Off Loop Entrance/Garage 55 Exit	B	B	B	**A**	**A**	**A**	B	B	**A**	**A**	**A**
22.	R.B. Brown Drive & Drop-Off Loop Exit/Garage 55 Entrance	A	A	A	A	A	A	A	A	A	A	A
23.	R.B. Brown Drive & South Palmer Road	B	B	B	**A**	B	**A**	B	B	**A**	B	**A**
24.	East Palmer Road & North Palmer Road/Taylor Road	B	B	B	**C**	B	**C**	B	B	B	B	B
25.	East Palmer Road & Visitor Garage Exit/Rixey Road	B	B	B	B	B	B	B	B	B	B	B
26.	East Palmer Road/Gunnell Road & Stokes Road	B	**C**	**C**	**C**	**D**	**C**	B	B	**C**	**D**	**C**
27.	AFRRI Driveway/Stokes Road & South Palmer Road	B	B	B	B	B	B	B	B	B	B	B
28.	University Road/Grier Road & South Palmer Road	B	**C**	**C**	B	**C**	B	**C**	**C**	B	**C**	B
29.	University Road & South Palmer Road	A	A	A	A	A	A	A	A	A	A	A
31.	South Wood Road & South Palmer Road	--	B	--	--	--	--	B	--	--	--	--

*** HCM unsignalized intersection capacity analysis result in abnormally high levels of delay at intersections with large pedestrian volumes. This intersection would perform with a similar LOS as the AM conditions, LOS C.**

4.4 Gate Count Summary

Counts at the five gates were made on October 18, 19, 20, and 26, 2011, under the existing conditions. The projected trips to each gate under the No Build condition and ten Build Alternatives were calculated from each alternative's projected intersection turning movement counts, used in previous sections to determine the future intersection operations.

The gate volumes would differ for each alternative, reflecting the shift in patient or staff trips between gates to access the new parking structure serving Building C or by new staff trips destined to the new USU Alternative parking structure sites.

Table 98 shows the AM peak hour 2018 volumes by gate and Table 99 shows the AM peak hour 2018 percent change by gate. Note that the outbound direction at Gate #4 is closed during the AM peak hour; therefore, a zero volume is shown. Also note that the volumes shown for inbound Gate #4 would likely be higher than shown as the existing gate counts were obtained during a period when Gate #4 was the temporary truck entrance, thus passenger vehicles arriving from the

east along Jones Bridge Road would have been required to use Gate #3 or #5 instead of Gate #4.

Table 98: AM Peak Hour 2018 Volumes by Gate

Gates - Proposed Counts		Direction	NB	Alternatives									
				1	2	3	4	5	6	7	8	9	10
7	North Wood Road (Gate #1)	inbound	427	491	488	491	394	491	427	396	423	314	427
		outbound	117	67	115	116	97	117	67	115	116	97	117
9	South Wood Road (Gate #2)	inbound	190	190	190	152	152	152	254	285	220	241	216
		outbound	91	156	107	107	109	106	156	108	107	111	106
11	Gunnell Road (Gate #3)	inbound	254	276	274	314	398	314	254	254	291	372	292
		outbound	122	127	127	127	141	127	122	122	122	137	122
12	Grier Road (Gate #4)	inbound	48	48	48	0	26	0	128	128	31	136	28
		outbound	0	0	0	0	0	0	0	0	0	0	0
13	University Road (Gate #5)	inbound	135	193	190	293	205	293	135	135	233	135	235
		outbound	6	20	18	20	17	20	25	25	25	25	25

Table 99: AM Peak Hour 2018 Percent Change by Gate

Gates - Percent Change		Direction	NB	Alternatives									
				1	2	3	4	5	6	7	8	9	10
7	North Wood Road (Gate #1)	inbound	427	13%	13%	13%	-8%	13%	0%	-8%	-1%	-36%	0%
		outbound	117	-75%	-2%	-1%	-21%	0%	-75%	-2%	-1%	-21%	0%
9	South Wood Road (Gate #2)	Inbound	190	0%	0%	-25%	-25%	-25%	25%	33%	14%	21%	12%
		Outbound	91	42%	15%	15%	17%	14%	42%	16%	15%	18%	14%
11	Gunnell Road (Gate #3)	Inbound	254	8%	7%	19%	36%	19%	0%	0%	13%	32%	13%
		Outbound	122	4%	4%	4%	13%	4%	0%	0%	0%	11%	0%
12	Grier Road (Gate #4)	Inbound	48	0%	0%	-100%	-85%	-100%	63%	63%	-55%	65%	-71%
		Outbound	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
13	University Road (Gate #5)	Inbound	135	30%	29%	54%	34%	54%	0%	0%	42%	0%	43%
		Outbound	6	70%	67%	70%	65%	70%	76%	76%	76%	76%	76%

Table 100 shows the AM peak hour 2018 gate volume change by gate and Table 101 shows the AM peak hour 2018 percent change by gate. Note that the inbound direction at Gate #4 is closed during the PM peak hour; therefore, a zero volume is shown.

Table 100: PM Peak Hour 2018 Volume Change by Gate

Gates - Proposed Counts		Direction	NB	Alternatives									
				1	2	3	4	5	6	7	8	9	10
7	North Wood Road (Gate #1)	Inbound	85	112	111	112	96	112	85	83	84	70	85
		outbound	464	423	443	453	334	456	431	451	460	342	464
9	South Wood Road (Gate #2)	Inbound	102	102	102	97	97	97	129	131	125	127	124
		outbound	198	306	283	235	250	232	298	278	228	251	224
11	Gunnell Road (Gate #3)	Inbound	166	175	175	180	191	180	166	166	171	182	171
		outbound	373	371	371	411	498	412	373	373	413	500	414
12	Grier Road (Gate #4)	Inbound	0	0	0	0	0	0	0	0	0	0	0
		outbound	342	433	430	328	429	324	423	423	318	433	314
13	University Road (Gate #5)	Inbound	7	32	30	32	27	32	41	41	41	42	41
		outbound	7	0	0	105	0	108	7	7	113	7	116

Table 101: AM Peak Hour 2018 Percent Change by Gate

Gates - Percent Change		Direction	NB	Alternatives									
				1	2	3	4	5	6	7	8	9	10
7	North Wood Road (Gate #1)	Inbound	85	24%	23%	24%	11%	24%	0%	-2%	-1%	-21%	0%
		outbound	464	-10%	-5%	-2%	-39%	-2%	-8%	-3%	-1%	-36%	0%
9	South Wood Road (Gate #2)	Inbound	102	0%	0%	-5%	-5%	-5%	21%	22%	18%	20%	18%
		outbound	198	35%	30%	16%	21%	15%	34%	29%	13%	21%	12%
11	Gunnell Road (Gate #3)	Inbound	166	5%	5%	8%	13%	8%	0%	0%	3%	9%	3%
		outbound	373	-1%	-1%	9%	25%	9%	0%	0%	10%	25%	10%
12	Grier Road (Gate #4)	inbound	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		outbound	342	21%	20%	-4%	20%	-6%	19%	19%	-8%	21%	-9%
13	University Road (Gate #5)	inbound	7	78%	77%	78%	74%	78%	83%	83%	83%	83%	83%
		outbound	7	-100%	-100%	93%	-100%	94%	0%	0%	94%	0%	94%

4.5 Internal Parking

The 2018 No Build condition parking facility inventory provided a base for determining how much parking would potentially be available for the 270 new employees anticipated to be added to the installation as part of the ten Build Alternatives. For alternatives where existing parking lots would be replaced by a new parking facility, those lost spaces were assumed to be provided for within the new parking structure. This would reduce the number of available new spaces for new staff expected by 2018.

The study assumed the proposed new parking structure in the existing N-Lot would have 62 spaces assigned to former N-Lot users. Additionally, the study assumed the proposed new parking structure in H-Lot would have 110 spaces assigned to former H-Lot users and the proposed new parking structure in Z-Lot would have 17 spaces assigned to former Z-Lot users. If the G-Lot was affected by the new

underground parking facility, then the study assumed that 82 spaces in the new USU parking structure site would be assigned to those users.

Build Alternatives 1, 2, 3, 4, 5, 8 and 9 would displace existing parking. Existing employees with parking spaces in the displaced lots would be re-assigned spaces in other lots on campus or in new lots. Therefore, the number of new staff trips generated by any given Build Alternative would be calculated by subtracting the number of displaced staff parking spaces from the total number of staff spaces to be provided under the alternative. The number of peak hour trips used to calculate traffic impacts was derived by comparing the number of remaining parking spaces to the maximum trip generation rate of 270 new employees. If the remaining spaces were equal or greater than 270, then all 270 generated trips were included in the alternative. If less than 270 spaces remained, then the remaining number of spaces was used as the trip generation rate for the alternative. The total patient, visitor and barracks spaces were also calculated. However, the new trips were only staff; therefore, staff spaces were the only focus of the traffic study.

The total NSA Bethesda available parking is bound by the NCPC staff parking ratio of one space for every three employees. To ensure that NSA Bethesda would adhere to NCPC policy and to determine if additional staff parking could be constructed after the 2018 proposed buildings and parking structures are complete, the NCPC ratio was calculated for the existing condition, project 2018 No Build condition and Build Alternatives. Under all Build Alternatives, the staff parking ratio would remain greater than the NCPC ratio of one space: three employees. Table 102 shows the parking summary.

4.6 Bicycle and Pedestrian Impacts

The bicycle and pedestrian network were discussed in the existing conditions, providing the Bicycle and Pedestrian Impact Statement elements required in the M-NCPPC-LATR. This included existing bicycle routes, storage racks, and counts as well as pedestrian counts, sidewalk extent and widths, and ADA compliant curbing.

Each alternative was evaluated for bicycle and pedestrian impacts, including the addition of pedestrian trips at each appropriate intersection to determine the impact, if any, to vehicle operations. For Build Alternatives 1-5, pedestrian flows between the proposed USU Alternative 2 parking structure in N-Lot and the Medical Buildings were analyzed and sidewalk widths were checked to ensure a safe walkway would exist. For the Build Alternatives 6-10, an additional intersection was included to connect with the proposed USU Alternative 1 parking structure south of South Palmer Road across from the USU. For Build Alternatives 3-5, and 8-10, pedestrian flows between the proposed parking structures along Taylor Road or Grounds Road were analyzed and sidewalk widths were checked to ensure a safe walkway would exist. For Build Alternatives 4 and 9, the Stokes Road at

Gunnell Road intersection was analyzed to connect the proposed H-Lot parking structure to the Medical Buildings.

