Report No. DODIG-2012-024 November 30, 2011

Inspector General

United States Department of Defense

Independent Engineering Assessment of the Army's Transportation Plan for the BRAC Recommendation #133 Project Fort Belvoir - Mark Center, Virginia.

Additional Information

The Department of Defense Office of the Deputy Inspector General for Policy and Oversight, prepared this report. If you have questions, contact the signer of the report.

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INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
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November 30, 2011

MEMORANDUM FOR AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir - Mark Center, Virginia, (Report No. DODIG-2012-024)

On July 19, 2011, we initiated an independent engineering assessment of the Army's Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir - Mark Center, Virginia. This project was initiated in response to a requirement in Section 2704, "Transportation Plan for BRAC 133 Project under Fort Belvoir, Virginia, BRAC Initiative," of the National Defense Authorization Act for Fiscal Year 2011 (Public Law 111-383). The assessment was contracted to the engineering team of Strategy and Management Services (SAMS), Inc. Attached please find our findings and recommendations (Attachment 1) and the SAMS report (Attachment 3).

The SAMS assessment concluded that the traffic studies used to develop the Army Transportation Plan were based on faulty baseline data; therefore, the findings and conclusions presented in the Transportation Plan are unreliable. In addition, the traffic studies used to develop the Transportation Plan failed to adequately address the issues related to site ingress/egress. This finding may result in severe traffic congestion during peak hours. The resultant congestion could constrain single occupancy vehicle traffic, emergency response vehicles, and undermine the efficiency of the high frequency bus and shuttle services to and from the Mark Center. Also, the measures proposed by the Transportation Plan will not maintain the existing level of service at the six intersections. The required project mitigations, scheduling of programmed improvements, and their related funding requirements may be invalid. Furthermore, the goal of the proposed Transportation Management Plan to increase non-single occupancy vehicle traffic may not be achievable.

On November 7, 2011, the Army responded to our draft report with non-concurrence to all SAMS findings and recommendations (Attachment 2). We reviewed the Army responses and found that they did not respond to the concerns addressed in the SAMS assessment report. Therefore, we request that additional comments be provided by December 30, 2011. DoD Directive 7650.3, "Follow-up on General Accounting Office (GAO), DoD Inspector General (DoD IG), and Internal Audit Reports," requires that recommendations be resolved promptly.

Please send a .pdf file containing your comments to james.howell@dodig.mil. Copies of your comments must have the signature of the authorizing official for your organization. If you arrange to send classified comments electronically, you must send them over the SECRET Internet Protocol Router Network (SIPRNET).

We appreciate the courtesies extended to our engineering staff and assessment team. If you have any questions, please contact Mr. James Howell at (703) 604-9096 (DSN 664-9096) or e-mail at james.howell@dodig.mil.

Randolph R. Stone, SES
Deputy Inspector General
Policy and Oversight

Attachments:

1. Office of the Inspector General Findings, Recommendations, Summaries of Army Responses, and Responses to the Department of the Army's Comments
2. Department of the Army Comment to the Findings and Recommendations of DoD Draft Report – Dated October 7, 2011.
3. SAMS final report "Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation # 133 Project Fort Belvoir - Mark Center, Virginia" September 30, 2011

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CDR, IMCOM

Table of Contents Page No.

Attachment 1 1

Office of the Inspector General Findings, Recommendations, Summaries of Army Responses, and Responses to the Department of the Army's Comments

Attachment 2 19

Department of the Army Comment to the Findings and Recommendations of DoD Draft Report – Dated October 7, 2011.

Attachment 3 41

SAMS final report "Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation # 133 Project Fort Belvoir - Mark Center, Virginia" September 30, 2011

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Attachment 1

Office of the Inspector General Findings, Recommendations, Summaries of Army Responses, and Responses to the Department of the Army's Comments

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Office of the Inspector General's Findings, Recommendations, Summary of Army Responses, and Responses to the Department of the Army's Comments

Finding 1 –Transportation Plan Development Process Deficiencies

The process and procedures used to develop the Transportation Plan are inconsistent with industry standards, as stated in the Institute of Transportation Engineers (ITE) recommended practices.[1F] The deficiencies of the baseline data are of such significance, they render the findings and conclusions of the Transportation Plan unreliable,[1A] explained below:

- Traffic Counts/Background Traffic – The existing traffic counts and estimated background traffic volumes used in the Army's transportation studies do not accurately represent existing baseline traffic conditions at the Mark Center.
    - Traffic counts were conducted around national holidays and while schools were not in session, which could have resulted in peak hour traffic volumes of up to 35 percent less than average peak hour volumes.[1B] (ITE, 2010: Traffic Volumes, Table 3-2, Suggested Background Data, pg. 17)
    - None of the studies evaluated the traffic impact of the four million gross square feet (gsf) of approved background development identified in the Transportation Plan.[1C] (ITE, 2010: Background Traffic, pg. 23, Paragraph 2)
- Trip Generation – Application of ITE and the Virginia Department of Transportation (VDOT) recommended guidelines suggest, the BRAC 133 Project Fort Belvoir - Mark Center site generated peak hour volumes could be as high as 3000 vehicles per hour, or approximately double the peak hour volumes shown in the Transportation Plan.[1D] (ITE, 2010: Procedure for Determining Appropriate Trip Generation Estimates, Table 5-1, pg. 36)
- Trip Distribution/Traffic Assignment – The procedure used to determine site trip distribution patterns for the Transportation Plan only accounted for the residential location of federal employees and did not include the residential location of defense contractors, who account for 31 percent of the 6,809 employees (2,111 employees). Further, traffic assignment patterns were based on assumed employee travel routings, instead of considering possible alternative routes based on minimum travel times. This may have resulted in unrealistic traffic patterns for BRAC 133 Project Fort Belvoir - Mark Center site generated traffic.[1E] (ITE: Procedure for Determining Appropriate Trip Generation Estimates, pg. 50, Paragraph 8)

Impact 1

The traffic studies used to develop the Transportation Plan were based on faulty baseline data and application of non-standard methodologies to estimate site generated impact; thus, negating the value of any subsequent analysis of the traffic impact generated by the BRAC 133 Project Fort Belvoir - Mark Center. The findings and conclusions presented in the Transportation Plan based on these analyses are unreliable.

Army Response to Finding 1

The Army non-concurs with IG Finding 1. The Army states, "The process and procedures used to develop the Army's Transportation Plan and Transportation Management Plan (TMP) were consistent with industry standards. The Army's transportation Plan and TMP were a result of extensive study, public vetting, decision making and execution of transportation demand management strategies, and transportation network improvements over the past 3 years. The studies upon which the transportation planning decisions are based were prepared by recognized transportation engineering professionals using accepted transportation engineering principles, practices and procedures…." (Attachment 2, Page 22)

DOD IG Response to "Army Response to Finding 1"

The Army's response did not adequately address the impact of using faulty traffic data nor did they provide any new data. The SAMS Assessment Report indicated the traffic studies used to develop the Transportation Plan were based on faulty baseline data and application of non standard methodologies to estimate site generated impact, which negates the value of any subsequent analysis of the traffic impact generated by the BRAC 133 Project Fort Belvoir - Mark Center. As noted in our finding, the traffic counts were conducted around national holidays and while schools were not in session, which could have resulted in peak hour traffic volumes of up to 35 percent less than average peak hour volumes.[1B] The findings, conclusions, and planned actions, presented in the Transportation Plan, based on these analyses, are unreliable.

Recommendation 1

We recommend the Army conduct a new traffic study[1A] utilizing the most accurate, reliable, and sufficient data and methodology in accordance with industry standards or the Institute of Transportation Engineers recommended practices and processes. Specifically, the study should include the following:[1D]

- AM and PM peak hour turning movement traffic counts[1B] which represent an "average worst case" volume scenario; and
- An accurate representation of background traffic[1C] growth to include ambient and pipeline project traffic;
- An accurate representation of trip distribution[1E] patterns based on all employees occupying the site;
- An accurate representation of traffic assignment[1E] patterns reflecting alternative routings, resulting from system congestion and other factors, which dictate route selection.

The Transportation Plan should be updated based on the results of the new traffic study.[1F]

Army Response to Recommendation 1

The Army non-concurs with DoD IG Recommendation 1. The Army states, "the studies upon which the transportation planning decisions have been based were prepared by recognized transportation engineering professionals using professionally accepted transportation engineering principle, practices and procedures and in an open, public, coordinated process with VDOT and the, City of Alexandria. Additionally, post site selection, all transportation studies have been performed either at the direction of the City of Alexandria, or VDOT…" (Attachment 2, Page 24)

DOD IG Response to "Army Response to Recommendation 1"

The Army did not adequately address the specific issues identified in the SAMS report. The Army argued that to interpose another study is redundant and an unwise expenditure of funds. They referred to three additional studies to satisfy our recommendation.

The studies referenced are 1) VDOT's HOV/Bus only ramp study, 2) Virginia Governor's Traffic Monitoring Task Force and 3) the City of Alexandria's federally funded Alternatives Analysis of a High Capacity Transit Corridor. These studies were not used in developing the Transportation Plan and, therefore, they are not relevant to the assessment. Furthermore, they are not focused on identifying and mitigating the traffic impact created by BRAC 133 Project Fort Belvoir - Mark Center.

The Army also failed to consult effectively with local jurisdiction planning and transportation officials, including VDOT and City of Alexandria. SAMS assessment report stated the key transportation agencies within the NCR reported little or no involvement in the preparation or review of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, Transportation Plan and/or its Transportation Management Plan.[1G] The previous DoD IG Assessment of July 2010 BRAC 133 Transportation Plan also stated the inadequate coordination with local jurisdiction planning and transportation officials.[II]

> …the heavy reliance on the City of Alexandria and the BRAC 133 Advisory Group to serve as the primary avenue for the Virginia Department of Transportation and county officials to provide input may not have been the most effective approach for ensuring close coordination and mutual support of interrelated programs and projects in the development of the TMP…

References: I. SAMs Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir – Mark Center, Virginia. September 30, 2011.

1A. **4.1.1** Traffic Studies (page 78)
1B. **4.1.2** Traffic Counts (page 78)
1C. **4.1.3** Background Traffic (page 78)
1D. **4.1.4** Traffic Generation (page 79)
1E. **4.1.5** Trip Distribution/Traffic Assignment (page 79)
1F. **4.1.6** Transportation Plan (page 79)
1G. Table 4-7: Agency-Reported Involvement in the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, Transportation Plan and/or Transportation Management Plan (page 58)

II. Assessment of BRAC 133 Final Environmental Assessment of July 2008 and Transportation Management Plan of July 2010, Attachment 3: Acelsior's Report, pg, 3-23, 3.3.4.4 OBSERVATIONS: 3-C PLANNING

Finding 2 – Inadequate Analysis of Site Ingress/Egress

The traffic studies used to prepare the Transportation Plan do not adhere to Institute of Transportation Engineers (ITE) standards, VDOT requirements (24VAC30-155-60), or City of Alexandria requirements necessary to analyze the impact and determine mitigation measures required to provide a safe and highly functional ingress/egress roadway network for the BRAC 133 Project Fort Belvoir - Mark Center employees and the immediate community.

- Congestion – The Transportation Plan fails to adequately address expected congestion on I-395, local arterial roadways, and roadways within the site.[2C, 2D, 2G]
    - Additional traffic added to an already congested freeway will have a disproportionate impact on freeway operations that could result in gridlock. (Transportation Research Board (TRB) Special Report 302, 2011)
    - Previous studies failed to:
        - mitigate the impact of queuing on the adjacent arterial street which constrains site access;[2E]
        - mitigate the impact of on-site queuing created by congestion on the local arterial roadways serving the site;[2E]
        - appropriately analyze and mitigate potential congestion at the parking garage access created by the substandard roundabout design within the site itself.[2E] (WSDOT Design Manual, Chapter 1320, Exhibit 1320-8)
- Study Area – The Transportation Plan fails to evaluate the project impact at all signalized intersections within a two-mile radius and all un-signalized intersections within a one-mile radius.[2B] (ITE Recommended Practice, Table 2-3, pg. 10)
- Construction Impacts & Mitigation – The Transportation Plan fails to evaluate the traffic impact associated with the construction of short/mid/long-term improvements and identify appropriate mitigation measures.[2J]
- High Occupancy Vehicle (HOV) Access – Travel options at the Mark Center are severely limited with rail access 4.31 miles away, and no HOV freeway lanes directly serving the site. Under these conditions, the BRAC 133 Project Fort Belvoir - Mark Center Transportation Management Plan strategy for achieving 43 percent non-Single Occupancy Vehicle (SOV) trips may fail.[2A]
- Parking Supply – The Transportation Plan fails to provide a sufficient amount of parking spaces to accommodate the TMP goal of 57 percent SOV, forcing employees to seek parking offsite, which will increase traffic congestion and impact adjoining neighborhoods.[2F]
- Safety – None of the traffic studies used in the formulation of the Transportation Plan evaluated the impact of BRAC 133 Project Fort Belvoir - Mark Center on high crash locations within the study area. The safety issues at these locations will adversely affect site ingress and egress.[2H]
- Emergency Response – The Transportation Plan fails to identify the impact of the increased volume of calls for emergency services, and the impact on emergency vehicle response time due to anticipated traffic congestion. The Transportation Plan does not provide the mitigation strategies necessary to meet the requirement of emergency services for the BRAC 133 Project Fort Belvoir - Mark Center employees and the immediate community.[2I]

Impact 2

The traffic studies used to develop the Transportation Plan failed to adequately address the issues related to site ingress/egress. Failure to address these issues is likely to result in extreme traffic congestion with possible gridlock conditions during peak hours. The resultant congestion will constrain SOV traffic, emergency response, and undermine the efficiency of the high frequency express bus and shuttle services, envisioned to move employees quickly to and from the site. As a result, more employees will drive their vehicles and seek alternative routes through residential neighborhoods to avoid arterial congestion; emergency response time will be hindered impacting life safety; and the Transportation Plan's goal to achieve 43 percent non-SOV will not be achieved.