Table 102: Parking Summary

ALT				Total Staff	Total Patient	Total Visitor	Total Barracks	Total Gov't	Capacity	NCPC
Existing Condition				3,525	2,436	1,120	457	148	7,686	3.32
No Build Condition				3,484	2,286	1,512	601	229	8,112	3.54
ALT	**New Staff spaces**	**New Patient spaces**	**Spaces Shifted**	**Total Staff**	**Total Patient**	**Total Visitor**	**Total Barracks**	**Total Gov't**	**Capacity**	**NCPC**
Alt 1:	338	500	N-LOT=62	3,822	2,786	1,512	601	229	8,950	3.30
Alt 2:	256	500	G-LOT=82 N-LOT=62	3,740	2,786	1,512	601	229	8,868	3.37
Alt 3:	321	500	N-LOT=62 Z-LOT=17	3,805	2,786	1,512	601	229	8,933	3.31
Alt 4:	228	500	N-LOT=62 H-LOT=110	3,712	2,786	1,512	601	229	8,840	3.40
Alt 5:	338	500	N-LOT=62	3,822	2,786	1,512	601	229	8,950	3.30
Alt 6:	400	500		3,884	2,786	1,512	601	229	9,012	3.25
Alt 7:	318	500	G-LOT=82	3,802	2,786	1,512	601	229	8,930	3.32
Alt 8:	383	500	Z-LOT=17	3,867	2,786	1,512	601	229	8,995	3.26
Alt 9:	290	500	H-LOT=110	3,774	2,786	1,512	601	229	8,902	3.34
Alt 10:	400	500		3,884	2,786	1,512	601	229	9,012	3.25

Existing Condition ratio based upon population of 11,686
No Build Condition ratio based upon population of 12,341
Build Alternatives ratio based upon population of 12,611

Table 103 shows the AM peak hour 2018 Build Alternative new pedestrian trips and Table 104 shows the PM peak hour 2018 Build Alternative new pedestrian trips. These new trips would be the result of shifted and new staff trips required to walk from one of the new parking structures to their office in the Medical Building or USU campus.

Table 103: AM Peak Hour 2018 Build Alternative New Pedestrian Trips

Pedestrian Trips Added	Alternatives									
	1	2	3	4	5	6	7	8	9	10
R.B. Brown Drive & America Garage/Garage 54 Exit			285		294			285		287
R.B. Brown Drive & South Palmer Road	17	48	26	308	17	17	48	22	311	17
East Palmer Road & North Palmer Road/Taylor Road			285		294			285		287
East Palmer Road/Gunnell Road & Stokes Road				230					230	
AFRRI Driveway/Stokes Road & South Palmer Road	17	48	26	78	17	17	48	22	81	17
University Road/Grier Road (Gate #4) & South Palmer Road						178	202	174	242	178

Table 104: PM Peak Hour 2018 Build Alternative New Pedestrian Trips

Pedestrian Trips Added	Alternatives									
	1	2	3	4	5	6	7	8	9	10
R.B. Brown Drive & America Garage/Garage 54 Exit			297		305			297		301
R.B. Brown Drive & South Palmer Road	16	31	20	320	16	16	31	24	322	16
East Palmer Road & North Palmer Road/Taylor Road			297		305			297		301
East Palmer Road/Gunnell Road & Stokes Road				239					239	
AFRRI Driveway/Stokes Road & South Palmer Road	16	31	20	81	16	16	31	24	83	16
University Road/Grier Road (Gate #4) & South Palmer Road						209	215	208	276	209

In addition to NSA Bethesda having adequate sidewalk widths and curbing, the NSA Bethesda Accessibility Capital Improvement Plan recommends improving the sidewalks along the entire length of R.B. Brown Drive and Taylor Road, which will improve the future connections between the Medical Buildings and the proposed parking structures along Taylor and Grounds Roads.

Although alternatives to the underground parking garage are more distant from the Medical Facilities where most of the staff work, based upon the existing sidewalk widths, available internal and external sidewalk network, and available bicycle external network and internal storage racks, there would be no significant impact from implementing any of the alternatives with regard to bicycle and pedestrian accessibility at NSA Bethesda.

5.0 Construction Impacts

The construction conditions include parking, sidewalk, and truck access through Gate #5. The parking section includes the NSA Bethesda plan for handling parking needs during the construction period. The sidewalk section includes discussion of the potential temporary impacts to the internal and external network due to construction activities, and the Gate #5 construction truck impacts consists of a trucking queue analysis to determine if any temporary measures might be recommended to mitigate potential queues.

5.1 Parking

Overall parking at NSA Bethesda is impacted on a daily basis due to major and minor construction projects. On the average day, approximately 100 spaces are lost to construction staging, storage, and contractor vehicles associated with both capital improvements and ongoing maintenance of existing facilities. These impacts are coordinated to allow for the least possible impact to the installation patient population.

To minimize impacts on installation parking from construction workers, the Navy will contractually limit construction worker parking to within the construction sites and lay down areas. It is anticipated that the limited construction parking would be utilized for contractor management staff, on-site government representatives, and visitors. Further, for those construction contractors who do not receive on-site construction parking, the Navy will contractually require the contractors to utilize mass transit options to access the installation. The Navy will require documented verification of these provisions and to ensure compliance, may conduct security inspections and badge verifications at the installation entrance(s) or at the contractor-provided parking site.

The number of peak trips to the installation may temporarily increase due to construction worker trips during the construction period, which is projected to last 66 months. Additionally, staff commuting patterns may be temporarily altered due to shifts in parking locations. NSA Bethesda will seek to minimize impacts on parking and the road network during this period by employing constraints on construction worker parking (as described above) and the mitigation strategies discussed in Section 7.0.

5.2 Sidewalk Impacts

During the construction period within the NSA Bethesda installation, there would be temporary sidewalk closings, temporary new connections provided to compensate for the sidewalk closings when necessary, and sidewalk impacts such as narrowed or torn up sidewalks.

As all construction would occur internally to the installation, the external sidewalk or bicycle network along Rockville Pike or Jones Bridge Road would not be significantly impacted.

These impacts would be short term and would not have any long-term impacts. NSA Bethesda will seek to minimize these impacts by employing the mitigation strategies discussed in Section 7.0.

5.3 Gate #5 Construction Truck Impacts

NSA Bethesda operates five Gates: two on Rockville Pike and three on Jones Bridge Road. Passenger vehicles may enter through any one of the five gates, depending on the hours of operation. However, trucks must enter through the newly upgraded Gate #5.

5.3.1 ***Existing Condition***

Gate #5 is located on the southeastern corner of NSA Bethesda along University Road, connecting Jones Bridge Road to the USU campus. There are two sets of security gatehouses, one serving private vehicles and the other only serving commercial vehicles as the official NSA Bethesda CVIF. The security gatehouse serving private vehicles is located directly along University Road, with one inbound and one outbound lane operating between the hours of 5:00 AM and 6:00 PM, Monday through Friday. Commercial vehicles exiting NSA Bethesda would exit mainly through Gate #1 on Rockville Pike.

The security gatehouse serving the commercial vehicles is located to the right of the private vehicle inspection area and can store four trucks at one time, two under the gatehouse and two directly behind them. Once a truck is cleared, it may proceed northbound through the CVIF gatehouse to Perimeter Road and access the rest of the installation. If the NSA Bethesda security does not clear a truck, then the truck must use the truck turnaround bay, located on the right side, directly past the inspection area. Once in the truck turnaround bay, a truck may wait to be cleared or return to University Road and exit the installation. Figure 69 shows Gate #5.

On Tuesday, February 21st, between 6:30 AM and 9:00 AM, truck arrival counts and inspection times by truck type were collected to observe an existing queue condition. Based upon the data collection effort, 54 trucks entered through Gate #5's CVIF, composed of dump trucks, trucks carrying food, mail trucks (United Parcel Service and Federal Express), trucks carrying waste, contractor vehicles, and vans. Truck sizes ranged from small contractor pick-up trucks through 53-foot tractor trailers.

The average processing times by truck types ranged between 27 seconds for a Coca Cola truck to 148 seconds (2 minutes and 28 seconds) for a tractor trailer carrying food. Other than the large truck carrying food, most of the other truck processing times ranged between 45 to 65 seconds. Five dump trucks took an average of 47 seconds to pass

through the CVIF. Table 105 contains an existing truck arrival and inspection summary.

Table 105: Existing Truck Arrival and Inspection Summary

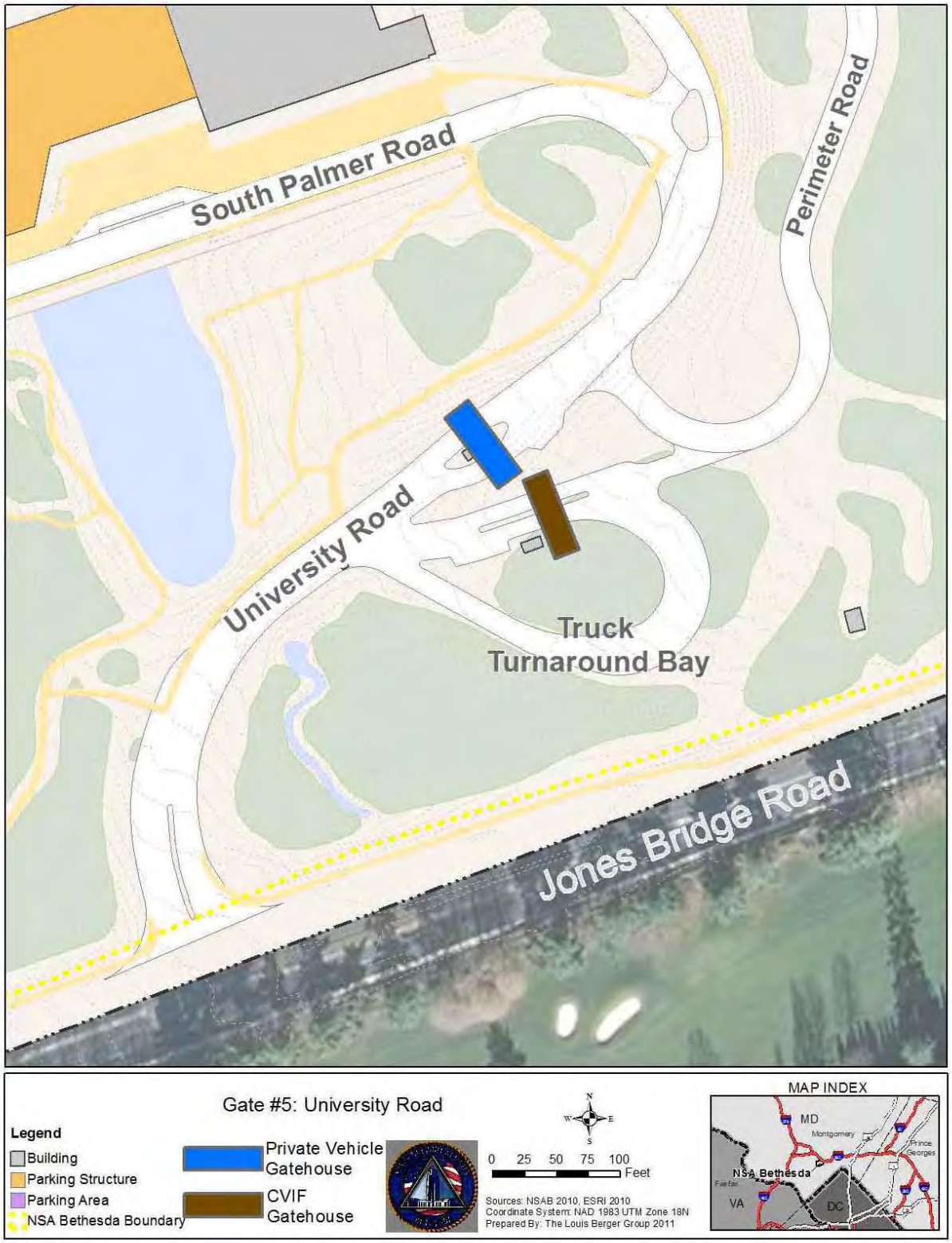
Time Periods	Trucks Arriving	Average Inspection Time (in seconds)
6:30am - 6:45am	3	60.0
6:45am - 7:00am	7	82.4
7:00am - 7:15am	4	42.8
7:15am - 7:30am	7	60.4
7:30am - 7:45am	6	72.2
7:45am - 8:00am	3	53.3
8:00am - 8:15am	3	17.3
8:15am - 8:30am	7	57.1
8:30am - 8:45am	7	72.0
8:45am - 9:00am	7	33.7
Grand Total	**54**	**58.1**

Based on the existing truck arrivals and average inspection times, there are two peak hours, between 6:30 AM and 7:30 AM, and 8:00 AM and 9:00 AM. Both of those peak hours totaled 24 trucks arriving at the Gate #5 CVIF. According to a field survey, a maximum of four trucks could be stored at one time during the two peak periods, with the security staff inspecting three trucks at one time.

5.3.2 *Future Condition*

To determine the worst case scenario for construction truck impacts, the study used July 1, 2015 through June 30, 2016, as the future year. Based on the current construction schedule estimates, during this time period, the new Medical Facility (Building C), new parking structure serving Building C, and USU expansion building and new parking structure would be under construction. In addition, there will be utility upgrades involving construction or repairs, and a number of Medical Facility buildings, USU buildings and Building 13 will be undergoing renovation.

Figure 69: Gate #5



5.3.2.1 Estimated Trucks

The study projected future construction trucks by first dividing the construction into two distinct periods. The initial period, scheduled to require approximately 2 years, would include the excavation or demolition required for the Medical Facility garage, as well as a number of smaller accessibility and appearance plan projects and utility upgrades. A set of estimates was developed for the maximum amount of earth or debris that could potentially be generated by excavation or demolition under each of the alternatives for Medical Facilities Development parking. The number of dump trucks required to remove this earth or debris from the installation was estimated under the assumption that all earth and debris would potentially require off-site disposal. The material requirements and resulting trucks for the other several smaller proposed projects that are currently scheduled to occur during the same period as the excavation or demolition for the parking garage were also added. To be conservative, one 250-day construction year was assumed and an average daily requirement for trucks was estimated.

The second period of construction was assumed to include all remaining projects, including necessary demolition of existing buildings and construction of Medical Facilities Development and the parking garage, the majority of utility upgrades, all proposed renovation, and the USU Expansion. Estimates were made of the construction materials needed to be brought onto the installation for new construction and renovation, and estimates were made of construction and demolition (C&D) debris that would need to be removed during the same time period. The estimates were based upon average factors for nonresidential buildings determined by a study conducted for the U.S. Environmental Protection Agency by Franklin Associates. The types of trucks that would be used and their capacity were assumed based upon those typically used to support construction. It was also assumed, conservatively, that supply trucks used to bring in materials would not be used to remove the C&D debris; rather, separate dump trucks that come on-site empty would be used to remove the C&D debris. Again, to be conservative, it was assumed that although these actions are scheduled to occur over several years, all would take place over one construction year of 250 days. The resulting total tonnage coming on-site and being removed from the installation was then allocated to the trucks to derive an average requirement for trucks per day.

The result was 37 trucks per day during the second period. The second period required more trucks than the first and was therefore used as the number of trucks entering the facility each day on average. This estimate of 37 trucks per day was used for the analysis of construction traffic impacts.

5.3.2.2 Queue Analysis

The queue analysis consists of calculating the most severe case estimate for the number of trucks that would enter at Gate #5, the

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average length of time to inspect each truck, and determining the storage space to handle the truck demand.

To calculate the number of trucks entering Gate #5 during the AM peak hour, the existing peak hour number plus the estimated future peak hour number were summed. As surveyed, the existing peak hour was 24 trucks per hour. These included mail, food, contractors, and trash.

Based upon the assumptions discussed in the previous section, there would be approximately 37 additional construction trucks per day. Using the 24 hour Grier Road (Gate #4) automated traffic recorder (ATR) data used to calculate the existing volumes, the study obtained a 3 day sample of northbound traffic volumes. During the time the ATR was placed on Grier Road, Gate #4 served as the CVIF, with all other vehicles required to use one of the other four gates to enter the installation. This data provided a quality sample to calculate the maximum percent of daily trucks that would arrive during the peak hour. Based upon the data, an average of 17.51 percent of trucks arrived at the installation during the AM peak hour (average of 18.29 percent, 18.40 percent, and 15.83 percent). The resulting peak hour additional construction truck flow would be 7 trucks per hour (6.48 rounded to the next whole number).

The total number of trucks per hour (existing plus future) would be 31 trucks per hour in 2015. If the average time to inspect a truck was observed to be between 45 and 65 seconds, the study used the severe case scenario by rounding to the next minute or 2 minutes, with two trucks inspected at one time. This would result in the security staff processing 60 trucks per hour (60 minutes in an hour divided by 2 minutes inspection time, times two inspection stations).

Currently, the CVIF can store four tractor trailer trucks; two inspection slots with one truck queued directly behind. Based on 31 trucks per hour arriving during the AM peak hour and a uniform arrival rate, there would be no queue, as the existing facility can handle up to 60 trucks per hour. Figure 70 shows the existing tractor trailer truck storage.

As the arrival rates for the trucks would not be uniform, the Poisson distribution was used to calculate the probability of truck arrivals. According the Poisson distribution, there would be a probability of 32.33 percent that two, 14.29 percent that three, 5.27 percent that four, 1.66 percent that five, and 0.45 percent that six trucks would arrive during a 2 minute interval. Based upon these calculations, there would be a 95 percent or greater probability that no more than four trucks would arrive, the maximum number that the existing facility can store, and an 85 percent probability that no more than two trucks would arrive at the same time.

Since there would be less than a 2 percent probability that more than four trucks would arrive at the same time to Gate #5, and that this

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analysis assumes all four trucks would be tractor trailers, there would be no significant queue impact to the CVIF and Gate #5.

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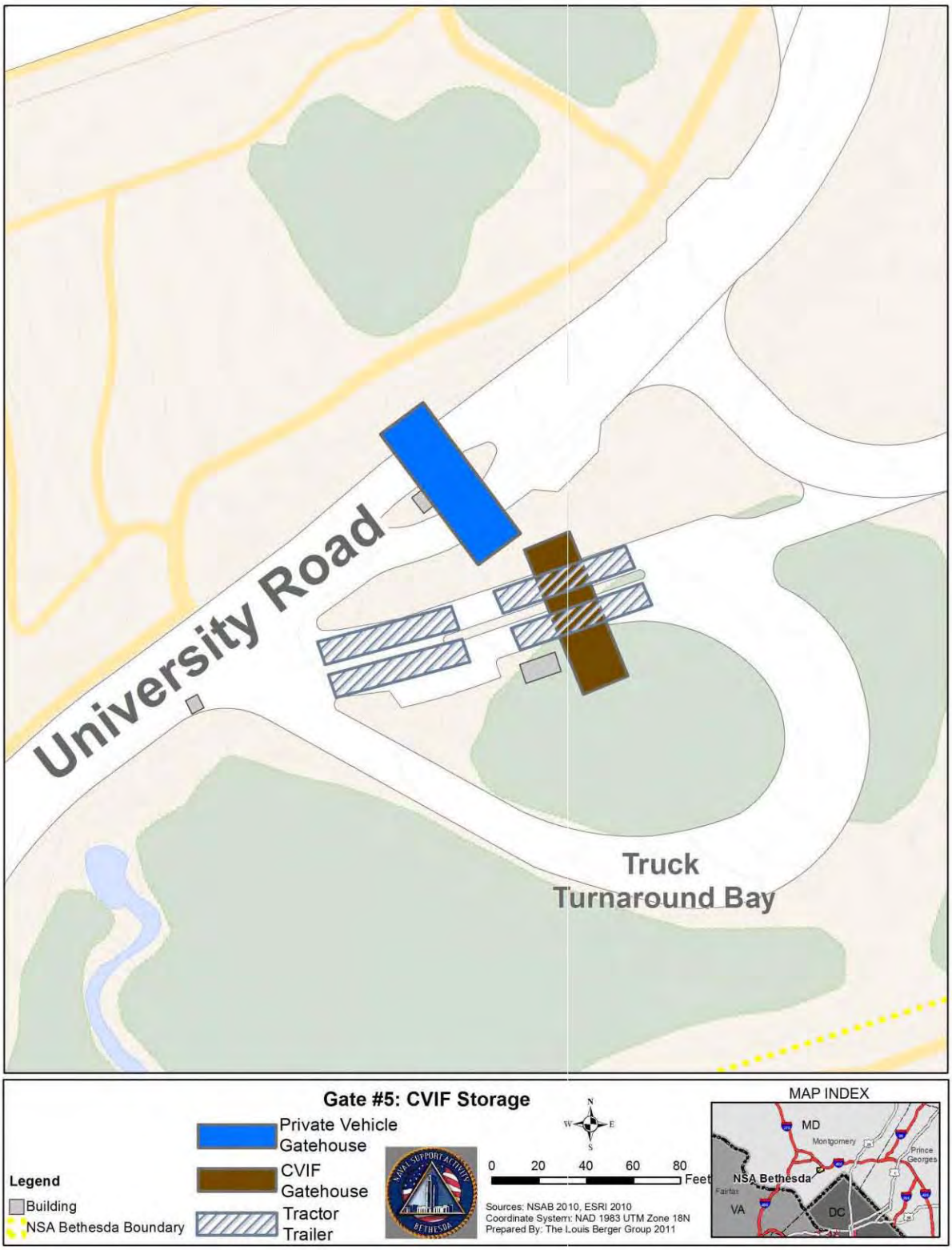
Figure 70: Existing Tractor Trailer Truck Storage



6.0 Proposed Action Recommendations

The existing conditions provided a starting point for analyzing the NSA Bethesda roadway system and approved external roadway network. The 2018 No Build condition was then developed using the background trips, planned development trips (adjusting to the No Build condition parking constraints), planned roadway improvements, planned transit improvements, and parking lot shifts due to planned lot closures. From the 2018 No Build condition, ten 2018 Build Alternatives were developed and analyzed to determine the effects on the external roadways, internal roadways, and bicycle/pedestrians.

For the external roadway, there were no significant impacts to any of the intersections or arterials when comparing the 2018 No Build condition to the 2018 Build Alternatives. Although some intersections would experience a slight decline in LOS, no intersections would shift to a failing LOS. Therefore, no mitigation measures are recommended for the external roadway intersections.

For the internal roadway network, there were no significant impacts to any of the intersections when comparing the 2018 No Build condition to the 2018 Build Alternatives. Therefore, no mitigation measures are recommended for the internal roadway intersections.

For the bicycle and pedestrian network, there are ample sidewalks, bike racks, and ADA compliant curbing at intersections where new pedestrian trips would occur. Therefore, no mitigation measures are recommended for the bicycle or pedestrian network. However, it is recommended that if one of the 2018 Build Alternatives 6 through 10 be implemented, signing and pedestrian markings clearly identify an appropriate crossing location between the new parking structure serving Building F and the USU. This recommendation is to accommodate the 161 AM peak hour and 193 PM peak hour new pedestrian trips created by the 220 USU employees being consolidated to NSA Bethesda.