Army Response to Finding 2

The Army non-concurs with IG Finding 2. The Army states, "The traffic studies used to prepare the Transportation Plan comply with applicable federal, state and local standards. The results of the traffic operational analysis displayed in the Transportation Plan are based on an extended study area analysis conducted by VDOT. City officials, though well aware of the existing congestion conditions and the potential future impacts to I-395 and other primary arterials, had approved the proposed zoning and development following a thorough public review process that included consideration of transportation management issues…" (Attachment 2, Page 24)

DOD IG Response to "Army Response to Finding 2"

The Army failed to provide sufficient additional studies to address DoD IG concerns with supporting facts. Specifically, the Army did not provide the necessary additional studies to sufficiently address the impact of BRAC 133 Project Fort Belvoir - Mark Center on I-395, local arterial roadways, and roadways within the site; the project impact at all signalized intersections within a two-mile radius and all un-signalized intersections within a one-mile radius; the project related traffic impact associated with the anticipated roadway construction; the impact on emergency vehicle response time due to anticipated traffic congestion; and safety mitigation for the project impact at high crash locations, etc.

Although the Army stated micro simulation modeling was used to analyze the congestion condition, the output of the simulation is only as good as the validity of the input. The deficiencies in the baseline data, as stated in our independent assessment, will result in unreliable simulation outputs. For instance, SAMS assessment report, section "4.1.2 Traffic Counts", specifically stated the VDOT[II, III] studies failed to use seasonal adjustment for traffic counts, as suggested by the ITE practice. Furthermore, the VDOT[III] study of 2011 used 2008 traffic volumes – which are outside the one-year time horizon as suggested by ITE Recommended Practice.

The SAMS assessment report, section "4.1.1 Traffic Studies", performed a detail analysis of the traffic studies and their deficiencies that were used to develop the Transportation Plan. The SAMS assessment report stated that the amount of transportation studies prepared to address the impact of BRAC 133 project Fort Belvoir – Mark Center, Virginia, creates the illusion that the transportation issues have been thoroughly addressed and mitigated. The SAMS report further stated,

> All of the studies were based on faulty baseline data, including existing peak hour traffic volumes. Many of the studies were flawed in their assessment of the issues, which led to inaccurate conclusions. None of the studies, individually or collectively, provided a thorough and accurate analysis of the impact of BRAC 133 project Fort Belvoir – Mark Center, Virginia.

The previous DoD IG Assessment of July 2010 BRAC 133 Transportation Plan also found deficiencies in the traffic studies used to develop the TMP and suggested that a new traffic impact analysis be performed. The report stated, [IV]

> …a more technically robust stand-alone traffic impact analysis would be needed to confirm the accuracy of the BRAC 133 TMP's findings with respect to:
>
> - Existing and projected peak-hour traffic volumes;
> - Appropriate site variables (for purposes of accurate modeling);
> - Potential queues caused by the access control facility to the south parking garage; and
> - Effects of BRAC 133 traffic on additional intersections and interchanges beyond the narrowly defined BRAC 133 study limits.

In addition, the SAMS report stated the VDOT[III] study employed a Transportation Planning Board (TPB) Regional Travel Model (Version 2.2) to forecast background traffic. The impact of using such a model is explained in the SAMS report as, "typically, these models are used to identify the needs of the regional highway network, not local arterial streets. The use of the regional model output to estimate turning movements may not replicate reasonable forecasts."

The Army raised a concern regarding the use of Washington State Department of Transportation (WSDOT) Design Manual to evaluate the design of a roundabout located at WHS circle. The SAMS assessment report, section "4.2.7 On-Site Circulation (Vehicle and Pedestrian)", stated their justification for using WSDOT Design Manual,

> The WSDOT is a national leader in the design and installation of roundabouts. WSDOT has done extensive national and international research in the development of roundabout design criteria. A cursory review of the Virginia Department of Transportation found no reference to roundabouts or roundabout design parameters. Thus, the proposed WHS Circle roundabout was compared against WSDOT design standards.

The SAMS assessment report also showed the deficiencies of the roundabout in the "Table 4-2 *Summary of Critical Roundabout Design Features"* and "Figure 4-3: *Independent Evaluation of the Roundabout."* The SAMS assessment report further stated, "according to the WSDOT Design Manual, small changes in geometry can result in substantial changes in operational performance."

Recommendation 2

We recommend the Army address the ingress/egress of all personnel and services to and from the BRAC 133 Project Fort Belvoir - Mark Center site with adherence to ITE, VDOT, and the local City of Alexandria requirements and standards in the updated Transportation Plan. The Transportation Plan should:

- Evaluate and mitigate the impact of additional congestion on I-395 created by BRAC 133 Project Fort Belvoir - Mark Center;[2C,2D,2E]
- Evaluate and mitigate the traffic impact created by BRAC 133 Project Fort Belvoir - Mark Center on the adjacent local arterial roadways within a two-mile radius;[2B,2E] and
- Evaluate and mitigate the traffic impact on the roadways within the site itself;[2E,2G]
- Document an effective strategy for achieving 43 percent non-SOV;[2A]
- Provide sufficient parking supply to accommodate anticipated employee demand;[2F] and,
- Identify and adequately address appropriate mitigation measures in order to reduce safety hazards at high crash locations, the impact of congested traffic on the emergency response services, and the impact and mitigation measures to reduce congestion during roadway improvement construction activities.[2E, 2H, 2I, 2J]

Army Response to Recommendation 2

The Army non-concurs with DoD IG Recommendation 2 stating, "the Army believes that sufficient ingress/egress analysis has been conducted and that appropriate improvements are being proactively pursued with full participation by stakeholders. The Army TP identified three primary ingress/egress location intersections for road improvements and the Army has completed improvements that facilitate site and parking garage access. Additionally, the road network will undergo added improvements to include construction of a pedestrian bridge across Seminary Road. The Army believes it has sufficiently addressed the ingress/egress of all personnel and services."

DoD IG Response to "Army Response to Recommendation 2"

The Army fails to provide sufficient additional studies to address DoD IG concerns. Specifically, the Army did not provide the necessary studies to:

- Evaluate and mitigate the impact of additional congestion on I-395 created by the BRAC 133 Project, and the traffic impact on the local arterial roadways, and roadways within the site itself;
- Document an effective strategy for achieving 43 percent non-SOV;
- Identify the impact of congested traffic on emergency response services to BRAC 133 Project Fort Belvoir - Mark Center;
- Identify the impact and mitigation measures to reduce congestion during BRAC 133 related roadway improvement construction activities; and
- Identify appropriate mitigation measures to reduce safety hazards at high crash locations.

References: I. SAMs Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir - Mark Center, Virginia, September 30, 2011.

2A. **5.2.1** High Occupancy Vehicle Access (page 80)
2B. **5.2.2** Study Area (page 81)
2C. **5.2.3** Capacity of I-395 (page 81)
2D. **5.2.4** I-395 Congestion (page 81)
2E. **5.2.5** Mitigation (page 81)
2F. **5.2.6** Parking Supply (page 82)
2G. **5.2.7** On-Site Circulation (Vehicle and Pedestrian) (page 82)
2H. **5.2.8** Safety (page 82)
2I. **5.2.9** Impact on Emergency Response (page 82)
2J. **5.2.10** Construction Impacts (page 82)

II. Mark Center (BRAC 133) Access Study-Operational Analysis Report / IJR – VDOT, February 2010

III. Mark Center (BRAC-133) Short/Mid-Term Improvements Alternatives Technical Memorandum, VDOT, February 2011

IV. Assessment of BRAC 133 Final Environmental Assessment of July 2008 and Transportation Management Plan of July 2010, Attachment 3: Acelsior's Report, Page, 3-70, Page 3-71, 3.6 BRAC 133 TMP SUMMARY OF RESULTS

Finding 3 – Proposed Improvements Inadequate to Maintain Existing Level of Service

The proposed short-, mid-, and long-term infrastructure improvements fail to maintain the existing level of service (LOS) at six intersections, as required by the Public Law 111-383, even though the Transportation Plan identifies an adequate amount of funding, $112 million, to construct the proposed improvements.[3B]

- Proposed improvements fail to maintain existing LOS at three out of six intersections, as addressed in Public Law 111-383.[3B]
- The Transportation Plan fails to evaluate the impact of BRAC 133 Project Fort Belvoir - Mark Center five years into the future, as suggested by Institute of Transportation Engineers (ITE) guidelines. Failure to provide this analysis complicates the determination of actual facility needs for the future planning and programming of the responsible jurisdiction.[3A, 3D]
- The Transportation Plan does not provide an assessment of cost or programming of funds for the shuttle-bus program beyond FY2012.[3C]
- The Transportation Plan does not address funding for the critical administrative elements of the Transportation Management Plan, such as funding for the Employee Transportation Coordinator, support staff, marketing strategies and programs, and program monitoring. The Transportation Plan also does not provide a viable strategy for achieving the BRAC 133 Project Fort Belvoir - Mark Center Transportation Management Plan goals for future years.[3D]

Impact 3

The measures proposed by the Transportation Plan will not maintain existing LOS at the six intersections mentioned in the Public Law 111-383. The proposed Transportation Management Plan strategies to mitigate project impacts are likely to be unsuccessful because of anticipated traffic congestion on the surrounding arterial network and on-site roadway. Furthermore, the Transportation Plan fails to identify funding for the Transportation Management Plan beyond 2012. As a result, required project mitigations and anticipated program improvements may be invalid.

Army Response to Finding 3

The Army non-concurs with IG Finding 3. The Army states, "the Army is aware that there may be intersections incapable of achieving pre-BRAC 133 Levels of Service (LOS) following completion of the short-, mid- and long-term improvements. It should be noted that the City issued a Development special Use Permit for the density of development and traffic projections of the BRAC 133 Project…" (Attachment 2, Page 28)

DOD IG Response to "Army Response to Finding 3"

The Army fails to offer any supporting documentation to support their non-concurrence response.

Although the Army acknowledges the Transportation Plan does not maintain existing level of service at all six intersections, as required by Public Law 11-383, the Army fails to document why they are unable to accomplish this requirement. The Army did not provide any additional information to adequately address the assessment of cost or programming of funds for their shuttle bus program beyond FY2012. They also did not address funding for the administrative elements of the Transportation Management Plan or a strategy for achieving the BRAC 133 Project Fort Belvoir - Mark Center Transportation Management Plan goals for future years. The Army also fails to address the impact of BRAC 133 Project Fort Belvoir - Mark Center five years in the future, as suggested by Institute of Transportation Engineers (ITE) guidelines.

Recommendation 3

We recommend the Army revise and update the Transportation Plan to identify the required infrastructure improvements with associated costs and programming necessary to maintain existing LOS in the vicinity of the Mark Center.[3A, 3B, 3D] The Transportation Plan should identify available funding for the shuttle-bus program beyond FY2012 to relieve anticipated congestion in the future years.[3C] The updated Transportation Plan should also include the funding source of the administrative elements of the BRAC 133 Project Fort Belvoir - Mark Center Travel Demand Management program and the proposed funding source for additional funding necessary to maintain existing LOS.[3B, 3D]

Army Response to Recommendation 3

The Army non-concurs with DoD IG Recommendation 3. The Army states "as noted, the development permit issued for the site anticipated a traffic increase and included road improvements in mitigation thereof. Presumably, the City considered these improvements as adequate mitigations for the expected traffic volumes of the new development. The Army provided $12 million to construct these improvements. Public Law 11-383 imposed an entirely new set of standards well after the construction of the BRAC 133 project had been initiated, standards which are atypical of those customarily envisioned by urban jurisdictions attempting to balance continued growth with adequate infrastructure…" (Attachment 2, Page 28)

DoD IG Response to "Army Response to Recommendation 3"

The Army does not concur with our recommendation to identify mitigation measures to maintain level of service (LOS) at the six intersections. This is based on the Army's assumption there may be intersections incapable of achieving pre-BRAC 133 level of service (LOS) following the completion of the short-, mid-, and long-term improvements. Furthermore, they consider their current mitigation measures, which fail to address significant adverse project impacts, as adequate without presenting any sufficient supporting facts. They also did not address funding for the administrative elements of the Transportation Management Plan and strategy for achieving the BRAC 133 Project Fort Belvoir - Mark Center Transportation Management Plan goals for future years.

References: I. SAMs Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir – Mark Center, Virginia, September 30, 2011.

3A. **5.3.1** Horizon Year (page 83)
3B. **5.3.2** Maintaining Existing Level of Service (LoS) (page 83)
3C. **5.3.3** Cost Estimate (page 84)
3D. **5.3.4** Programming of Project Funding (page 84)

Finding 4 – Inadequate Implementation of Alternative Methods of Transportation Necessary to Maintain Existing Level of Service

The goal of maintaining Level of Service (LOS) at six intersections, required by the National Defense Authorization Act (NDAA) Public Law 111-383, may not be achievable because the Transportation Plan has several deficiencies in its proposed alternative methods of transportation to reduce Single Occupancy Vehicles (SOVs).[4C, 4D, 4E]

The Army Transportation Plan is based on the July 2010 Transportation Management Plan (TMP) for other methods of transportation, which was reviewed and granted conditional approval by the National Capital Planning Commission (NCPC). However, the TMP and the Transportation Plan do not comply with several NCPC policies, which is the violation of this Federal standard.[4A] The deficiencies in the Transportation Plan undermine the efficiency of alternative methods of transportation necessary to maintain the LOS.

- NCPC Policies – The Transportation Plan violates six NCPC policies, which are the Federal standard for ensuring that Federal projects built in the National Capital Region comply with traffic management and mitigation objectives.
    1. The Transportation Plan fails to provide a timeline updating the Travel Demand Management (TDM) program every two years. (ISTMP Section 1- pg. 3, Paragraph 3, and CPNC-TE, Pg. 87, Item #7)
    2. The Transportation Plan fails to discuss transportation infrastructure or service improvements within five miles of the BRAC 133 Project Fort Belvoir - Mark Center. (ISTMP Section 1 – pg. 3, Paragraph 2, and CPNC-TE, pg. 87, Item #5)
    3. The Transportation Plan fails to "select reasonable goals and objectives, plan appropriate strategies and tasks for carrying them out, and develop a timetable and establish a budget." (ISTMP Section 2 – pg. 11 – Bullet 2)
    4. The Transportation Plan fails to provide a management framework in sufficient detail to assess effectiveness or sustainability of the TDM programs. (ISTMP Section 1 – pg. 7, left column)
    5. The Transportation Plan fails to address safe travel routes in unfavorable weather conditions for walking and bicycling. (ISTMP Section 3 - pg. 28, Paragraph 2, right column)
    6. The Transportation Plan fails to consult with local jurisdiction planning and transportation officials that would be impacted by the BRAC 133 Project Fort Belvoir - Mark Center. (ISTMP Section 2 – pg. 9, Paragraph 5, right column)
- Shuttle Bus Strategy – The transit time and frequencies of the public bus and shuttle services may not be met due to failing LOS on roadways serving BRAC 133 Project Fort Belvoir - Mark Center.[4B]
- Pedestrian Services – A well-connected, continuous sidewalk system for pedestrian safety and access is not adequately provided at specific locations within the vicinity of the Mark Center and at specific locations at the site. The lack of a continuous, well-connected and safe pedestrian system does not comply with the Americans with Disabilities Act (ADA).[4F]
- Bicycle Services – The Transportation Plan assumption that 2 percent of the BRAC 133 Project Fort Belvoir - Mark Center employees will bicycle to work may not be achievable because there is no safe and direct bicycle route serving the site. In addition, the

Transportation Plan fails to identify bicycle circulation within, to, and through the campus.[4G, 4H]

Impact 4

The deficiencies in the Transportation Plan, as noted below, undermine the efficiency of alternative methods of transportation necessary to maintain the LOS due to increased traffic congestion. Failure to achieve the TMP goal of 43% non-SOV will increase the congestion and invalidate the FONSI.

- The Transportation Plan violates six NCPC policies, as follow:
  1. Fails to provide a timeline updating the Travel Demand Management (TDM) program every two years;
  2. Fails to discuss transportation infrastructure or service improvements within five miles of the BRAC 133 Project Fort Belvoir - Mark Center;
  3. Fails to "select reasonable goals and objectives, plan appropriate strategies and tasks for carrying them out, and develop a timetable and establish a budget."
  4. Fails to provide a management framework in sufficient detail to assess effectiveness or sustainability of the TDM programs;
  5. Fails to address safe travel routes in unfavorable weather conditions for walking and bicycling; and
  6. Fails to consult with local jurisdiction planning and transportation officials that would be impacted by the BRAC 133 Project Fort Belvoir - Mark Center.
- The inability of the proposed employee bus and shuttle services to achieve sufficient headways and travel time objectives, and
- The lack of adequate and safe pedestrian and bicycle facilities at specific locations within the vicinity and at the Mark Center site.

Army Response to Finding 4

The Army non-concurs with IG Finding 4. The Army states, "the claim that the Transportation Management Plan and Transportation Plan are non-compliant with National Capital Planning Commission (NCPC) policies is inaccurate. The BRAC 133 development was briefed to NCPC on September 3, 2010 and the Final Transportation Management Plan was approved by NCPC under Staff Recommendation No. 6903, which specifically notes that the "proposed TMP for the BRAC 133 development adequately demonstrates how the proposed modal split will be achieved". Attached is the approval letter (figure 1). The Army coordinated extensively with the NCPC staff resulting in a comprehensive TMP that was in accordance with NCPC policies and guidelines…" (Attachment 2, Page 30)

DoD IG Response to "Army Response to Finding 4"

The Army failed to address why they are unable to comply with six NCPC policies with supporting facts. The SAMS report stated the approved TMP and the Transportation Plan fail to comply with six NCPC policies, which are the Federal standard for ensuring that Federal projects built in the National Capital Region comply with traffic management and mitigation objectives.

Recommendation 4

We recommend the Army revise and update the Transportation Plan to comply with NCPC policies and guidelines.[4A] The Transportation Plan should evaluate and address the shuttle bus strategy,[4B] mode choice assumption,[4D] TDM marketing strategy,[4E] and needs of pedestrian/bicycle routes, facilities and services[4F, 4G, 4H] to achieve the goals stated in the Transportation Management Plan. This will ensure safe access and compliance with ADA and ITE recommended practices.[4F, 4G, 4H]

Army Response to Recommendation 4

The Army non-concurs with DoD IG Recommendation 4. The Army states, "the BRAC 133 Transportation Plan incorporates the plans set forth in the NCPC approved BRAC 133 TMP. The TMP is comprehensive, continuously monitored and implemented and if changes are necessary they will be coordinated with the City of Alexandria."

DoD IG Response to "Army Response to Recommendation 4"

The Army did not agree to update their Transportation Plan to comply with NCPC policies. The Army also failed to adequately address other concerns identified in the SAMS report to ensure compliance with ADA and ITE recommended practices. These concerns include the shuttle bus strategy, mode choice assumption, TDM marketing strategy, and pedestrian/bicycle route facilities and services. Failure to address these concerns may compromise the Transportation Management Plan goal of reducing SOV traffic. The previous DoD IG Assessment of July 2010 BRAC 133 Transportation Plan also found weaknesses in the TMP that may compromise the ability to meet its SOV reduction goal. The report[II] stated, "...the BRAC 133 TMP has the following weaknesses that may compromise the feasibility of achieving a 40-percent reduction in single-occupancy-vehicle trips and may consequently impose further adverse impacts on the roadway network..."

References: I. SAMs Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir - Mark Center, Virginia, September 30, 2011.

4A. **5.4.1** National Capital Planning Commission (NCPC) Compliance (page 85)
4B. **5.4.2** Public Transportation – Shuttle Bus Strategy (page 85)
4C. **5.4.3** Transportation Demand Management Goal (page 86)
4D. **5.4.4** Mode Choice Assumption (page 86)
4E. **5.4.5** TDM Marketing Strategy (page 86)
4F. **5.4.6** Pedestrian Service (page 86)
4G. **5.4.7** Bicycle Service At or Near Site (page 86)
4H. **5.4.8** Bicycle Routings in Proximity to Site (page 87)

II. Assessment of BRAC 133 Final Environmental Assessment of July 2008 and Transportation Management Plan of July 2010, Attachment 3: Acelsior's Report, Page, 3-70, 3.6 BRAC 133 TMP SUMMARY OF RESULTS

Attachment 2

Department of the Army Comment to the Findings and Recommendations of
DoD Draft Report – Dated October 7, 2011

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DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
INSTALLATIONS, ENERGY AND ENVIRONMENT
110 ARMY PENTAGON
WASHINGTON, DC 20310-0110

NOV 4 2011

Mr. Randolph R. Stone
Deputy Inspector General
Policy and Oversight
Office of the Inspector General, Department of Defense
Arlington, VA 20301-3010

Dear Mr. Stone:

This is the Department of the Army's response to the Department of Defense Inspector General (DoDIG) Draft Report on its Independent Engineering Assessment of the Transportation Plan for BRAC 133 Report to Congress (Report No. D2011-DTOTAD-0002).

The Department of Defense (DoD), the Virginia Department of Transportation (VDOT) and the City of Alexandria are working together to minimize any potential adverse impact on the already congested regional transportation system. The $12 million in traffic improvements called for in the development permit for the site were completed in August. Additionally, as you know, the Department transferred $20 million to the Federal Highway Administration to execute the short- and mid-term improvements recommended by VDOT. Finally, our Transportation Management Plan includes transit subsidies, a robust system of shuttle buses from area metro stations, and other enhancements for commuting. DoD will closely monitor the effectiveness of that plan and adjust as necessary.

We do not believe a new traffic study will provide additional solutions to past or existing traffic issues along the I-395 corridor and interior arteries leading to the BRAC 133 site, and therefore do not concur with the findings and recommendations in the draft report (see enclosed). The collective activities and funding commitments of DoD, VDOT, and the City are well underway to address the localized and more regional traffic management needs of the area.

The Army continues to appreciate the work performed by the DoDIG and the opportunity to provide a response to this report.

Sincerely,

L. Jerry Hansen
Principal Deputy Assistant Secretary of the Army

Enclosure:
As stated

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DoDIG DRAFT REPORT – DATED OCTOBER 7, 2011
(Project No. D20II-DTOTAD-0002)

"Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation # 133 Project Fort Belvoir – Mark Center, Virginia"

DEPARTMENT OF THE ARMY COMMENTS
TO THE FINDINGS AND RECOMMENDATIONS

The Army reviewed the draft assessment and disagrees with both findings and transportation engineering analysis. All BRAC 133 traffic studies were conducted following local and Virginia requirements using guidelines and standards germane to the area and similar developments. Additionally, most of the studies were conducted under the auspices of the City of Alexandria or the Virginia Department of Transportation. We believe that the references to and strong reliance on research studies and general guides are inappropriate and result in invalid conclusions and recommendations. Based on this, the Army non-concurs with the recommendations held within the DoDIG Draft report.

FINDING 1: Transportation Plan Development Process Deficiencies: The DoDIG finds that "the process and procedures used to prepare the Transportation Plan are inconsistent with industry standards as stated in the Institute of Transportation Engineers (ITE) recommended practices. The deficiencies of the baseline data explained below are so significant that they rendered the findings and conclusion of the Transportation Plan unreliable……." (TAB A Page 1/DoDIG Draft Report).

ARMY RESPONSE: Non-concur. The process and procedures used to develop the Army's Transportation Plan and Transportation Management Plan (TMP) were consistent with industry standards. The Army's Transportation Plan and TMP were a result of extensive study, public vetting, decision making and execution of transportation demand management strategies, and transportation network improvements over the past 3 years. The studies upon which the transportation planning decisions are based were prepared by recognized transportation engineering professionals using accepted transportation engineering principles, practices and procedures.

The Baseline volumes that were used in developing the BRAC 133 Mark Center Transportation Management Plan (TMP) and the Transportation Plan were informed by previous Mark Center studies and then verified against Virginia Department of Transportation's (VDOT) 2009 traffic data publications for annual average daily traffic, vehicle classification and peak hour factors. The data was verified for I-395 general purpose and High Occupancy Vehicle (HOV) lanes, and Seminary Road and Beauregard Street corridors, and was found to be consistent with the VDOT's published data. The claim that the Army "cherry picked" traffic data is both inaccurate and unsubstantiated.

The Transportation Plan (TP) prepared for the BRAC 133 site is a brief summary of multiple Traffic Impact Analysis documents that were prepared to estimate and quantify the specific transportation impacts of the proposed development. The *Institute of Transportation Engineers (ITE)* and other state Department of Transportation recommended guidelines state that the need for preparing a Traffic Impact Analysis (TIA) document is to evaluate the

change in performance of the adjacent transportation network when the proposed development takes place. Since the only Army proposed development within the study area was the BRAC 133 development at Mark Center, the transportation analysis and plan were developed only for this proposed development. Professionally accepted approaches were used by the Army, the City and VDOT in the various TIA's. Although different methodologies may have been used in the TIA's, they all used projected regional growth rates or established regional models. These analyses produced very similar results and are within the normal range of variation typical of such.

The *ITE Trip Generation Manual* is an informational report prepared by the Institute of Transportation Engineers as an educational tool. The information contained in it has been prepared based on Trip Generation studies submitted voluntarily by public agencies, developers, consulting firms and associations. The manual itself states that the guidelines and data are for information purposes only and does not include ITE recommendations on the best course of action or the preferred application of the data, which should be based on site specific conditions. As per ITE guidelines, a more site specific trip generation methodology was adopted in which the data utilized was obtained from surveys and studies conducted by Washington Headquarters Services (WHS) at federal office campuses managed by WHS in the National Capital Region. This provided a more accurate reflection of the BRAC 133 site trip generation characteristics. The overall methodology adopted in the development of the Traffic Impact Analysis and the Transportation Plan is similar to that of ITE/VDOT guidelines and follows standard procedures of trip generation, trip distribution, modal choice and trip assignment based on existing traffic characteristics and travel patterns as obtained from employees' current travel patterns. This adopted methodology in developing the BRAC 133 Transportation Plan is a more accurate reflection of the specific land use development than a generic recommended practice. This methodology reflected consistent results in the peak hour projections among the myriad of independently prepared BRAC 133 traffic studies and we strongly disagree with the assertion that the projections could be off by a factor of more than 100%. The specific statement that peak hour volumes could be as much as 3,000 vehicles would equate to nearly all BRAC 133 traffic reporting in the peak hour. This is not consistent with any planning factors accepted in transportation planning.

Traffic engineering and operational analysis techniques involve collection of large amounts of data. It is not practical or expected that 100% of the population will respond, therefore statistical estimation procedures are adopted to obtain a sample size that is representative of the overall population. The zip code analysis utilized in the BRAC 133 TMP is representative of 69 percent of the relocating population (4,422 employees (including contractors) out of 6,409 employees), and is considered a large sample representative of the overall relocating population. This is greater than a 95% confidence level with a 1% margin of error. The table below shows sample sizes calculated with acceptable margin of errors and confidence bounds that adequately represent the total population.

Sample Size for Statistical Estimation for Accurate Representation of Overall Population			
Acceptable Margin of Error	*90% confidence level*	*95% confidence level*	*99% confidence level*
1% Error	3,301	3,844	4,623
2% Error	1,345	1,747	2,518
5% Error	261	362	601

RECOMMENDATION 1: The DoDIG recommends that "the Army conduct a new traffic study utilizing the most accurate, reliable and sufficient data and methodology in accordance with industry standards or the Institute of Transportation Engineers recommended practices and processes……." (TAB A Page 2/DoDIG Draft Report)

ARMY RESPONSE: Non-concur. The studies upon which the transportation planning decisions have been based were prepared by recognized transportation engineering professionals using professionally accepted transportation engineering principles, practices and procedures and in an open, public, coordinated process with VDOT and the City of Alexandria. Additionally, post site selection, all transportation studies have been performed either at the direction of the City of Alexandria, or VDOT.