It is also recommended that the Installation TMP continue to be implemented to reduce the number of vehicle trips on the external and internal roadway system by using the Metro, Montgomery County transit system, vanpools, carpools, and bicycle trails. The sustained implementation of the TMP would continue to ensure that the transportation system in the area functions efficiently.

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7.0 Construction Recommendations

To keep the installation functioning and to preserve staff parking during construction, NSA Bethesda would implement the following basic step. To minimize impacts on installation parking from construction workers, the Navy would contractually limit construction worker parking to within the construction sites and lay down areas. It is anticipated that the limited construction parking would be utilized for contractor management staff, on-site government representatives, and visitors. Further, for those construction contractors who do not receive on-site construction parking, the Navy would contractually require the contractors to utilize mass transit options to access the installation. The Navy would require documented verification of these provisions and to ensure compliance, may conduct security inspections and badge verifications at the installation entrance(s) or at the contractor-provided parking site. These steps would minimize the impact of the construction of NSA Bethesda's ultimate mission of medical care, medical research, and recovery services to aid our nation's wounded warriors.

To address the internal sidewalk needs to enable staff, patients, visitors, and residents to safely and easily access the installation, NSA Bethesda will provide signing to alert pedestrians of closed sidewalks and direct them to the temporary or alternative existing sidewalks through construction zones. In addition, NSA Bethesda construction contractors will install temporary barriers to protect pedestrians from vehicular traffic in areas where sidewalks are narrowed or shifted closer to the roadway. Lastly, any sidewalk shifts or closures would be announced to alert potential users of the pending sidewalk system changes.

The truck queue analysis determined that the existing truck volumes added to the projected additional short-term construction truck volumes would be less than the total number of trucks that the existing commercial vehicle inspections station can accommodate. In addition, the Navy will contractually limit the construction contractors to stagger their truck arrivals to operate within the capacity of the commercial vehicle inspection facility. An arrival analysis determined there would be less than a 2 percent probability that five trucks would arrive at the same time. Based upon this analysis, there would be no significant queuing impacts caused by the construction trucks at Gate #5.

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8.0 Bibliography

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9.0 Appendices

Appendix D1 – EXTERNAL ROADWAY MSHA DESIGNS

Appendix D2 – DETAILED TRIP GENERATION TABLES

Appendix D3 – GATES 3 AND 4 GATE DESIGNS

Appendix D4 – UNDERGROUND PARKING GARAGE CONCEPTS

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APPENDIX D1 – EXTERNAL ROADWAY MSHA DESIGNS

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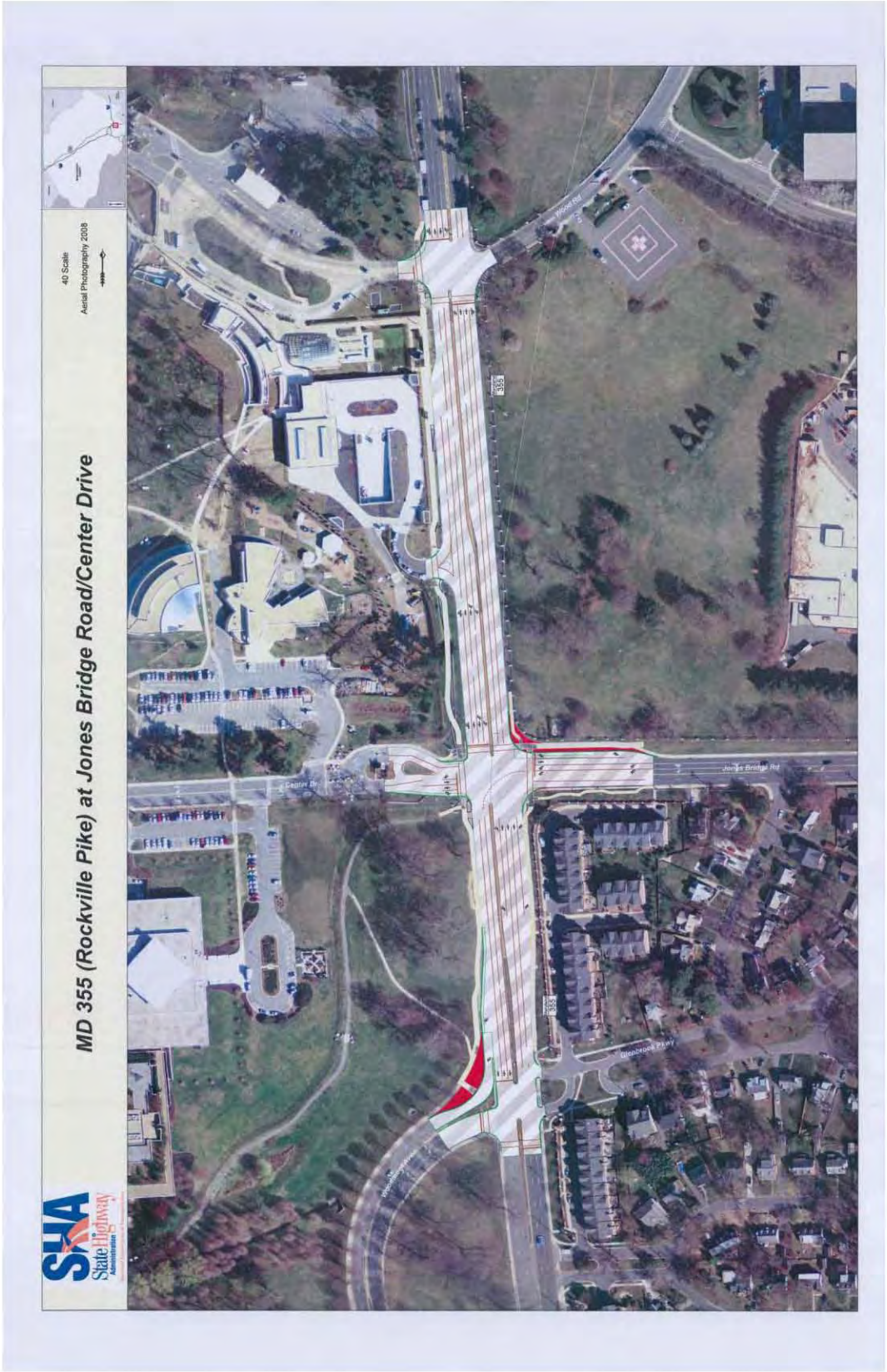
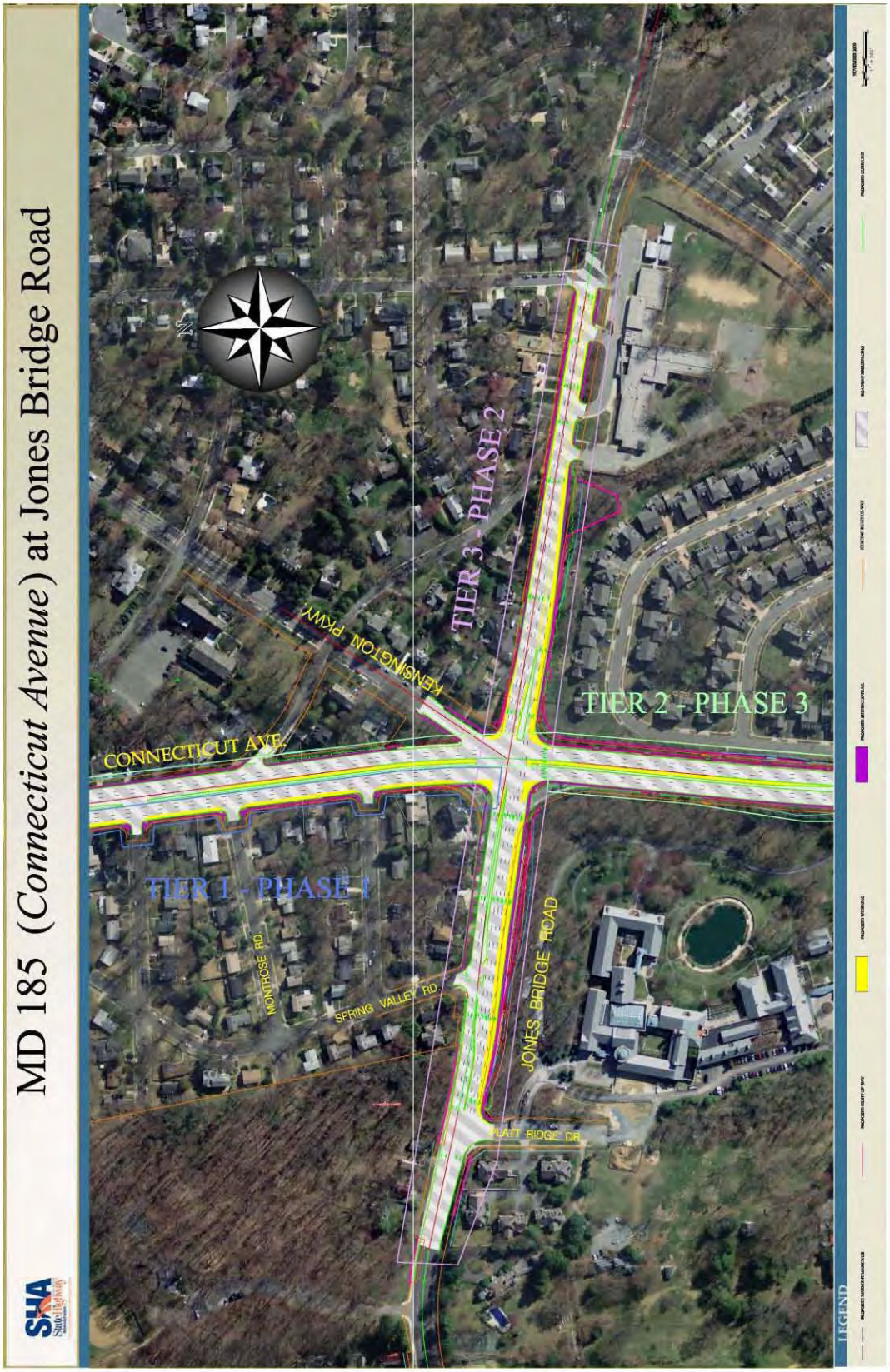
SHA
State Highway Administration
MD 187 (Old Georgetown Rd)
at W. Cedar Lane and Oakmont Ave.
30 Scale
Aerial Photography 2008
Maryland 187
Johnson Ave
Oakmont Ave
W. Cedar Lane
Oak Place
Center Drive
Maryland 187
Sonoma Rd

MD 355 (Rockville Pike)
at Cedar Lane and W. Cedar Lane
50 Scale
Aerial Photography 2008
N
SHA
State Highway
Administration
W. Cedar Lane
Cedar Way
Locust Hill Rd
Cedar Lane
East Drive
Wilson Lane
MARYLAND
355
MARYLAND
355


MD 355 (Rockville Pike) at Jones Bridge Road/Center Drive
SHA
State Highway
Administration
40 Scale
Aerial Photography 2008
Center Dr
Jones Bridge Rd
Woodmont Ave
Woodmont Pkwy
355