The Army strongly believes that sufficient analysis has been conducted in a highly collaborative approach with a multitude of stakeholders in this matter and that appropriate mitigations are being proactively pursued with full participation by the Army and the Department of Defense (DoD). To interpose another study in addition to 1) VDOT's HOV/Bus only ramp study, 2) Virginia Governor's Traffic Monitoring Task Force, and 3) the City of Alexandria's federally funded Alternatives Analysis of a High Capacity Transit Corridor, is redundant and an unwise expenditure of funds.

FINDING 2: Inadequate Analysis of Site Ingress/Egress: The DoDIG finds that "the traffic studies used to prepare the Transportation Plan do not adhere to Institute of Transportation Engineers (ITE) standards, VDOT requirements (24VAC30-155-60), or City of Alexandria requirements necessary to analyze the impact and determine mitigation measures required to provide a safe and highly functional ingress/egress roadway network for the BRAC 133 Project Fort Belvoir - Mark Center employees and the immediate community…….The Transportation Plan fails to identify impact of the increased volume of calls for emergency services, and the impact on emergency vehicle response……." (Page 2/DoDIG Memorandum on the Draft Report)

ARMY RESPONSE: Non-concur. The traffic studies used to prepare the Transportation Plan comply with applicable federal, state and local standards. The results of the traffic operational analysis displayed in the Transportation Plan are based on an extended study area analysis conducted by VDOT. City officials, though well aware of the *existing* congestion conditions and the potential future impacts to I-395 and other primary arterials, had approved the proposed zoning and development following a thorough public review

process that included consideration of transportation management issues. The area analyzed as part of the VDOT's Mark Center (BRAC 133) Access Study extends from Little River Turnpike / Duke Street to King Street interchanges along I-395 and includes signalized intersections along Little River Turnpike / Duke Street, Seminary Road and King Street. The analysis conducted by VDOT utilized micro simulation modeling, an industry standard, that accounted for existing congestion conditions, additional delay in freeway operations caused by congestion extending from downstream bottlenecks and residual queues at intersections. The post-BRAC condition level of service results identified in the Transportation Plan indicate improvements in traffic operations along all the major intersections in the vicinity of the project site that were highlighted in the Section 2704, National Defense Authorization Act 2011. It is important to note that the Mark Center site had already been zoned by the City of Alexandria to allow office development of a density exceeding that of the BRAC 133 project.

The Army strongly believes that there has been ample analysis of site ingress and egress. The Transportation Plan identifies three intersections as the primary site ingress/egress locations,

- Beauregard Street and Mark Center Drive
- Beauregard Street and Seminary Road
- Seminary Road and Mark Center Drive

The improved roadway sections that are part of the BRAC 133 construction project provide exclusive left and right turn lanes to allow smooth ingress and egress into the Mark Center project site from these access intersections. Significant upgrades to Mark Center Drive facilitate access and circulation within the site and improve site and parking garage ingress/egress. Traffic control improvements along the internal Mark Center Drive access road, including intersection signalization and a roundabout design, also facilitate site ingress/egress. All prior Mark Center studies which analyze the site access and ingress/egress conditions provide similar results. Access to the North Parking Garage, which has the maximum number of parking spaces, allows smooth entry into the site without causing any residual queues to extend back into the major access intersections. In addition, the North Parking garage has two access points, one via the WHS Circle and one via the internal loop road. The access point along WHS Circle offers one inbound lane and one outbound lane. The access point along the internal loop road has two inbound lanes and one outbound lane. The visitor parking area is located within the North Parking Garage but has a separate entrance from the general parking area to avoid undue delays to commuter traffic caused by visitor registration and/or credential verification. The secured main access control point to the site is located at the South Campus away from the surrounding major city street network to prevent the possibility of any spillback from traffic queues waiting at the access control gates. This will prevent any internal traffic queues from affecting the adjacent major roadway network operations.

A newly constructed two-lane roundabout at the intersection of WHS Circle/IDA Drive and the North Parking Garage will slow down internal traffic and circulate them efficiently without stopping the through movements. Results of the traffic operational analysis conducted earlier

by Wells and Associates utilizing industry recognized software applications to study the internal roadway traffic operations and site ingress/egress conditions indicate acceptable operational conditions, adequate site ingress/egress facilities, improved garage access and reduced traffic delay owing to the proposed roundabout design. All the above constructed and proposed roadway and traffic control improvements at the project location are focused to improve traffic operations and safety of all the drivers accessing and departing the site along with the performance along the adjacent street network.

We believe that the independent assessment's analysis, findings, and subsequent recommendations concerning the design adequacy of the roundabout are flawed and should be omitted from the report as they misuse inapplicable codes. The Independent Engineering Assessment evaluated the roundabout based upon the Washington State Department of Transportation (WSDOT) Design Manual, which is not applicable to this project. The evaluator then compared the WHS mini roundabout to a multi-lane state route type roundabout to draw conclusions. This is analogous to comparing a residential street to a state highway and to then deem the residential street as inadequate. The discussion section on the roundabout omits the fact that traffic to IDA Drive bypasses the circle en route to IDA drive. The WHS circle is best described as a multi-lane mini roundabout with semi-mountable center island, for which the WSDOT design manual has no specific design requirements. The WSDOT Design Manual describes the data incorporated into Table 4-2 of the Independent Engineering Assessment as "general guidelines to follow to begin the design process; final design values will vary," but the values are treated as rigid and inviolable in the Independent Engineering Assessment and do not account for factors such as design speed, design vehicle, design intent, and available land area.

Table 2-4 of the BRAC 133 TMP lists the total number of parking spaces available for the employees accessing the Mark Center site. The north and south parking garages together allow a total of 3,747 parking spaces. As stated in the TMP, these parking spaces will be distributed to tenant organizations based on the number of employees. Tenant organizations are responsible for determining which employees receive parking permits. The Washington Headquarters Services (WHS) Transportation Planning team will be involved in enrolling all employees electronically in the transportation management program and comparing those with a parking permit to adequately determine overflow parking potential. Parking will be managed and enforced by the Pentagon Force Protection Agency using the same standards and procedures in force at the Pentagon. Employees will have a difficult time finding suitable overflow parking options and will therefore seek other than Single Occupancy Vehicle (SOV) modes of transit to the site. Parking rates in adjacent Mark Center facilities have been set at $50 per entry to discourage parking within the business park. Additionally, the City has established a special residential permit program for the neighborhoods surrounding the Mark Center to prevent the incursion of overflow parking. These techniques have been successfully implemented and managed in other federal office campuses in the National Capital Region.

Employee survey results obtained from WHS surveys indicated that many of the surveyed employees relocating to Mark Center were considering various rideshare modes. These

employees were aware of the lack of an existing direct HOV access at Seminary Road. The 2010 commuter survey report published by the Metropolitan Washington Council of Governments indicates that commuters in the National Capital Region primarily utilize the rideshare modes of travel for multiple reasons that include - cost savings on commute expenses (save money on fuel, insurance and car maintenance), avoid stress, productive use of time, help environment, reduce auto wear and tear, companionship, etc. A small percentage of the surveyed commuters (5%) listed the use of a HOV lane as the primary reason for using an alternate rideshare mode of travel. Direct access to HOV lanes serves only as an additional incentive to commuters who are already adapted to rideshare modes of travel. The BRAC 133 site also offers priority designated parking spaces for rideshare vehicles including carpools and vanpools. Ridematching assistance provided by the WHS Transportation Planning team at the Mark Center site will also enable coworkers to team with friends and attain cost savings. Note also that VDOT has allocated $80 million in funding and is in the preliminary planning stages toward the construction of an HOV/bus only ramp from I-395 to Seminary Road.

It is nationally recognized and acknowledged by transportation entities that the combination of work zones and already existing heavy volumes has a greater effect on roadway systems than heavy volumes alone. This problem is faced by all transportation agencies nationwide endeavoring to improve capacity and operations and is typically addressed as part of the project design process. The $20 million which the Army has provided for the construction of short and mid-term improvements includes a significant amount for maintenance of traffic as well as transportation management measures that will be implemented as a part of the project. VDOT will similarly include measures to mitigate traffic impacts during construction of the long-term improvements.

At the time of the BRAC 133 TMP development, the City of Alexandria, Army and DoD officials were still working on an emergency response plan that would minimize the impacts to emergency response time and improve fire, emergency medical, and related public safety needs at BRAC 133. Since then, the City of Alexandria has performed Emergency Incident Management Planning and developed Emergency Management Plans for large scale incidents that would affect the surrounding public. In addition, as stated in the TMP, the Pentagon Force Protection Agency personnel located on site are trained to handle emergencies at the BRAC 133 site until other Emergency Personnel arrive at the scene.

RECOMMENDATION 2: The DoDIG recommends that "the Army address the ingress/egress of all personnel and services to and from the BRAC 133 Project Fort Belvoir - Mark Center site with adherence to ITE, VDOT, and the local City of Alexandria requirements and standards in the updated Transportation Plan……." (TAB A, Page 3/DoDIG Draft Report)

ARMY RESPONSE: Non-concur. The Army believes that sufficient ingress/egress analysis has been conducted and that appropriate improvements are being proactively pursued with full participation by stakeholders. The Army TP identified three primary ingress/egress location intersections for road improvements and the Army has completed improvements that

facilitate site and parking garage access. Additionally, the road network will undergo added improvements to include construction of a pedestrian bridge across Seminary Road.

The Army believes it has sufficiently addressed the ingress/egress of all personnel and services.

FINDING 3: Proposed Improvements Inadequate to Maintain Existing Level of Service: The DoDIG finds that "the proposed short-, mid-, and long-term infrastructure improvements fail to maintain the existing Level of Service (LOS) at six intersections, as required by the Public Law 111-383, even though the Transportation Plan identifies an adequate amount of funding, $112 million, to construct the proposed improvements..." (TAB A, Page 5/DoDIG Draft Report)

ARMY RESPONSE: Non-concur. The Army is aware that there may be intersections incapable of achieving pre-BRAC 133 Levels of Service (LOS) following completion of the short-, mid- and long-term improvements. It should be noted that the City issued a Development Special Use Permit for the density of development and traffic projections of the BRAC 133 project. The City's permit for the Mark Center development mandated local intersection improvements which were constructed as part of the project. The Army and WHS have worked closely with the City and VDOT in an effort to better assess the effects of the BRAC 133 project on traffic operations in the area and to mitigate the impacts. These efforts have resulted in a comprehensive and aggressive Transportation Management Plan which is being implemented. The Army and DoD are active participants in Governor McDonnell's Mark Center Task Force which is pursuing additional regional solutions to regional traffic concerns. This includes monitoring the traffic conditions in the area as occupancy of the BRAC 133 facility continues so that transportation demand management measures can be adjusted as necessary.

The Department's TMP includes transit subsidies, a robust system of shuttle buses from four area metro stations, and other enhancements for commuting. We are closely monitoring the effectiveness of this plan and will adjust it as necessary.

RECOMMENDATION 3: The DoDIG recommends that "the Army revise and update the Transportation Plan to identify the required infrastructure improvements with associated costs and programming necessary to maintain existing LOS in the vicinity of the Mark Center. The Transportation Plan should identify available funding for the shuttle-bus program beyond FY2012 to relieve anticipated congestion in the future years. The updated Transportation Plan should also include the funding source of the administrative elements of the BRAC 133 Project Fort Belvoir-Mark Center Travel Demand Management program and the proposed funding source for additional funding necessary to maintain existing LOS....." (TAB A, Page 5/DoDIG Draft Report)

ARMY RESPONSE: Non-concur. As noted, the development permit issued for the site anticipated a traffic increase and included road improvements in mitigation thereof.

Presumably, the City considered these improvements as adequate mitigations for the expected traffic volumes of the new development. The Army provided $12 million to construct these improvements. Public Law 11-383 imposed an entirely new set of standards well after the construction of the BRAC 133 project had been initiated, standards which are atypical of those customarily envisioned by urban jurisdictions attempting to balance continued growth with adequate infrastructure. VDOT's post BRAC 133 traffic analysis resulted in a recommendation to construct a series of short and mid-term improvements in the vicinity of the Mark Center. The study concluded that the implementation of these measures would significantly improve the performance of the ramps, approaches and intersections which were projected to be most heavily impacted by the BRAC 133 project. Although the study does not indicate that all intersections will maintain pre-BRAC 133 LOS following the additional improvements, it does indicate that non-failing LOS will be restored to all but one of the intersections. It further indicates that the operations of all intersections will be significantly improved in terms of delay time, throughput and queue length.

The City of Alexandria endorsed these improvements as necessary to mitigate the incremental traffic effects of the BRAC 133 project. The Army and DoD evaluated these measures, certified them as meeting the criteria of the Defense Access Roads Program and reprogrammed $20 million dollars to VDOT to construct these improvements as quickly as possible. VDOT's study also included a preliminary assessment of the benefits of constructing a dedicated HOV/bus only ramp from I-395 to the Seminary Road interchange. This assessment preliminarily indicated that an HOV/bus only ramp, by affording more convenient access to HOV and transit vehicles, would further improve traffic operations in the Mark Center area and would also improve the LOS at the Seminary Road and Mark Center Drive intersection by eliminating mainline ramp backups and traffic delays. In recognition of the longstanding need and benefit of this improvement, the Commonwealth of Virginia has committed $80 million dollars and has initiated environmental compliance and preliminary engineering to complete the project as quickly as possible. The short/mid and long-term improvements currently being pursued as described above provide additional effective and appropriate measures to further mitigate traffic conditions in this urban setting.

As a final point, we have noted that by letter of October 24, 2011, the City provided recommendations to the Commonwealth Transportation Board on its FY 2013 – FY 2018 Six-Year Program. One of the City's recommendations was that VDOT undertake and complete on a priority basis a study to address adding a lane on southbound I-395 in the Duke Street area to eliminate one of the most serious and longstanding choke points on I-395 south. The Army's Transportation Plan similarly highlighted the need for this regional improvement which would assist the southbound flows from all ramps onto and on the mainline from points north of Duke Street. Likewise, it is expected that the proposed HOV/Bus ramp would not only improve the LOS at the Seminary Road and Mark Center Drive intersection but would help to eliminate some West End (Alexandria) generated downstream mainline backups and traffic delays.