MD 185 (Connecticut Avenue) at Jones Bridge Road
SHA
State Highway
N
CONNECTICUT AVE.
KENSINGTON PKWY
TIER 3 - PHASE 2
TIER 2 - PHASE 3
TIER 1 - PHASE 1
MONTROSE RD.
SPRING VALLEY RD.
JONES BRIDGE ROAD
PLATT RIDGE DR.
LEGEND

APPENDIX D2 – DETAILED TRIP GENERATION

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Table D2-1: Detailed Trip Generation Rate Calculations for Background Development

	Facility Name	Development Use	Square Feet/ Dwelling Unit	AM Peak Hour				PM Peak Hour			
				In	Out	Pass -by	Total	In	Out	Pass-by	Total
1	FASEB Office Addition (Office park expansion)	*Existing Headquarters	167,312	160	10	**0**	170	16	160	**0**	176
		***Future Expansion**	**40,000**	**38**	**2**	**0**	**40**	**4**	**38**	**0**	**42**
		*Total Headquarters	207,312	198	12	0	210	20	198	0	218
2	Alta Vista at ACC (New development)	**Single family homes**	**37**	**7**	**22**	**0**	**29**	**22**	**12**	**0**	**34**
3	NIH – Porter Neuroscience Research Lab	Office	[1]200 Veh. per day	40	0	0	40	0	36	0	36
4	Suburban Hospital (Hospital Expansion)	*Existing Total	418,887	210	86	0	296	92	212	**0**	304
		***Future Expansion**	**114,996**	**111**	**35**	**0**	**146**	**51**	**130**	**0**	**182**
		*Future Total	533,883	321	121	0	442	143	342		486
5	Glen Aldon on Battery Lane (Med-Rise to be replaced)	Existing Med-Rise	260	23	94	0	117	78	39	0	117
		Future High-Rise	694	42	166	0	208	139	69	0	208
		Differential		**19**	**72**		**91**	**61**	**30**		**91**
6	Woodmont View (Office and house to be Replaced)	**Office**	**4,200**	**-5**	**-1**	**0**	**-6**	**-1**	**-5**	**0**	**-6**
		Single Family	1	0	1	0	1	1	0	0	1
		Mid-Rise	46	4	17	0	21	14	7	0	21
		Residential Diff.		**4**	**16**		**20**	**13**	**7**		**21**
		[2]Restaurant	3,200	0	0	0	0	9	4	11	24
		Extended Stay Fac.	5	0	2	0	2	1	1	0	2
		Total Retail		**0**	**2**		**2**	**10**	**5**		**26**
7	8300 Wisconsin Avenue (New development)	**High-Rise**	**350**	**21**	**84**	**0**	**105**	**70**	**35**	**0**	**105**
		Hotel	150 rooms	20	13	0	33	18	15	0	33
		Grocery Store	50,000	43	18	0	61	155	155	0	310
		Total Retail		**63**	**31**		**94**	**173**	**170**		**343**
8	Woodmont Central - A (Gas station to be replaced)	**Office**	**81,107**	**104**	**18**	**0**	**122**	**31**	**91**	**0**	**122**
		Gas Station/ Mart	6 pumps	22	20		42	23	22		45
		Retail	10,505	4	3		7	13	14		27
		Retail Differential		**-18**	**-17**		**-35**	**-10**	**-8**		**-18**
9	BRAC - National Navy	(Include in existing Counts)									
10	Chevy Chase Lake East (Retail to be replaced)	**Office**	**74,356**	**103**	**15**	**0**	**118**	**22**	**105**	**0**	**127**
		Retail(existing)	67,009	40	36	51	127	158	146	202	506
		Retail(new)	174,016	108	100	138	346	432	398	553	1,383
		Retail Differential		**68**	**64**		**132**	**274**	**252**		**526**

BOLD values used for determining new trips generated
*Trip generation rates obtained from proposed development traffic study

[1] Trips based on 200 vehicles per day or 100 entering vehicles during the AM peak hour and 100 vehicles departing during the PM peak hour. To determine peak hour the numbers were adjusted by multiplying the percentage resulting from dividing the existing condition peak hour vehicles entering/exiting all NSAB gates divided by the existing condition peak hour vehicles entering/exiting all NSAB gates to determine peak hour trips. (AM – 2,125 peak hour / 5,250 peak hour = 40% or 40 trips & PM – 1,834 peak hour/ 5,028 peak hour = 36% or 36 trips)
[2] ITE Land Use Code 931 (Quality Restaurant)

Table D2-2: Detailed Trip Generation Rate Calculations for Planned Development

	Facility Name	Development Use	Square Feet/	AM Peak Hour			PM Peak Hour		
			Dwelling Unit Employees	In	Out	Total	In	Out	Total
3	[3]Sanctuary Hall	Assisted Living	200 Beds	25	9	34	30	28	58
4	Child Development Center (CDC)	[4]Day Care Center	63 employees	55	48	103	47	54	101
5	United Service Organization (USO)	[5]Community Center	5 employees	3	1	4	2	2	4
6	Public Private Venture	Rehabilitation of Houses	N/A						
7	[6]Navy Exchange (NEX)	Existing Market	48,029 SQ FT	0	0	0	31	31	62
		New Market	150,000 SQ FT	0	0	0	65	65	130
		Differential		**0**	**0**	**0**	**34**	**34**	**68**
8	[7]Navy Lodge	Hotel Style Facility	64 Rooms	15	9	24	20	18	38
10	Helipad	N/A	N/A						
	Medical Facility	Naval Dosimetry Center	6 employees	2	0	2	0	2	2
	USU growth	Staff growth	306 employees	55	12	67	26	64	90
	Credit Union	[8]New Employees	5 employees	3	0	3	4	4	8

The CDC, USO, Medical Facility, USU, and Credit Union trips reduced by 66 percent to reflect employee parking ratio

[3] Trips reported in Wounded Warrior Transition and Navy Lodge Expansion at NSAB Environmental Assessment
[4] ITE Land Use Code 565 (Day Care Center)
[5] ITE Land Use Code 435 (Recreational Community Center
[6] Trips reported in the Navy Exchange Replacement at NSAB Environmental Assessment
[7] Trips reported in Wounded Warrior Transition and Navy Lodge Expansion at NSAB Environmental Assessment
[8] ITE Land Use Code 912 (Bank)

APPENDIX D3 – GATES 3 AND 4 GATE DESIGNS

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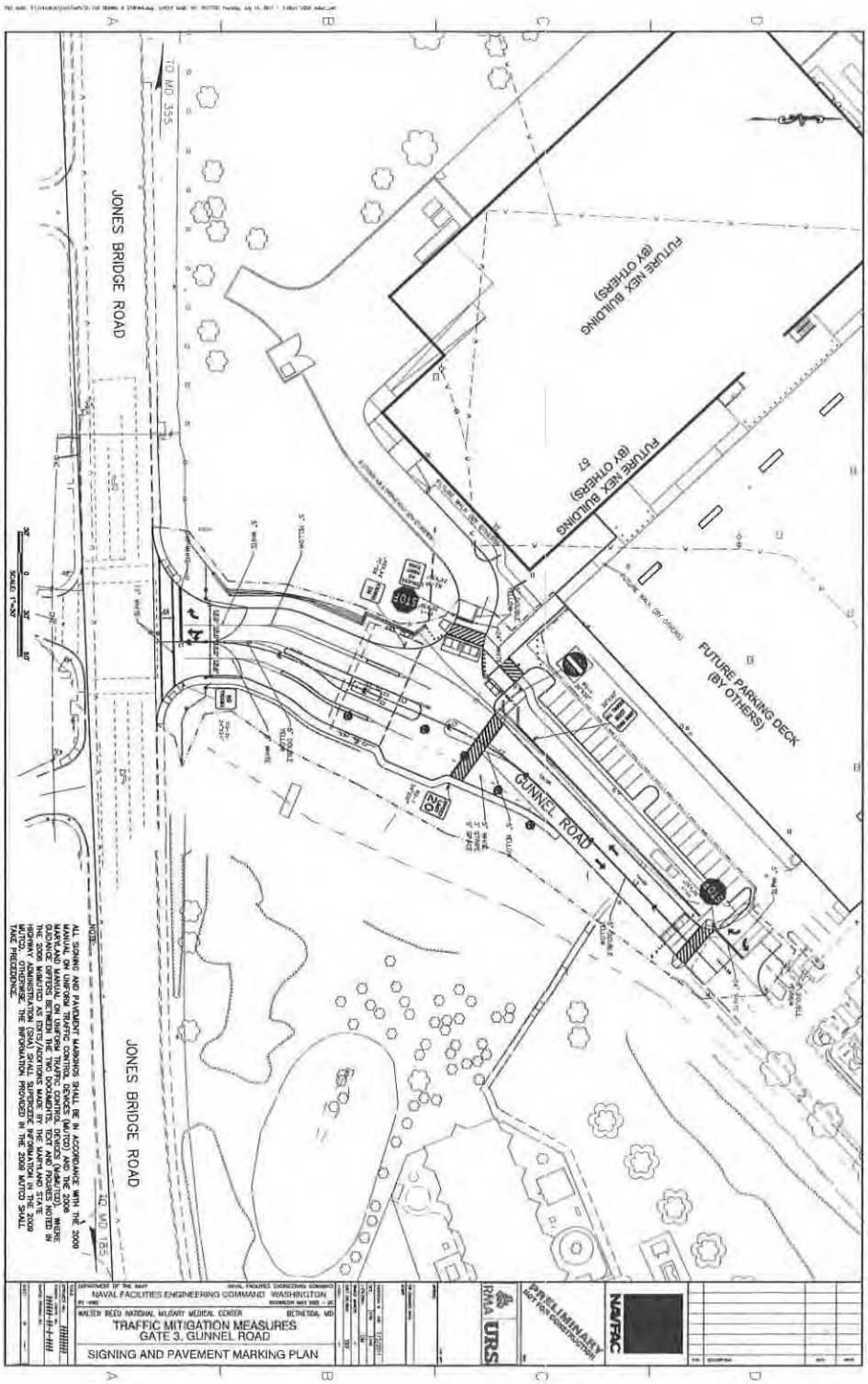
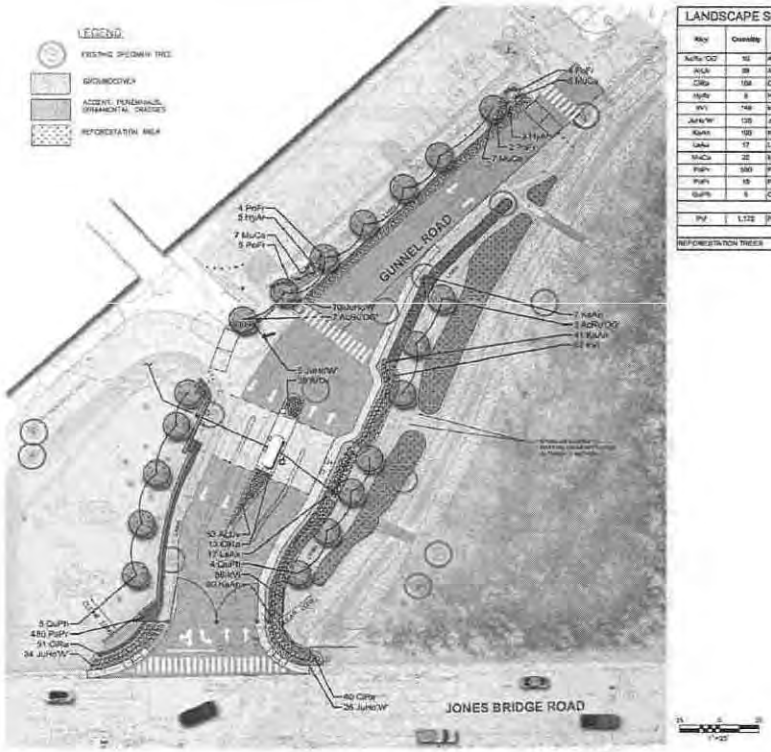

JONES BRIDGE ROAD
TO MD 355
FUTURE NEX BUILDING (BY OTHERS)
FUTURE NEX BUILDING (BY OTHERS)
FUTURE PARKING DECK (BY OTHERS)
GUNNEL ROAD
STOP
NO EXIT
ONE WAY
NAVAL FACILITIES ENGINEERING COMMAND WASHINGTON
WALTER REED NATIONAL MILITARY MEDICAL CENTER BETHESDA, MD
TRAFFIC MITIGATION MEASURES
GATE 3, GUNNEL ROAD
SIGNING AND PAVEMENT MARKING PLAN
PRELIMINARY NOT FOR CONSTRUCTION
URS
NAVFAC



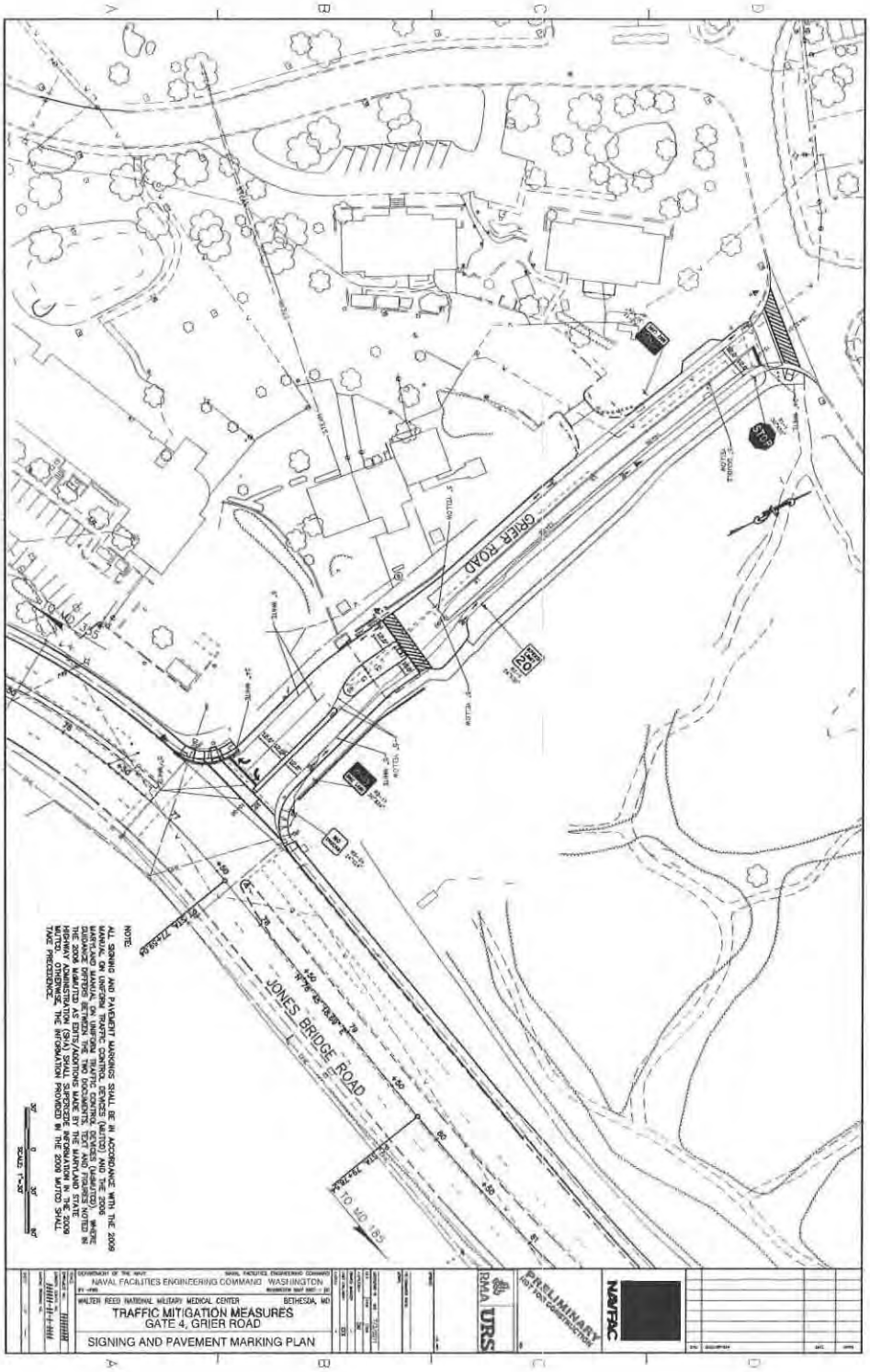
LANDSCAPE SCHEDULE							
Key	Quantity	Botanical Name	Common Name	Size	Condition	Spacing	Remarks
AcRu 'OG'	10	Acer rubrum 'October Glory'	October Glory Red Maple	3" CAL	B&B	30' O.C.	
AnVe	89	Anthoxanthum nitens	Common Sweetgrass	1" HT	#1 CONT.	2' O.C.	
CiRa	104	Cimicifuga racemosa	Black Cohosh	1 GAL	CONT.	18" O.C.	
HyAr	8	Hydrangea arborescens	Smooth Hydrangea	3 GAL	CONT.	2' O.C.	
IlVi	749	Ilex virginica	Virginia Ilex	3' HT.	#1 CONT.	2' O.C.	
JuHo'W'	135	Juniperus horizontalis 'Wiltonii'	Blue Rug Juniper	2 GAL	CONT.	2' O.C.	
KaAn	100	Kalmia angustifolia	Sheep Laurel	18" HT.	CONT.	2' O.C.	
LeMa	17	Leucothoe axillaris	Coast Leucothoe	18" HT.	CONT.	2' O.C.	
MuCa	22	Muhlenbergia capillaris	Pink Hair Grass	1 GAL	CONT.	18" O.C.	
PaPr	300	Parthenocissus quinquefolia	Allegheny Virginia Creeper	2" DEPTH	PLUGS	18" O.C.	
PoPr	15	Potentilla fruticosa	Bush Cinquefoil	18" HT	CONT.	2' O.C.	
QuPh	5	Quercus phellos	Willow Oak	3" CAL	B&B	30' O.C.	
SWM AREA							
PaV	1,172	Panicum virgatum 'Heavy Metal'	Heavy Metal Switch Grass	1 GT.	CONT.	18" O.C.	
REFORESTATION							
REFORESTATION TREES				1" CAL	CONT.	12' O.C.	

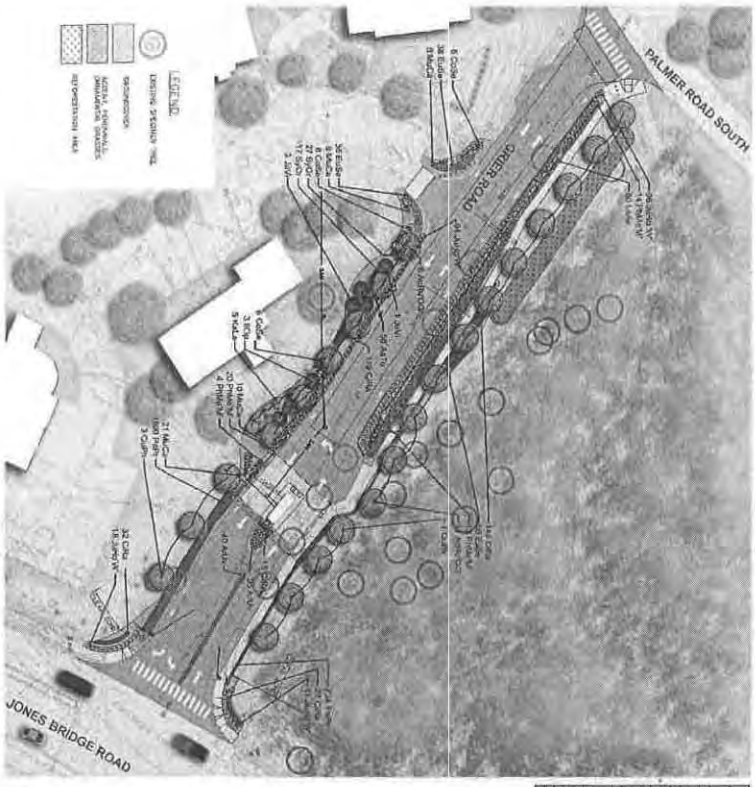
GATE 3 - GUNNEL RD

WALTER REED NATIONAL MILITARY MEDICAL CENTER - BETHESDA, MD LANDSCAPE PLAN

NORTH

NCPC & SHPO SUBMISSION - SEPTEMBER 15, 2011


GRIER ROAD
JONES BRIDGE ROAD
TO MD 185
NOTE:
ALL SIGNING AND PAVEMENT MARKING SHALL BE IN ACCORDANCE WITH THE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND THE 2009 MARYLAND MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MMUTCD). WHERE DIFFERENCES EXIST BETWEEN THE MUTCD AND THE MMUTCD, WHICHEVER IS MORE RESTRICTIVE SHALL BE ADOPTED AS FOLLOWS: (AUTHORITY NAME) IS THE MARYLAND STATE HIGHWAY ADMINISTRATION (SHA) SHALL SUPERCEDE INFORMATION IN THE 2009 MUTCD. OTHERWISE, THE INFORMATION PROVIDED IN THE 2009 MUTCD SHALL TAKE PRECEDENCE.
SCALE: 1"=30'
NAVAL FACILITIES ENGINEERING COMMAND WASHINGTON
WALTER REED NATIONAL MILITARY MEDICAL CENTER BETHESDA, MD
TRAFFIC MITIGATION MEASURES
GATE 4, GRIER ROAD
SIGNING AND PAVEMENT MARKING PLAN
RMA
URS
PRELIMINARY
NAVFAC


PALMER ROAD SOUTH
GRIER ROAD
JONES BRIDGE ROAD
LEGEND
EXISTING SIGNAL POLE
GROUNDCOVER
MEDIUM PERENNIALS, ORNAMENTAL GRASSES
REFORESTATION AREA
SEEDS
8 COSH
8 COSH
27 SOCH
17 SOCH
2 SAFI
2 CIRH
5 VIOC
5 VIOC
10 MAGC
10 PHIH
4 PHIH
21 MAGC
180 PHIP
3 CUPP
32 CIRH
18 JUPCV
1 ILOP
30 ILOP
40 ASIV
1 ILOP
11 ILOP
11 ILOP
144 COSH
32 SAFI
11 MAGC
11 MAGC
11 ILOP
11 ILOP
18 CIRH
18 CIRH
18 CIRH