FINDING 4: Inadequate Implementation of Alternative Methods of Transportation Necessary to Maintain Existing Level of Service: The DoDIG finds that "the goal of maintaining Level of Service (LOS) at six intersections required by the National Defense Authorization Act (NDAA) Public Law 111-383 may not be achievable because the Transportation Plan has several deficiencies in its proposed alternative methods of transportation to reduce Single Occupancy Vehicles (SOVs)……." (TAB A, Page 7/DoDIG Draft Report)

ARMY RESPONSE: Non-concur. The claim that the Transportation Management Plan and Transportation Plan are non-compliant with National Capital Planning Commission (NCPC) policies is inaccurate. The BRAC 133 development was briefed to NCPC on September 3, 2010 and the Final Transportation Management Plan was approved by NCPC under Staff Recommendation No. 6903, which specifically notes that the "proposed TMP for the BRAC 133 development adequately demonstrates how the proposed modal split will be achieved". Attached is the approval letter (figure 1). The Army coordinated extensively with the NCPC staff resulting in a comprehensive TMP that was in accordance with NCPC policies and guidelines. Continued coordination between the WHS Transportation Planning team and the City of Alexandria will also ensure the achievement of the proposed mode splits by implementing improvements to the Travel Demand Management (TDM) programs based on employee surveys, tenant agency feedbacks and citizen concerns. The Independent Engineering Assessment asserts that little coordination occurred with local transportation agencies. No mention is made of the coordination noted in Section 3.3.2, Need **for Modifications of Transit Routes**, of the Army's TMP. This section of the TMP discusses the coordination that occurred with regional transit providers, including a BRAC 133 Transit Round Table discussion that was hosted by the Army for the express purpose of stimulating discussion about potential service modifications that could more effectively serve the BRAC 133 population. Additionally, the assessment ignores the flexible, enhanced transit approach that has been negotiated and successfully implemented among DoD, the City and Washington Metropolitan Area Transit Authority.

The assessment's characterization of NCPC's approval of the TMP as "conditional" is misleading. The only condition placed on the approval of the TMP was a requirement to resubmit the TMP if an amendment to the 2011 National Defense Authorization Act (NDAA) that included a parking space limitation of 1,000 spaces was incorporated. The 2011 NDAA has been enacted without such limitations, and any further references to a "conditional approval" are inappropriate. The previous DoDIG *Assessment of July 2010 BRAC 133 Transportation Management Plan* made specific mention of the coordination with NCPC and conformity to NCPC policies, procedures, and staff level recommendations.

The TMP is a working document that will be periodically updated based on continuous coordination between the WHS Transportation Planning Team and the City of Alexandria. As stated in the TMP, WHS will maintain a Transportation Planning Team at the BRAC 133 facility with a Transportation Coordinator(s) who will be responsible for liaision with the City of Alexandria, local jurisdictions, transit agencies, alternative mode share groups and other neighborhood communities to address improvements to the TMP proposed TDM programs. Timeline and schedule of future commuter surveys, review and updates to the TMP, goals

and strategies to obtain desired driver characteristics and modal splits, implementation of the proposed programs, and estimated cost will be coordinated between the City of Alexandria and WHS BRAC 133 Transportation Planning teams. The City of Alexandria officials understand and agree with this arrangement.

The results obtained from the 2009 commuter survey indicate more than 54 percent of the relocating employees responding favorably towards transit use if a frequent DoD shuttle service to Mark Center was provided, with over 80 percent of the employees indicating they would use the shuttle service for commuting. The 2010 commuter survey report published by the Metropolitan Washington Council of Governments indicates that commuters who utilize alternative transit modes of travel use it to minimize SOV travel through heavy traffic, reduce pollution, reduce greenhouse gases, reduce stress and avoid road rage, use time productively and attain cost and energy savings. The Army and WHS have implemented a robust shuttle plan that provides a shuttle service at 10-30 minute headways to four major transit hubs during peak hours and 15-30 headways for two major transit hubs during mid-day service. Initial 30 minute peak hours headways for the two lowest use transit hubs will be improved to 15 minute headways over time as the building is occupied. In addition, the WHS Transportation Coordinator (s) and staff are monitoring the performance of the shuttle bus system, schedules and routes and making modifications as necessary based on employee concerns and tenant feedback. Adjustments will be made to the service frequencies, operating hours, vehicle sizes and route capacity to reflect actual ridership and demand during both peak hour and mid-day services. Since this effort will be especially important during the first six months as employees adjust to their new commute, WHS will conduct a detailed analysis of ridership trends at the 3-month and 6-month mark to determine if adjustments are needed at that time, and annually thereafter. On-board passenger counters on each vehicle will facilitate ease and accuracy of data collection. The information on shuttle operations and monitoring will be shared with the City of Alexandria for review and comments that will facilitate improvements to the shuttle system.

The assessment of pedestrian and bicycle services draws incorrect conclusions, perhaps due to the field site review having been conducted prior to final striping of the BRAC 133 internal roadways. There are no "missing crosswalks" as referenced in the report. The assessment team was provided with full site plans of the BRAC 133 facility which clearly depicted the crosswalks. The BRAC 133 campus is connected to each and every other Mark Center building via continuous sidewalks and crosswalks. There is full pedestrian circulation around the campus and direct pedestrian circulation from the transportation center to building entrance. The findings of "circuitous pedestrian route from transit center to building entry" and "undefined pedestrian circulation" are incorrect.

The findings that the pedestrian facilities in and around the BRAC 133 facility are unsafe and ADA-deficient are incorrect. Due to the weight that a finding of "ADA-deficient" carries, the Army requests that this inaccurate characterization be deleted from the final report. Each item in Figure 4-6, found on page 72 of the Independent Engineering Assessment and titled "Locations of Observed Pedestrian Service Deficiencies" is addressed here:

1- Item listed on figure 4-6 but not discussed in commentary
2- Please note the pedestrian control devices noted in the photograph (fig. 2)
3- Please note the 6" protective curbing in the photograph (fig. 3)
4- This ramp is on private property
5- Crosswalks are located at this intersection. No pedestrian traffic control devices are installed as this is not a signalized intersection (fig. 4)
6- There are several pedestrian traffic control devices at this intersection, as shown in the photo (fig. 5)
7- Note the seamless transition and clear path of travel at this location (fig. 6)
8- Sidewalk widths in and surrounding Mark Center are 4'-0" wide, 12" wider than required per ADA. All sidewalks are well graded and in good repair.
9- Same as item 8 above
10- This traffic device is well outside the BRAC 133 scope
11- This traffic device is even further outside the BRAC 133 scope than item 10
12- Crosswalks are located at this intersection. No pedestrian traffic control devices are installed as this is not a signalized intersection (fig. 7)
13- This is outside the project area
14- Please see the attached photo, which clearly shows the well defined pedestrian routes
15- The route is straight thru the North Parking Structure (NPS), on a well defined, well signed and well lit/protected path. The path thru the Visitor Control Center is also a straight path directly from the NPS to the turnstiles of the secure perimeter.
16- See attached photo which shows a standard Metro bus stop (fig. 8)
17- No bus stop is located at the identified location
18- There is well defined pedestrian circulation in this area. This is the transit center itself.
19- This is outside the project area
20- The pedestrian bridge is identified as a proposed improvement in the Transportation Plan. It is unclear why the lack of a proposed element is listed as a deficiency.

The TMP projection of a 2% mode split for bicycles was based on the results of the 2009 WHS commuter survey. The BRAC 133 project has been designed to make commuting by this mode of transit as convenient as possible under urban conditions. Per the City of Alexandria's Local Motion Bikeways map, there are multiple bikeways located in the vicinity of BRAC 133, and bicycles are authorized for use on ALL roads within the City. The DoDIG assessment asserts that the mode splits in the TMP are overly optimistic, citing that they are more aggressive than national averages. Commuter characteristics in the National Capital Region are very different from those nationwide. The proposed mode splits were developed based on commuter surveys conducted among the relocating employees the employee zip code data, actual conditions likely to affect BRAC 133 employee commuting habits, and existing commuter characteristics in the National Capital Region. According to NCPC's *Implementing a Successful TMP Handbook*, "the best way to ensure trip reduction through parking management or any other TDM strategy is to limit the amount of parking available to employees." The BRAC 133 campus has an absolute limit on the number of available parking spaces. Additionally, parking rates in adjacent Mark Center facilities are $50 per

entry, regardless of time spent in the garage, and the nearest street parking is over 0.75 miles from the facility and restricted to permit-holding residents. The nearest medium sized retail facility where illegal parking could occur is over 0.75 miles from the BRAC 133 facility, not close enough to provide an attractive alternative to the shuttle program.

RECOMMENDATION 4: The DoDIG recommends that "the Army revise and update the Transportation Plan to comply with NCPC policies and guidelines. The Transportation Plan should evaluate and address the needs of pedestrian/bicycle routes and services to achieve the goals stated in the Transportation Management Plan. The Transportation Plan should also address pedestrian and bicycle services at and near the site to provide safe access and to ensure compliance with ADA and ITE recommended practices……." (TAB A, Page 8/DoDIG Draft Report)

ARMY RESPONSE: Non-concur. The BRAC 133 Transportation Plan incorporates the plans set forth in the NCPC approved BRAC 133 TMP. The TMP is comprehensive, continuously monitored and implemented and if changes are necessary they will be coordinated with the City of Alexandria.

DoDIG DRAFT REPORT – DATED OCTOBER 7, 2011
(Project No. D20II-DTOTAD-0002)

"Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation # 133 Project Fort Belvoir – Mark Center, Virginia"

DEPARTMENT OF THE ARMY COMMENTS
TO THE FINDINGS AND RECOMMENDATIONS
CONTINUED

FIGURES 1 - 8

STAFF RECOMMENDATION

National Capital Planning Commission

C.Hart

NCPC File No. 6903

FORT BELVOIR
BRAC 133 PROJECT, MARK CENTER DEVELOPMENT
(WASHINGTON HEADQUARTERS SERVICES)

Mark Center Drive at Seminary Road
Alexandria, VA

Submitted by the Department of the Army

August 26, 2010

Abstract

The Department of the Army has submitted a final transportation management plan for the BRAC 133 project currently under construction at the Mark Center in Alexandria, VA. Once completed, this installation will consist of approximately 6,409 personnel from the Washington Headquarters Services (WHS) and other Department of Defense agencies. The Mark Center site was chosen by the Department of Defense in 2008. Although the project included a parking ratio of 1 space per 1.71 employees in accordance with the Comprehensive Plan, the Commission recommended that the Army submit a transportation management plan demonstrating how the project will meet the approved modal split. This recommendation was included because the site is not Metrorail accessible, with the nearest Metrorail station being more than two miles away. In addition, the Army needed to identify how it would manage its traffic given the existing traffic congestion along I-395 and the nearby local roadways.

Commission Action Requested by Applicant

Approval of the final transportation management plan, pursuant to 40 U.S.C. § 8722(b)(1).

Executive Director's Recommendation

The Commission:

Approves the final transportation management plan for the BRAC 133, Mark Center Development, as it demonstrates how the proposed modal split will be achieved.

FIGURE 1
Extract of NCPC Approval

FIGURE 2

FIGURE 3

FIGURE 4

FIGURE 5

FIGURE 6

FIGURE 7

FIGURE 8

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Attachment 3

SAMS final report “Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation # 133 Project Fort Belvoir - Mark Center, Virginia”
September 30, 2011

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Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir – Mark Center, Virginia (Project No. D2011-DT0TAD-0002)

Submitted To:

Office of the Inspector General
United States Department of Defense
Policy and Oversight
Technical Assessment Directorate

Submitted By:

Strategy and Management Services (SAMS), Inc.
Exceeding Expectations with People who Make a Difference

7001 Loisdale Road, Suite C
Springfield, VA 22150

Date: Sept. 30, 2011

This report was prepared for the Department of Defense Inspector General (DoD OIG) by Strategy and Management Services (SAMS), Inc., and provides an independent engineering assessment of BRAC 133 at Mark Center.

This report is exempt from release under the Freedom of Information Act. This report is solely for the use of the Office of Inspector General, Department of Defense personnel. No part of it may be circulated, quoted, or reproduced for distribution outside the client organization without prior written approval from Strategy and Management Services (SAMS), Inc., or DoD OIG. The data subject to this restriction are contained in sheets marked "Use or disclosure of data contained on this page is subject to the restriction on the title page of this report.