APPENDIX D4 – UNDERGROUND PARKING GARAGE CONCEPTS

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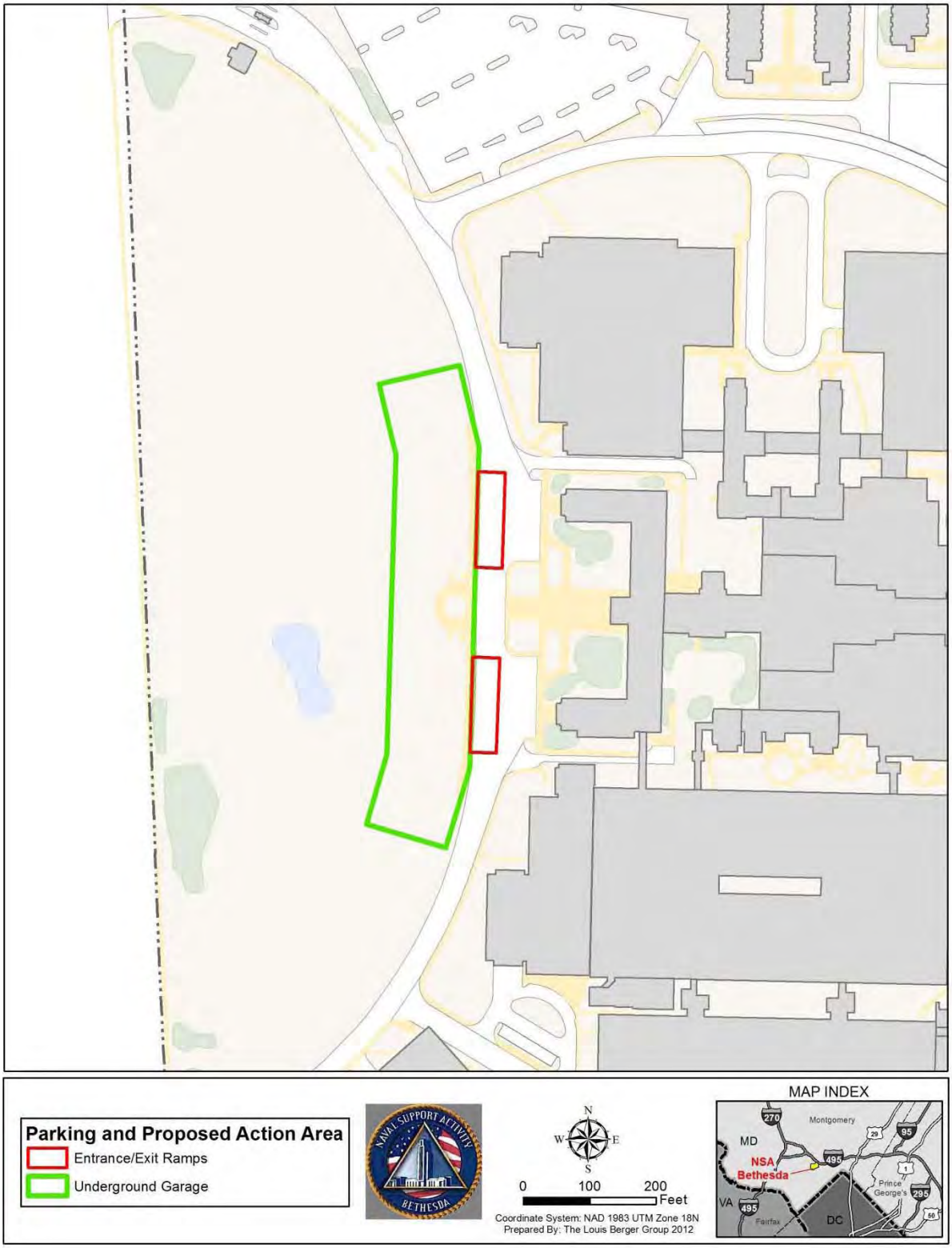
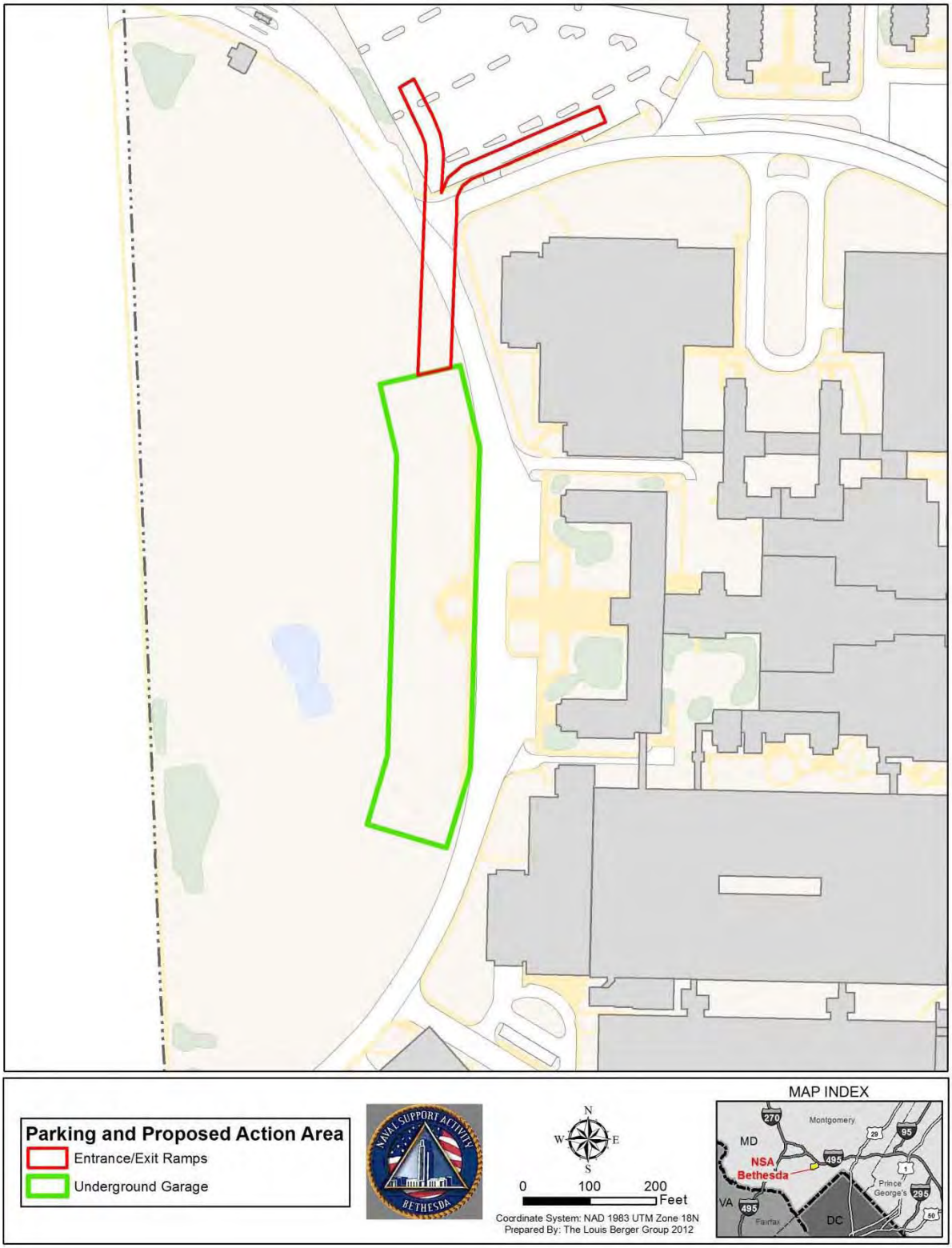
Underground Parking Garage - Alternatives 1 and 6



Underground Parking Garage - Alternatives 2 and 7



APPENDIX E: ECONOMIC IMPACT FORECAST SYSTEM MODEL

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TABLE OF CONTENTS

1.0 Socioeconomic Impact Assessment 1

2.0 The Economic Impact Forecast System 1

3.0 The EIFS Model 2

4.0 The Significance of Socioeconomic Impacts 3

4.1 Summary of Assumptions 3

TABLES

Table 1: Historical Deviation Variables..... 3

Table 2: Forecast Input for the EIFS Model..... 4

Table 3: EIFS Report for Montgomery County, Maryland – Forecast Output 5

Table 4: Forecast Input for the EIFS Model..... 5

Table 5: EIFS Report for Montgomery County, Maryland – Forecast Output 6

Table 6: Forecast Input for the EIFS Model..... 6

Table 7: EIFS Report for Montgomery County, Maryland – Forecast Output 7

Table 8: Forecast Input for the EIFS Model..... 7

Table 9: EIFS Report for Montgomery County, Maryland – Forecast Output 8

Table 10: Forecast Input for the EIFS Model..... 8

Table 11: EIFS Report for Montgomery County, Maryland – Forecast Output..... 9

Table 12: Forecast Input for the EIFS Model..... 9

Table 13: EIFS Report for Montgomery County, Maryland – Forecast Output..... 10

Table 14: EIFS Report for Montgomery County, Maryland – RTV Summary. 10

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APPENDIX E: ECONONIC IMPACT FORECAST MODEL

1.0 Socioeconomic Impact Assessment

Socioeconomic impacts are linked through cause-and-effect relationships. Military payrolls and local procurement contribute to the economic base for the region of influence (ROI). In this regard, the proposed Medical Facilities Development and University Expansion have a multiplier effect on the local and regional economy. With the proposed actions, direct jobs would be created, generating new income and increasing personal spending. This spending generally creates secondary jobs, increases business volume, and increases revenues for schools and other social services.

2.0 The Economic Impact Forecast System

The U.S. Army, with the assistance of many academic and professional economists and regional scientists, developed the Economic Impact Forecast System (EIFS) to address the economic impacts of the National Environmental Policy Act (NEPA)-requiring actions and to measure their significance. As a result of its designed applicability, and in the interest of uniformity, EIFS should be used in NEPA assessments for the proposed action. The entire system is designed for the scrutiny of a populace affected by the actions being studied. The algorithms in the EIFS model are simple and easy to understand, but still have firm, defensible bases in regional economic theory.

EIFS was developed under a joint project of the U.S Army Corps of Engineers (USACE); the Army Environmental Policy Institute (AEPI); and the Computer and Information Science Department of Clark Atlanta University, Georgia. EIFS is an on-line system, and the EIFS Web application is hosted by USACE, Mobile District. The system is available to anyone with an approved user-id and password. University staff and the staff of USACE, Mobile District are available to assist with the use of EIFS.

The databases in EIFS are national in scope and cover the approximately 3,700 counties, parishes, and independent cities that are recognized as reporting units by federal agencies. EIFS allows the user to define an economic ROI by identifying the counties, parishes, or cities to be analyzed. Once the ROI is defined, the system aggregates the data, calculates multipliers and other variables used in the various models in EIFS, and prompts the user for forecast input data.

3.0 The EIFS Model

The basis of the EIFS analytical capabilities is the calculation of multipliers that are used to estimate the impacts resulting from military-related changes in local expenditures or employment. In calculating the multipliers, EIFS uses the economic base model approach, which relies on the ratio of total economic activity to basic economic activity. Basic, in this context, is defined as the production or employment engaged to supply goods and services outside the ROI or by federal activities (such as military installations and their employees). According to economic base theory, the ratio of total income to basic income is measurable (as the multiplier) and sufficiently stable so that future changes in economic activity can be forecast. This technique is especially appropriate for estimating aggregate impacts and makes the economic base model ideal for the environmental assessment (EA) and environmental impact statement (EIS) process.