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Table of Contents

1.0 Executive Summary 1
2.0 Introduction 4
2.1 History and Overview 4
2.2 Scope of Report 5
3.0 Method of Assessment 7
4.0 Issues, Analyses and Findings 8
4.1 Process 8
4.1.1 Traffic Studies 8
4.1.2 Traffic Counts 12
4.1.3 Background Traffic 14
4.1.4 Trip Generation 17
4.1.5 Trip Distribution/Traffic Assignment 20
4.1.6 Transportation Plan 23
4.2 Ingress/Egress 25
4.2.1 High Occupancy Vehicle Access 25
4.2.2 Study Area 26
4.2.3 Capacity of I-395 31
4.2.4 I-395 Congestion 33
4.2.5 Mitigation 34
4.2.6 Parking Supply 35
4.2.7 On-Site Circulation (Vehicle and Pedestrian) 37
4.2.8 Safety 41
4.2.9 Impact on Emergency Response 42
4.2.10 Construction Impacts 43
4.3 Assessment of Costs 44
4.3.1 Horizon Year 45
4.3.2 Maintaining Existing Level of Service (LoS) 46
4.3.3 Cost Estimates 48
4.3.4 Programming of Project Funding 52
4.4 Use of Other Methods of Transportation that are Necessary to Maintain Existing LoS 53
4.4.1 National Capital Planning Commission (NCPC) Compliance 54
4.4.2 Public Transportation - Shuttle and Bus Strategy 59
4.4.3 Transportation Demand Management Goal 66
4.4.4 Mode Choice Assumptions 66
4.4.5 TDM Marketing Strategy 68
4.4.6 Pedestrian Service 69
4.4.7 Bicycle Service At or Near Site 73
4.4.8 Bicycle Routings in Proximity to Site 74
5.0 Findings and Conclusions 78
5.1 Conclusion: Process 78
5.1.1 Finding: Traffic Studies 78
5.1.2 Finding: Traffic Counts 78

5.1.3 Finding: Background Traffic 78
5.1.4 Finding: Trip Generation 79
5.1.5 Finding: Trip Distribution/Traffic Assignment 79
5.1.6 Finding: Transportation Plan 79
5.2 Conclusion: Ingress/Egress 80
5.2.1 Finding: High Occupancy Vehicle Access 80
5.2.2 Finding: Study Area 81
5.2.3 Finding: Capacity of I-395 81
5.2.4 Finding: I-395 Congestion 81
5.2.5 Finding: Mitigation 81
5.2.6 Finding: Parking Supply 82
5.2.7 Finding: On-Site Circulation (Vehicle and Pedestrian) 82
5.2.8 Finding: Safety 82
5.2.9 Finding: Impact on Emergency Response 82
5.2.10 Finding: Construction Impacts 82
5.3 Conclusion: Assessment of Costs 83
5.3.1 Finding: Horizon Year 83
5.3.2 Finding: Maintaining Existing Level of Service (LoS) 83
5.3.3 Finding: Cost Estimates 84
5.3.4 Finding: Programming of Project Funding 84
5.4 Conclusion: Use of Other Methods of Transportation Necessary to Maintain Existing LoS 85
5.4.1 Finding: National Capital Planning Commission (NCPC) Compliance 85
5.4.2 Finding: Public Transportation - Shuttle and Bus Strategy 85
5.4.3 Finding: Transportation Demand Management Goal 86
5.4.4 Finding: Mode Choice Assumptions 86
5.4.5 Finding: TDM Marketing Strategy 86
5.4.6 Finding: Pedestrian Service 86
5.4.7 Finding: Bicycle Service At or Near Site 86
5.4.8 Finding: Bicycle Routings in Proximity to Site 87
Appendices 88
Appendix A: Acronyms 88
Appendix B: Tables 90

Tables

Table 4-1: Summary of Traffic Studies Performed 11
Table 4-2: Summary of Critical Roundabout Design Features 40
Table 4-3: Level of Service Definitions 47
Table 4-4: Alternative E Costs 49
Table 4-5: Bus and Shuttle Program Cost Estimates for the BRAC 133 Project Fort Belvoir – Mark Center, Virginia 50
Table 4-7: Agency-Reported Involvement in the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, Transportation Plan and/or Transportation Management Plan 58
Table 4-8: Shuttle Services From and To the Mark Center Transit Station 62
Table 4-9: Mark Center Transit Station - Bus Bay Assignments and Expected AM Peak Hour Frequencies 62
Table 4-10: Service Frequency LoS – Urban Scheduled Transit Service 63
Table 4-11: Comparative Commute-to-Work Mode Percentages for BRAC 133 Project Fort Belvoir – Mark Center, Virginia, and Study Area Jurisdictions 67

Figures

Figure 4-1: Mark Center Ingress/Egress Intersections 27
Figure 4-2: Locations of Recommended Analysis Intersections 29
Figure 4-3: Independent Evaluation of the Roundabout 40
Figure 4-4: BRAC 133 Mark Center Shuttle Routes 61
Figure 4-5: Estimation of Bus and Shuttle Carrying Capacity – AM Peak Hour BRAC 133 Project Fort Belvoir – Mark Center, Virginia 63
Figure 4-6: Locations of Observed Pedestrian Service Deficiencies 72
Figure 4-7: City of Alexandria Bike Map (Excerpt) Designated Trails and Routes in proximity to BRAC 133 Mark Center 76

1.0 Executive Summary

The Defense Base Closure and Realignment Commission (BRAC), known as BRAC 2005, became law in Nov. 9, 2005. It required relocating various Department of Defense (DoD) and related agencies from leased spaces throughout the National Capital Region (NCR) to Fort Belvoir, Virginia. It was scheduled to be completed by Sept. 15, 2011.

Due to the large number of BRAC movements to Fort Belvoir Engineering Proving Ground (EPG) and the lack of sufficient infrastructure to support the movement, the Army and Commonwealth of Virginia agreed to limit the number of units that would move to the EPG. This resulted in BRAC 133 Project Fort Belvoir – Mark Center, Virginia, requiring the relocation of 6,409 employees to the Mark Center.

The United States Army Corps of Engineers (USACE) completed an environmental assessment (EA), studying locations outside of Fort Belvoir for the BRAC 133 operations in July 2008. This EA resulted in a Finding of No Significant Impacts (FONSI), and the Mark Center, located adjacent to Interstate 395 (I-395) and bounded by Seminary Road and North Beauregard Street, was selected as the site. The BRAC 133 FONSI required a transportation management plan which was developed in July 2010, by USACE in association with the Washington Headquarters Services (WHS). The National Capital Planning Commission (NCPC) reviewed and granted a conditional approval of the Transportation Management Plan Sept. 2, 2010.

The U.S. Department of the Army submitted its report, "Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, pursuant to the National Defense Authorization Act for Fiscal Year 2011 (Public Law 111-383)" to the Congress May 9, 2011. The purpose of the Transportation Plan was to address ingress and egress of all personnel to and from the BRAC 133 project site, the costs and programming of short-, medium-, and long-term projects, and the use of other methods of transportation, that are necessary to maintain existing level of service, and the proposed funding source to obtain such levels of service, at six intersections.

On Jan. 7, 2011, the Ike Skelton National Defense Authorization Act (NDAA) for Fiscal Year 2011 was signed and became Public Law 111-383. The law directed the Department of Defense Office of Inspector General (DoD OIG) to review and provide comments on the Transportation Plan for BRAC 133 Project. On July 12, 2011, the DoD OIG contracted Strategy and Management Services (SAMS), Inc., to provide an independent engineering assessment of the aforementioned BRAC 133 Project Fort Belvoir – Mark Center, Virginia. This report is a result and product of that requirement and, based on our work, we developed the following conclusions.

A review of the data, analysis, and information contained in the Transportation Plan is suspect and debatable. The volume of transportation studies prepared to address the BRAC 133 impact at Mark Center creates an illusion that the transportation issues have been thoroughly addressed and mitigated. However, any sound analysis must begin with sound data. Data for traffic counts, background traffic, trip generation, trip distribution/traffic assignment was not developed

using industry standards or recommended engineering practice. Clouding the Transportation Plan's message was a lack of industry standard format and composition leaving the reader confused and questioning. The end result is the information and the processes used to prepare the Transportation Plan were not reliable in formulating a plan to address the impacts of BRAC 133.

The efficient ingress and egress of all personnel to and from BRAC 133 is dependent upon the provision of a safe and highly functional roadway network. The Transportation Plan failed to adequately address expected congestion on adjacent arterial roadways serving the Mark Center and on the roadways within the site itself. Projected queuing on the adjacent arterials will back up on to the site's internal roadways and create severe congestion resulting in near gridlock conditions in peak periods. This will hamper the high frequency express bus and shuttle services envisioned to move employees quickly to and from the site in the morning and evening.

The Transportation Plan failed to analyze the complete impact of BRAC 133 by limiting its analysis to the six adjoining intersections as if they existed in isolation. In order for any traffic analysis to be realistic and complete, standard engineering practice dictates the transportation plan should include an evaluation of traffic impacts at both signalized and unsignalized intersections within a radius of two miles from the Mark Center. An additional issue is parking. The insufficient supply of BRAC 133 parking will likely have a deleterious impact on adjoining neighborhood traffic and parking conditions as Mark Center employees seek parking on their own. Other safety concerns related to ingress/egress, but not addressed in the Transportation Plan, are the historically high crash locations on roadways within the vicinity of the Mark Center.

Each of these issues will exacerbate congestion on the local road network, have a significant impact on emergency response, and create an unsafe environment for BRAC employees and the immediate community. The Transportation Plan failed to adequately address the ingress and egress needs of all BRAC 133 personnel as directed in the law.

The Transportation Plan generally assessed the costs and programming of short-, medium-, and long-term projects according to industry standards. However, horizon year studies did not adhere to industry standards, and because of this may alter current findings on the true costs for project mitigation. According to the Transportation Plan, the $112 million identified for short-, medium-, and long-term infrastructure improvements of the BRAC 133 project is not adequate to maintain the existing level of service (LoS) at the six intersections analyzed. Additional funding will be necessary to relieve anticipated congestion and maintain existing levels of service. The Transportation Plan failed to identify necessary improvements to maintain existing levels of service at the six intersections analyzed.

The use of alternative modes of transportation to support the goal to significantly reduce single occupancy vehicles generated by BRAC 133 was not well defined. Moreover, it is questionable whether the goal can be achieved, given the Transportation Plan offers contradictory non-single occupancy vehicle (SOV) goal statements. Further, the Transportation Plan fails to comply with several federal standards for developing transportation management plans programs. There are

also deficiencies and/or an absence of bicycle and pedestrian facilities and services at and near BRAC 133. This will hinder the employee walk and bicycle goals established in the Transportation Plan. Each of these factors, in combination with the inability of the proposed employee bus and shuttle services to achieve proposed headways due to expected roadway congestion, suggests the aggressive non-SOV goals established in the Transportation Plan may not be achieved or sustained. The Transportation Plan failed to identify use of other methods of transportation necessary to maintain existing levels of service at the six intersections analyzed.

2.0 Introduction

2.1 History and Overview

The recommendations of the Defense Base Closure and Realignment Commission (BRAC) became law Nov. 9, 2005, as provided for in the Defense Base Closure and Realignment Act of 1990 (Public Law 101-510, as amended). One of the recommendations, known as BRAC Commission Recommendation Number 133 (BRAC 133), required relocating various Department of Defense (DoD) and related agencies from leased spaces throughout the National Capital Region (NCR) to Fort Belvoir, Va. It was scheduled to be completed by Sept. 15, 2011.

Due to the large number of BRAC movements to Fort Belvoir Engineering Proving Ground (EPG) and the lack of sufficient infrastructure to support the movement, the Army and Commonwealth of Virginia agreed to limit the number of units that would move to the EPG. This resulted in BRAC 133 Project Fort Belvoir – Mark Center, Virginia, requiring the relocation of 6,409 employees to the Mark Center.

An environmental assessment (EA) of locations outside of Fort Belvoir for the BRAC 133 operations was completed by the United States Army Corps of Engineers (USACE) in July 2008. The EA resulted in a Finding of No Significant Impacts (FONSI), signed Sept. 25, 2008, for three alternative BRAC 133 sites in Virginia. The sites were the Mark Center and the Victory Center in Alexandria, Va., and the General Services Administration site in Fairfax County. The BRAC 133 FONSI resulted in the decision to select the Mark Center as the site for BRAC 133 operations. The site is located adjacent to Interstate 395 (I-395) and is bounded by Seminary Road to the east and North Beauregard Street to the north. The BRAC 133 FONSI also required a transportation management plan be prepared for the Mark Center.

In association with the Washington Headquarters Services (WHS), USACE developed the required transportation management plan for BRAC 133. The transportation management plan outlined a specific set of programs and strategies to be implemented by the WHS to meet the goal of at least 40 percent of BRAC 133 employees commuting to the Mark Center by means other than single occupancy vehicles (SOV). The transportation management plan was documented in a report entitled Transportation Management Plan for BRAC 133 at Mark Center, Benham Companies, July 2010. The National Capital Planning Commission (NCPC) reviewed the completed July 2010 Transportation Management Plan and granted a conditional approval of the document on Sept. 2, 2010.

On Jan. 7, 2011, the Ike Skelton National Defense Authorization Act of Fiscal Year 2011, Section 2704 "Transportation Plan for BRAC 133 Project Fort Belvoir, Virginia, BRAC Initiative" was signed and became Public Law 111-383. The law directed the DoD OIG to "Submit to the congressional defense committees a report evaluating the sufficiency and coordination conducted in completing the requisite environmental studies associated with the site selection of the BRAC 133 Project." The DoD OIG contracted professional services on Oct. 13, 2010, to conduct an independent engineering assessment of the sufficiency of two

documents related to the BRAC 133 site selection and implementation process. These documents were (1) the Final Environmental Assessment: Implementation of 2005 Base Realignment and Closure Recommendation 133 dated July 2008, and (2) the Transportation Management Plan for BRAC 133 at Mark Center dated July 2010. This assessment was completed and the final report was published on April 20, 2011.

In addition, the Jan. 7, 2011 NDAA, Section 2704, "Transportation Plan for BRAC 133 Project Fort Belvoir, Virginia, BRAC Initiative" directed the Secretary of the Army to submit to the congressional defense committees a transportation plan for the BRAC 133 project, not later than 90 days after the date of the enactment of this Act. The U.S. Department of the Army submitted the report, "Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, pursuant to the National Defense Authorization Act for Fiscal Year 2011 (Public Law 111-383)" to the Congress on May 9, 2011. The specific provisions of Section 2704 of the Act required:

> The transportation plan for the BRAC 133 project must address ingress and egress of all personnel to and from the BRAC 133 project site. The transportation plan shall also assess the costs and programming of short-, medium-, and long-term projects, and the use of other methods of transportation, that are necessary to maintain existing level of service, and the proposed funding source to obtain such levels of service, at the following six intersections:
>
> (1) The intersection of Beauregard Street and Mark Center Drive
> (2) The intersection of Beauregard Street and Seminary Road
> (3) The intersection of Seminary Road and Mark Center Drive
> (4) The intersection of Seminary Road and the northbound entrance-ramp to I-395
> (5) The intersection of Seminary Road and the northbound exit-ramp from I-395
> (6) The intersection of Seminary Road and the southbound exit-ramp from I-395

The 2011 NDAA law also directed the DoD OIG "shall give specific attention to the transportation determinations associated with the BRAC 133 project and review and provide comment on the transportation plan for the BRAC 133 project…" On July 12, 2011, the DoD OIG contracted Strategy and Management Services (SAMS), Inc., to provide an independent engineering assessment of the aforementioned BRAC 133 Project Fort Belvoir – Mark Center, Virginia. This report is a result and product of the requirement to conduct an independent engineering assessment.