The multiplier is interpreted as the total impact on the economy of the region resulting from a unit change in its base sector; for example, a dollar increase in local expenditures due to an expansion of its military installation. EIFS estimates its multipliers using a location quotient approach based on the concentration of industries within the region relative to the industrial concentrations for the nation.

The user inputs into the model the data elements that describe the Navy action: the change in expenditures, or dollar volume of the construction project(s); change in civilian or military employment; average annual income of affected civilian or military employees; the percent of civilians expected to relocate due to the Navy's action; and the percent of military living on-post. Once these are entered into the EIFS model, a projection of changes in the local economy is provided. These are projected changes in sales volume, income, employment, and population. These four indicator variables are used to measure and evaluate socioeconomic impacts. Sales volume is the direct and indirect change in local business activity and sales (total retail and wholesale trade sales, total selected service receipts, and value-added by manufacturing). Employment is the total change in local employment due to the proposed action, including not only the direct and secondary changes in local employment, but also those personnel who are initially affected by the military action. Income is the total change in local wages and salaries due to the proposed action, which includes the sum of the direct and indirect wages and salaries, plus the income of the civilian and military personnel affected by the proposed action. Population is the increase or decrease in the local population as a result of the proposed action.

4.0 The Significance of Socioeconomic Impacts

Once model projections are obtained, the Rational Threshold Value (RTV) profile allows the user to evaluate the significance of the impacts. This analytical tool reviews the historical trends for the defined region and develops measures of local historical fluctuations in sales volume, income, employment, and population. These evaluations identify the positive and negative changes within which a project can affect the local economy without creating a significant impact. The greatest historical changes define the boundaries that provide a basis for comparing an action's impact on the historical fluctuation in a particular area. Specifically, EIFS sets the boundaries by multiplying the maximum historical deviation of the following variables: the sales volume, income, employment, and population (Table 1).

Table 1: Historical Deviation Variables

		Increase	Decrease
Sales Volume	X	100%	75%
Income	X	100%	67%
Employment	X	100%	67%
Population	X	100%	50%

These boundaries determine the amount of change that will affect an area. The percentage allowances are arbitrary, but sensible. The maximum positive historical fluctuation is allowed with expansion because economic growth is beneficial. While cases of damaging economic growth have been cited, and although the zero-growth concept is being accepted by many local planning groups, military base reductions and closures generally are more injurious to local economics than are expansion actions.

The major strengths of the RTV are its specificity to the region under analysis and its basis on actual historical data for the region. The EIFS impact model, in combination with the RTV, has proven successful in addressing perceived socioeconomic impacts. The EIFS model and the RTV technique for measuring the intensity of impacts have been reviewed by economic experts and have been deemed theoretically sound.

The following are the EIFS inputs and output data and the RTVs for the ROI. These data form the basis for the socioeconomic impact analysis presented in Section 3.10 of the EIS.

4.1 Summary of Assumptions

For purposes of running the EIFS model, the overall construction spending was selected to determine the maximum impact that proposed

actions could have on the regional economy. For this analysis, it was assumed that no civilian personnel would re-locate within the ROI as a result of the proposed actions. Therefore, only construction costs were used to determine the impact of the proposed action and only construction cost, and not civilian or military employment, estimates were inserted into Tables 2, 4, 6, 8, or 12 below. The total project costs for the Medical Facilities Development are between $617,609,000 and $629,462,000 depending on the location chosen to construct a parking structure. Four EIFS models were run to determine the separate economic impacts on the local economy that could occur from the four alternative site locations of the parking structure for the Medical Facilities Development. An additional fifth EIFS model was run to determine the economic impact that the 50 person increase in support level operations staff for the WRNMMC would have on the local economy (see Tables 10 and 11). The total project costs for the University Expansion are assumed to be $252,800,000. A sixth EIFS model was run to determine the economic impacts on the local economy that could occur from the University Expansion. The costs for all of these models were obtained through DD1391s for each project and communication with personnel at NAVFAC Washington and at NSA Bethesda. The impacts from project spending are shown in Tables 2 through 11 for the Medical Facilities Development, and Tables 12 and 13 for the University Expansion. Tables 2, 4, 6, 8, 10, and 12 show input to the model; Tables 3, 5, 7, 9, 11, and 13 show resultant sales, income, and employment generated for the economy and the percent annual fluctuation it represents; and Table 14 shows the annual fluctuations in RTV for the ROI above or below which the action would be considered significant.

Table 2 shows the input value into the EIFS model for the total construction cost of the Medical Facilities Development if the Underground Parking Alternative is chosen.

4.1.1 Medical Facilities Development – Underground Parking

Table 2: Forecast Input for the EIFS Model

EIFS Report Montgomery County, MD – Forecast Input	
Change In Local Expenditures	$629,462,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-base	0

Table 3 shows the EIFS model outputs that would result from construction-related spending on the Medical Facilities Development if the Underground Parking Alternative is chosen.

Table 3: EIFS Report for Montgomery County, Maryland – Forecast Output

Forecast Output		
Employment Multiplier	2.62	
Income Multiplier	2.62	
Sales Volume – Direct	$389,209,300	
Sales Volume – Induced	$630,519,000	
Sales Volume – Total	$1,019,728,000	2.06%
Income – Direct	$84,693,170	
Income - Induced	$137,202,900	
Income – Total (place of work)	$221,896,100	0.66%
Employment – Direct	1724	
Employment – Induced	2793	
Employment – Total	4517	0.83%

Table 4 shows the input value into the EIFS model for the total construction cost of the Medical Facilities Development if the H-Lot Parking Alternative is chosen.

4.1.2 Medical Facilities Development – Above-ground Parking – H-Lot Parking Structure Site

Table 4: Forecast Input for the EIFS Model

EIFS Report Montgomery County, MD – Forecast Input	
Change In Local Expenditures	$617,609,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-base	0

Table 5 shows the EIFS model outputs that would result from construction-related spending on the Medical Facilities Development if the H-Lot Parking Alternative is chosen.

Table 5: EIFS Report for Montgomery County, Maryland – Forecast Output

Forecast Output		
Employment Multiplier	2.62	
Income Multiplier	2.62	
Sales Volume – Direct	$381,880,400	
Sales Volume – Induced	$618,646,200	
Sales Volume – Total	$1,000,527,000	2.02%
Income – Direct	$83,098,360	
Income - Induced	$134,619,300	
Income – Total (place of work)	$217,717,700	0.65%
Employment – Direct	1692	
Employment – Induced	2740	
Employment – Total	4432	0.82%

Table 6 shows the input value into the EIFS model for the total construction cost of the Medical Facilities Development if the Warehouse Area Parking Alternative is chosen.

4.1.3 Medical Facilities Development – Above-ground Parking – Warehouse Area Parking Structure Site

Table 6: Forecast Input for the EIFS Model

EIFS Report Montgomery County, MD – Forecast Input	
Change In Local Expenditures	$617,648,337
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-base	0

Table 7 shows the EIFS model outputs that would result from construction-related spending on the Medical Facilities Development if the Warehouse Area Parking Alternative is chosen.

Table 7: EIFS Report for Montgomery County, Maryland – Forecast Output

Forecast Output		
Employment Multiplier	2.62	
Income Multiplier	2.62	
Sales Volume – Direct	$381,904,700	
Sales Volume – Induced	$618,685,500	
Sales Volume – Total	$1,000,590,000	2.02%
Income – Direct	$83,103,650	
Income - Induced	$134,627,900	
Income – Total (place of work)	$217,731,600	0.65%
Employment – Direct	1692	
Employment – Induced	2741	
Employment – Total	4432	0.82%

Table 8 shows the input value into the EIFS model for the total construction cost of the Medical Facilities Development if the Taylor Road Parking Alternative is chosen.

4.1.4 Medical Facilities Development – Above-ground Parking – Taylor Road Parking Structure Site

Table 8: Forecast Input for the EIFS Model

EIFS Report Montgomery County, MD – Forecast Input	
Change In Local Expenditures	$618,484,650
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-base	0

Table 9 shows the EIFS model outputs that would result from construction-related spending on the Medical Facilities Development if the Taylor Road Area Parking Alternative is chosen.

Table 9: EIFS Report for Montgomery County, Maryland – Forecast Output

Forecast Output		
Employment Multiplier	2.62	
Income Multiplier	2.62	
Sales Volume – Direct	$382,421,800	
Sales Volume – Induced	$619,523,300	
Sales Volume – Total	$1,001,945,000	2.02%
Income – Direct	$83,216,180	
Income - Induced	$134,810,200	
Income – Total (place of work)	$218,026,400	0.65%
Employment – Direct	1694	
Employment – Induced	2744	
Employment – Total	4438	0.82%

Table 10 shows the input value into the EIFS model for the average operations income per civilian and change in civilian employment for the operations period of the Medical Facilities Development.

4.1.5 Medical Facilities Development – Operations Period Impacts

Table 10: Forecast Input for the EIFS Model

EIFS Report Montgomery County, MD – Forecast Input	
Change In Local Expenditures	$0
Change In Civilian Employment	50
Average Income of Affected Civilian	$ 58,724
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-base	0

Table 11 shows the EIFS model outputs that would result from operations-related spending that would result from the 50 person increase in employment capacity as a result of the Medical Facilities Development.

Table 11: EIFS Report for Montgomery County, Maryland – Forecast Output

Forecast Output		
Employment Multiplier	2.62	
Income Multiplier	2.62	
Sales Volume – Direct	$2,360,705	
Sales Volume – Induced	$3,824,342	
Sales Volume – Total	$6,185,046	0.01%
Income – Direct	$2,936,200	
Income - Induced	$832,189	
Income – Total (place of work)	$3,768,389	0.01%
Employment – Direct	60	
Employment – Induced	17	
Employment – Total	77	0.01%

Table 12 shows the input value into the EIFS model for the total construction cost of the University Expansion.

4.1.6 University Expansion

Table 12: Forecast Input for the EIFS Model

EIFS Report Montgomery County, MD – Forecast Input	
Change In Local Expenditures	$252,800,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-base	0

Table 13 shows the EIFS model outputs that would result from construction-related spending on the University Expansion.

Table 13: EIFS Report for Montgomery County, Maryland – Forecast Output

Forecast Output		
Employment Multiplier	2.62	
Income Multiplier	2.62	
Sales Volume – Direct	$156,311,500	
Sales Volume – Induced	$253,224,500	
Sales Volume – Total	$409,536,000	0.83%
Income – Direct	$34,013,860	
Income - Induced	$55,102,450	
Income – Total (place of work)	$89,116,310	0.26%
Employment – Direct	692	
Employment – Induced	1122	
Employment – Total	1814	0.33%

Table 14 shows the annual fluctuations in RTV for the ROI above or below which either of the proposed actions would have a significant socioeconomic impact.

Table 14: EIFS Report for Montgomery County, Maryland – RTV Summary

RTV Summary				
	Sales Volume	**Income**	**Employment**	**Population**
Positive RTV	12.59%	12.60%	3.56%	2.28%
Negative RTV	-5.49%	-4.19%	-3.54%	-1.21%