2.2 Scope of Report

The scope of this independent engineering assessment is the review and analysis of data and information included in the U.S. Department of the Army's May 9, 2011 Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir - Mark Center and any referenced documentation associated with it.

Specific attention is given to the Transportation Plan's compliance with Subsection (b) of Section 2704, "Transportation Plan for BRAC 133 Project under Fort Belvoir, Virginia, BRAC Initiative," (Public Law 111-383). Subsection (b) required the BRAC 133 Transportation Plan to address ingress and egress of all personnel to and from the BRAC 133 project site, to assess the costs and programming of short-, medium-, and long-term projects, and the use of other methods of transportation that are necessary to maintain existing level of service, and the proposed funding source to obtain such levels of service, at the aforementioned six intersections.

3.0 Method of Assessment

The following steps were undertaken in preparing the Independent Assessment of the BRAC 133 Transportation Plan (herein referred to as the Transportation Plan):

Data Collection and Review	The Transportation Plan was collected and reviewed, as were all related policy and technical documents. This included all traffic engineering studies, transportation planning reports, technical memoranda, and previous interviews with key stakeholders, and reference materials related in any way to the issues and topics identified in the Transportation Plan.
Analysis	This assessment addressed the specific categories of review required by Section 2704 of the 2011 National Defense Authorization Act (NDAA). The transportation, traffic and alternative mode policy provisions, engineering standards, planning standards, technical calculations, data and findings were evaluated and assessed to determine consistency with the provisions of the Act. Industry standards were applied to determine if the goals and issues stated in the Transportation Plan complied with the Act.
Issues	Issues resulting from the analysis as described above were identified, listed, categorized, developed and refined.
Interviews	Written questions were forwarded to officials of public and private agencies that were involved in some way with the preparation, evaluation or review of transportation issues, findings and activities related to the Transportation Plan. This included agencies that responded to interviews from the earlier engineering assessment of the BRAC 133 Environmental Assessment and Transportation Management Plan conducted by the Department of Defense Office of the Inspector General (DoD OIG) in 2010. Oral interviews were conducted with agencies that either requested interviews or with those whom interviews were deemed desirable for the purpose of clarification or update on current events related to the BRAC 133 relocation.
Synthesis	All of the data collected, evaluated and discussed in the preceding steps were synthesized into Issues Summaries by category. These summaries were formatted and developed by Topic, Overview, Issue, Analysis and Finding.
Draft Report	A draft report was prepared highlighting the issues identified during the course of this assessment.
Management Review of Draft Report	Draft report was submitted to management for review and comment.
Final Report	A final report was prepared incorporating comments received from the draft report review.

4.0 Issues, Analyses and Findings

4.1 Process

Overview

The scope of work was to assess the Transportation Plan against the requirements of public law. Professional standards guide the development of transportation plans and are the basis for this assessment. The process and procedures used to prepare the Transportation Plan were inconsistent with professional standards. The following section provides a summary of the deficient process and procedural elements used in the development of the Transportation Plan. These deficiencies are so significant that it rendered the findings and conclusions of the Transportation Plan unreliable.

4.1.1 Traffic Studies

Issue

According to the United States Army Corps of Engineer (USACE)[1] and the Washington Headquarters Service (WHS), the Transportation Plan was based on data obtained from all the studies prepared for the Mark Center (Table 4-1). However, different stakeholders, with different perspectives, using different data and assumptions, developed over disparate time periods, and, in general, reaching different conclusions, prepared the studies. Combining or cherry-picking the various studies and elements make it difficult for anybody, including the general public to assimilate the information and reach consistent conclusions.

Analysis

There have been nine major studies focused on identifying BRAC impacts at Mark Center and several other minor studies, which addressed specific traffic-related issues at the site. According to the United States Army Corps of Engineer (USACE)[1] and the Washington Headquarters Service (WHS), the Transportation Plan was based on data obtained from all the studies prepared for the Mark Center.

A review of the various transportation studies used in the development of the Transportation Plan identified the following issues:

- Studies used different study areas ranging from 7 to 15 intersections and multiple I-395 interchanges
- Studies assumed different site generated peak hour volumes ranging from 1,274 to 2,034 AM peak hour trips and from 1,343 to 2,112 PM peak hour trips
- Studies used different estimates of employees ranging from 1,359 to 6,559 employees in determining traffic impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia
- Studies assumed different mode split values
- Studies assumed different parking space provisions ranging from 3,747 to 4,839

- Studies assumed different horizon years ranging from 2011 to 2015 with future year analyses up to year 2035
- Studies estimated different levels of service based on estimated BRAC impacts and alternative mitigation measures
- None of the studies identified mitigation measures that would maintain an existing level of service (LoS) at all intersections analyzed as directed by Public Law 111-383 (pg. 47 of this report - Table 4-3)

A table summarizing the key aspects of each study is presented in Table 4-1 (pgs. 10-11).

Finding

The volume of transportation studies prepared to address the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, creates an illusion that the transportation issues have been thoroughly addressed and mitigated. This is not correct. It appears the Transportation Plan cherry-picked the various traffic studies listed in Table 4-1 to formulate the findings expressed. All of the studies were based on faulty baseline data, including existing peak hour traffic volumes. Many of the studies were flawed in their assessment of the issues, which led to inaccurate conclusions. None of the studies, individually or collectively, provided a thorough and accurate analysis of the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia.

References

1. Oral Interview with U.S. Army Corps of Engineers and Washington Headquarters Service, Aug. 19, 2011
2. Transportation Management Plan for BRAC 133 at Mark Center, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010, Table 2-2, page 13

Report/Study	Intersections Studied	Employees present on a typical day shift		Visitors per day	Opening Year Employee Trip Modal Split	Single Occupant Vehicle (SOV) Trips (Employee + Visitor)	Rideshare (Carpool/Vanpool/Slug) Trips	Peak Hour Shuttle Bus & Truck Trips	Total Number of Parking Spaces
		Percent %	Total Number of Employees						
Mark Center Traffic Impact Study (TIS) – Wells & Associates, March 2003	7	n/a (Note 1)	n/a (Note 1)	n/a (Note 1)	10% Transportation Management Plan Trip Reduction assumed	WHS: AM Peak 2034 trips PM Peak – 2112 trips (W/O 10 % TMP reduction IDA: AM Peak – 481 trips PM Peak – 449 trips	Not Considered	Included as part of SOV trips	4,839 spaces (Inclusive of government vehicle and visitor parking spaces)
Final Environmental Assessment (FEIS) BRAC 133, Fort Belvoir – USACE/Tetra Tech, July 2008	7	90%	5,768	500	SOV – 58% Rideshare – 21% Walk/Bike/Other – 1% Metrorail – 20%	WHS/BRAC 133: AM Peak – 1,810 trips PM Peak – 1,810 trips (See Note 2)	WHS/BRAC 133: AM Peak – 395 trips PM Peak – 395 trips	WHS/BRAC 133: AM Peak – 31 trips PM Peak – 31 trips	Not Addressed
BRAC 133 Transportation Improvement & Management Plan (TIMP) – Wells & Associates, July 2008	7	75%	4,807	239 (5% of employees present during day shift)	SOV – 60% Rideshare –12% Bus Transit – 5% Walk/Bike/Other – 3% Metrorail – 20%	WHS: AM Peak – 1,240 trips PM Peak – 1,309 trips IDA: AM Peak – 470 trips PM Peak – 433 trips	Not Considered	AM Peak – 34 trips PM Peak – 34 trips	3,904 spaces (Inclusive of government vehicle and visitor parking spaces)
VDOT Mark Center (BRAC) Transportation Study PB, April 2009	7	75%	4,806 (Note 3)	239 (5% of employees present during day shift)	SOV – 60% Rideshare –12% Bus Transit – 5% Walk/Bike/Other – 3% Metrorail – 15% Re-adjusted – 20%	WHS: AM Peak – 1,240 + 332 trips PM Peak – 1,309 + 332 trips IDA: AM Peak – 470 trips PM Peak – 433 trips	Not Considered	AM Peak – 34 trips PM Peak – 34 trips	3,846 spaces (Inclusive of government vehicle and visitor parking spaces)
WHS Internal Roadway Network Traffic Analysis, Wells & Associates, August 2009	On-site intersections only	75%	4,807	239 (5% of employees present during day shift)	SOV – 60% Rideshare –12% Bus Transit – 5% Walk/Bike/Other – 3% Metrorail – 20%	WHS: AM Peak – 1,240 trips PM Peak – 1,309 trips IDA: AM Peak – 470 trips PM Peak – 433 trips	Not Considered	AM Peak – 34 trips PM Peak – 34 trips	3,904 spaces (Inclusive of government vehicle and visitor parking spaces)
Mark Center (BRAC 133) Transportation Study – City of Alexandria/VHB, November 2009	15	85% (See Note 4)	5,448 (See Note 4)	239 (5% of employees present during day shift)	SOV – 60% Rideshare –12% Bus Transit – 5% Walk/Bike/Other – 3% Metrorail – 20%	WHS: AM Peak – 1,384 trips PM Peak – 1,453 trips IDA: AM Peak – 470 trips PM Peak – 433 trips	Not Considered	AM Peak – 34 trips PM Peak – 34 trips	3,898 spaces (95% occupancy considered full; inclusive of government vehicle and visitor parking spaces)

Report/Study	Intersections Studied	Employees present on a typical day shift		Visitors per day	Opening Year Employee Trip Modal Split	Single Occupant Vehicle (SOV) Trips (Employee + Visitor)	Rideshare (Carpool/Vanpool/Slug) Trips	Peak Hour Shuttle Bus & Truck Trips	Total Number of Parking Spaces
		Percent %	Total Number of Employees						
Mark Center (BRAC 133) Access Study Operational Analysis Report / IJR – VDOT, February 2010	14	75%	4,807	239 (5% of employees present during day shift)	SOV – 60% Rideshare –12% Bus Transit – 5% Walk/Bike/Other – 3% Metrorail – 20%	WHS: AM Peak – 1,254 trips PM Peak – 1,323 trips IDA: AM Peak – 470 trips PM Peak – 433 trips	Not Considered	AM Peak – 34 trips PM Peak – 34 trips	3,904 spaces (Inclusive of government vehicle and visitor parking spaces)
USACE Transportation Management Plan (TMP) – Benham/SAIC, July 2010	9	90%	5,768	500	SOV – 57% Carpool – 5% Vanpool – 3% Slug – 3% Bus Transit – 5% Walk – 2% Bike – 2% Metrorail – 23%	WHS: AM Peak – 1,345 trips PM Peak – 1,277 trips IDA: AM Peak – 470 trips PM Peak – 433 trips	WHS/BRAC 133: AM Peak – 81 trips PM Peak – 77 trips	WHS AM Peak – 68 trips PM Peak – 68 trips	3,747 spaces (Inclusive of 150 government vehicle and visitor parking spaces)
Mark Center (BRAC 133) Short/Mid-Term Improvements, Alternative Technical Memorandum, - VDOT February 2011	7	90%	5,768	500	SOV – 57% Carpool – 5% Vanpool – 3% Slug – 3% Bus Transit – 5% Walk – 2% Bike – 2% Metrorail – 23%	WHS: AM Peak – 1,345 trips PM Peak – 1,277 trips IDA: AM Peak – 470 trips PM Peak – 433 trips	WHS/BRAC 133: AM Peak – 81 trips PM Peak – 77 trips	WHS AM Peak – 68 trips PM Peak – 68 trips	3,747 spaces (Inclusive of government vehicle and visitor parking spaces)
Transportation Plan for BRAC Recommendation 133 Project Fort Belvoir - Mark Center, Virginia – A report to Congress, May 2011	6	90%	5,768	500	SOV – 57% Carpool – 5% Vanpool – 3% Slug – 3% Bus Transit – 5% Walk – 2% Bike – 2% Metrorail – 23%	WHS: AM Peak – 1,345 trips PM Peak – 1,277 trips IDA: AM Peak – 470 trips PM Peak – 433 trips	WHS/BRAC 133: AM Peak – 81 trips PM Peak – 77 trips	WHS AM Peak – 68 trips PM Peak – 68 trips	3,747 spaces (Inclusive of 150 government vehicle and visitor parking spaces)

Table 4-1: *Summary of Traffic Studies Performed*[2]

NOTE 1. Institute of Transportation Engineers (ITE) Trip Generation rates to generate peak hour trips.
NOTE 2. Peak hour volumes obtained from Figure 3-20 (EA)
NOTE 3. Employee numbers obtained from Page 4 of the Technical Memorandum, PB.
NOTE 4. See Table 3, page 15.

4.1.2 Traffic Counts

Issue

AM and PM peak period turning movement counts were used to identify existing traffic circulation patterns in the vicinity of the proposed development. These counts provide the base data upon which background and site generated traffic volumes are added to provide a picture of traffic flow conditions at the time the development is occupied. It is expected these counts are collected during time periods that represent average traffic flow conditions. If not, the counts should be adjusted to represent these conditions.

Traffic counts used in the development of the Transportation Plan were conducted during periods impacted by holiday weekends or during the summer months when school was not in session. Traffic counts at these times will typically represent traffic volume scenarios which are lower than would be expected under an average peak condition.

Analysis

With the exception of the final environmental assessment (EA)[1], all traffic studies prepared to address the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, relied on the AM and PM peak hour traffic counts collected by Wells & Associates in the development of the Transportation Improvement and Management Program[2] (TIMP). In addition to the TIMP, the following studies also used the Wells data to represent existing counts:

- Mark Center (BRAC) Transportation Study, Parsons Brinckerhoff (PB), 2009
- Mark Center (BRAC 133) Transportation Study, Vanasse Hangen Brustlin, Inc. (VHB), 2009
- Transportation Management Plan for BRAC 133 at Mark Center, Benham Companies, 2010
- Mark Center (BRAC 133) Short/Mid-Term Improvements Alternatives Technical Memorandum, VDOT, 2011

The issue with these traffic counts is they were collected May 29, 2008 and July 1, 2008 – dates within the influence of national holidays when traffic volume conditions are typically less than the average. A recent study[3] of the traffic related impacts of statutory holidays suggests that holiday related traffic can be up to 35 percent less than typical PM peak hour volumes on commuter routes.

Additionally, VDOT[4,5] used counts collected taken during June, and VHB[6] used counts taken during July to provide the existing AM and PM peak traffic counts for the additional intersections not included in the TIMP.

The Institute of Transportation Engineers (ITE)[7] provides guidance on the collection and use of traffic count data in the preparation of transportation impact analyses for site development. ITE

recommends traffic impact analyses should include traffic count data that meets the following criteria:

- Current and historical daily and hourly volume counts in the study area
- Less than one year old
- Adjusted to account for seasonal variations
- Reflect average and design volume conditions

Based on the ITE guidance and industry practice, the TIMP counts should have been taken outside the influence of the Memorial Day (May 26, 2008) and July 4th national holidays.

In addition to the Wells & Associates counts used in all analyses, the Transportation Management Plan[8] used July 2009 counts without seasonal adjustments, and VDOT[4,5] used June counts without seasonal adjustment. The ITE practice suggests seasonal adjustments be applied to this data to ensure that it is representative of average peak hour traffic volume conditions.

Finally, the ITE Recommended Practice[7] suggests data should not be older than one year. The VDOT study[5] of 2011 used the 2008 traffic volumes – which are outside the one-year time horizon.

The VDOT's studies[4,5] indicate permanent count stations exist in the I-395 corridor in the vicinity of the Seminary Road interchange. Data from these stations should have been used to develop appropriate adjustment factors which could be applied to these counts to obtain average traffic volume conditions.

Finding

The traffic counts used in the transportation studies prepared to address the traffic impacts of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, did not comply with requirements of ITE recommended standards for collecting such data. The traffic counts were taken during time periods when traffic volumes are impacted by national holidays and summer vacations. The resultant peak hour turning movement volumes did not reflect an average peak hour traffic conditions for the study area. As a result, there was an understatement of existing AM and PM peak hour traffic volumes which was perpetuated through all other volume scenarios used to evaluate the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia.

References

1. Final Environmental Assessment (FEA) BRAC 133, Fort Belvoir – USACE/Tetra Tech, July 2008
2. BRAC 133 Transportation Improvement & Management Plan (TIMP) – Wells & Associates, July 2008
3. Statistical Investigation of Statutory Holiday Effects on Traffic Volumes, Figure 5 (c), Transportation Research Record 1945, 2006

4. Mark Center (BRAC 133) Access Study-Operational Analysis Report / IJR – VDOT, February 2010
5. Mark Center (BRAC-133) Short/Mid-Term Improvements Alternatives Technical Memorandum, VDOT, February 2011
6. Mark Center (BRAC 133) Transportation Study – City of Alexandria/VHB, November 2009
7. Transportation Impact Analyses for Site Development: An ITE Recommended Practice, 2010: Traffic Volumes (Table 3-2 Suggested Background Data, pg. 17)
8. Transportation Management Plan for BRAC 133 at Mark Center, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010

4.1.3 Background Traffic

■ Issue

Background traffic volumes represent the estimated growth in traffic expected to occur between the period represented by the existing traffic volumes and the period when the proposed development is expected to be occupied. The ITE Recommended Practice[1] defines the components of background traffic as:

- Through traffic consisting of all movements through the study area, without an origin or a destination in the study area – sometimes referred to as "background (or ambient) growth," and
- Traffic generated by all other developments in the study area, with an origin and/or a destination in the study area – sometimes referred to as "background development" or "pipeline development."

A review of the transportation impact studies used in the preparation of the Transportation Plan did not include a comprehensive representation of background growth and development in the formulation of AM and PM peak hour background traffic volumes for the 2011 horizon year.

■ Analysis

Background Growth

Background traffic growth was determined in two different ways by the traffic studies used to prepare the Transportation Plan.

The TIMP[2] compared the existing volumes on Seminary Road in June 1994 to the volumes existing in May 2002 and determined that traffic volumes had actually decreased. Therefore, no background traffic growth was included in the traffic impact study used for the development of the TIMP. The TIMP study offered no explanation as to the validity of comparing these two volume scenarios. The comparison did not identify the possible impact of variations in daily and monthly traffic flow conditions between the two dates or other potential influences that would

impact traffic flow, such as construction activity. Such issues could alter the conclusion that no traffic growth occurred during this time frame. A different approach was used for the remaining studies.

The remaining, non-VDOT studies applied projected regional growth rates developed from the Metropolitan Washington Council of Governments (MWCoG) models to develop an estimate of background growth. Under this methodology, a regional annual growth rate of 0.51 percent per year was obtained by comparing the 2010 and 2020 traffic forecasts identified in the MWCoG traffic-forecasting model. This rate was then applied to the existing traffic count data to determine the background growth element of the 2011 AM and PM peak hour BRAC horizon year traffic volume. This approach is consistent with standard practice as long as it is expected that recent development trends will continue at the same rate or at a rate that is predictable. (ITE Recommended Practice pg. 2, ¶2)

The VDOT studies identified in the Transportation Plan were not intended to offer an evaluation of the site impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. The studies performed by VDOT focused on the overall impact of future growth on the transportation facilities serving the Mark Center. For the future horizon year analysis, (2015 and 2035) VDOT[3] employed the Transportation Planning Board (TPB) Regional Travel Model (Version 2.2) to forecast background traffic.

The use of regional modeling to represent future year intersection turning movement counts for a site development traffic analysis by VDOT is problematic. Typically, these models are used to identify the needs of the regional highway network, not local arterial streets. The use of the regional model output to estimate turning movements may not replicate reasonable forecasts. This is supported by ITE Recommended Practice: Use of Regional Traffic Forecasting Models, (pg. 28, ¶6):

> "Even when an extremely detailed network is used and some sort of multiple-path assignment technique is employed, specific turning volumes produced by the area transportation plan forecast assignment process will rarely be directly usable for detailed analyses. Turning movement accuracy will not be high, particularly in long-range forecasts."

Background Development (Pipeline Projects)

In general, the transportation studies used in the development of the Transportation Plan did not recognize the traffic impact of pipeline development in the analysis process. As stressed in the ITE Recommended Practice (ITE, pg. 23, ¶3), identification of the traffic impacts of background development "…is particularly important, since conditions associated with nearby developments may be affected by traffic generated by the new site, or may generate traffic that affects the site being studied."

The transportation studies prepared for BRAC 133 Project Fort Belvoir – Mark Center, Virginia, included a very limited analysis of pipeline projects. The majority of the studies included only

development within the Mark Center, such as the expansion of the Institute for Defense Analysis, Inc. (IDA) Building 5, or releasing of space at 1801 and 2001 Beauregard Street. An exception to this approach was the VHB study[4] that included a proposed medical office building development at 4661 Kenmore Avenue. The results of the VHB future baseline volumes were also used in the development of the Transportation Management Plan[5].

The Transportation Plan stated "the City of Alexandria has already issued permits and approvals for the development of over [sic] 4 million gross square feet of additional space in the city's west end." (Transportation Plan pg. 16, ¶2)

Based on this information, it appears there is significant development planned for the Mark Center area of the city. The traffic impact of these developments should have been included in the background traffic used in the evaluation of traffic related impacts of BRAC 133 Project Fort Belvoir – Mark Center, Virginia.

Finding

Site development transportation impact analyses require the inclusion of background traffic growth to provide an understanding of overall traffic impact in the development's horizon year: defined as the time the proposed development is occupied. The transportation studies used to develop the Transportation Plan did not adhere to the ITE Recommended Practice in the development of background traffic volumes for the assessment of project impact. Not all studies used in the development of the Transportation Plan included ambient growth, and none of the studies evaluated the impact of the four million gross square feet (gsf) of pipeline development identified in the Transportation Plan.

The 2011 horizon year peak hour traffic volumes used in the development of the Transportation Plan are significantly less than the anticipated peak hour volumes. Consequently, the level of service will be significantly lower than those used in the development of the Transportation Plan. Therefore this creates an inaccurate representation of project impact in the horizon year.

References

1. Transportation Impact Analyses for Site Development: An ITE Recommended Practice, 2010: Background Traffic (pg. 23, ¶2)
2. BRAC 133 Transportation Improvement & Management Plan (TIMP) – Wells & Associates, July 2008
3. Mark Center (BRAC-133) Short/Mid-Term Improvements Alternatives Technical Memorandum, VDOT, February 2011(pg. 17, ¶1)
4. Mark Center (BRAC 133) Transportation Study – City of Alexandria/VHB, November 2009
5. Transportation Management Plan for BRAC 133 at Mark Center, Benham Companies. Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010

4.1.4 Trip Generation

Issue

According to the Transportation Plan, the site of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, is projected to generate 1,500 AM and PM peak hour trips (Transportation Plan, pg. 9, ¶1). ITE Recommended Practice[1] states, "One of the most critical elements of site impact studies is estimating the amount of traffic to be generated by a proposed development." (ITE, pg. 35, ¶1)

There was a significant variance in the peak hour traffic volumes between the various studies. The Environmental Assessment[2] (EA) suggested 310 peak hour trips, and the 2003 Wells study[3] stated 2,034 AM and 2,112 PM peak hour trips. The EA peak hour volume estimate was low because the analysis assumed the Mark Center had already been approved for 5,050 employees, and the additional impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, was simply an additional 1,359 (6,409 – 5050 = 1,359) employees resulting in 310 peak hour trips.

The Wells Study used ITE trip generation rates; whereas the other studies used a non-standard process of deriving an estimate of site trip generation based on assumptions applied to expected daily employment numbers. The assumptions included: the amount of SOV and non-SOV traffic volumes, available parking supply, percentage of employees assigned to the day shift, average attendance, and estimated visitors. This approach is not consistent with VDOT traffic impact study guidelines (24VAC30-155-60) that require the use of ITE trip generation rates, nor is it consistent with ITE Recommended Practice which delineates a process for estimating site generated traffic volumes.

The ITE Recommended Practice identifies a procedure for determining appropriate trip generation estimates, whereas VDOT traffic impact study guidelines (24VAC30-155-60) require the use of ITE trip generation rates in estimating site generated peak hour traffic volumes.

Analysis

A review of the traffic studies used in the preparation of the Transportation Plan indicates there are three issues related to the development of trip generation data used in the Transportation Plan.

First, the relevant transportation studies did not adhere to recommended practice in determining estimates of site generated peak hour traffic. ITE Recommended Practice[4] provides guidance in the selection of an appropriate process as the following:

- Check national sources for an applicable range of trip generation estimates based on trip rates and equations
- Check for availability of local trip generation rates for comparable sites

- Conduct trip generation studies at sites with characteristics similar to those of the proposed development if local data for similar developments are not available, and if time and funding permit
- Determine the design level of traffic (e.g., peak season, average peak hours) to be utilized for the analysis and select appropriate equations and/or rates
- Determine any adjustments that need to be applied to trip equations and/or rates to account for the specific characteristics of the development in question
- Select the most appropriate and defensible trip generation rates and/or equations and document the basis for selection
- Document the reasons for any variation from normally recognized generation rates or equations and for assumption unique to the development

The estimates of site trip generation used for the Transportation Plan were not developed in accordance with the guidelines identified above. There was no attempt to use the ITE trip generation data, to identify local trip generation rates, or to conduct a trip generation study using relevant sites. However, the TIMP[5] did include an AM and PM peak period traffic count at Liberty Crossing, a secure government facility, to determine directional orientation of peak hour trips.

The ITE Recommended Practice goes on to state, "National data sources should be used as starting point in estimating the amount of traffic that may be generated by a specific building or land use." (ITE pg. 36, ¶3) ITE provides a significant database of national trip generation studies[6]. A review of the ITE Trip Generation report indicates that Land Use (LU) Code 715 *Single Tenant Office Building* would be the appropriate code for an assessment of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. (ITE Trip Generation, pg. 1221)

A review of Trip Generation Handbook[7] suggests that application of the existing ITE rates or equations to the Mark Center may not be appropriate because the size of the Mark Center building (1,779,000 gsf) is significantly larger than the largest site included in the Land Use (LU) Code 715 database. One approach to this dilemma would be the application of the regression equations identified in LU Code 715. Use of the regression equation would provide the "best fit" for the line that passes through all available data points and in essence represent an extrapolation of the data to a building of the square footage of the Mark Center. The result of the calculation using the regression equation suggests an AM peak hour volume of 2,976 ($1.66 \times 1{,}779 + 22.94 = 2{,}976$) vehicles and a PM peak hour volume of 2,792 ($1.55 \times 1{,}779 + 34.88 = 2{,}792$) vehicles, which is significantly higher than the peak hour volumes presented in the Transportation Plan.

An alternative approach, recommended by the ITE Trip Generation Handbook, would be a special trip generation study performed in accordance with ITE standards to determine appropriate trip generation rates. (Trip Generation Handbook, pg. 10, Step 2). The ITE Trip Generation Handbook recommends a procedure and parameters for developing a legitimate estimate of trip generation for the proposed development (Trip Generation Handbook, Chapter 4).

The use of ITE rates, as required by VDOT[8], applied to the proposed 1,779,000 gsf, would yield an estimated 3,202 AM and 3,078 PM peak hour trips which is twice the volume identified in the Transportation Plan.

Secondly, it is believed that the traffic volumes assumed for IDA Building 5, used in the development of the Transportation Management Plan[9] and the associated traffic impact study, are significantly less than what ITE data would suggest. The Transportation Management Plan estimated IDA Building 5 would generate 470 AM and 433 PM peak hour trips. (Transportation Management Plan, Table 4-4, pg. 67) This data was obtained from application of the ITE rates for an office park development (LU Code 750) rather than the rates for a single tenant office building (LU Code 715).

Application of the regression equations, for LU Code 715, indicates IDA Building 5, with 368,400 gsf, would generate 634 (1.66 × 368.400 + 22.94 = 634) AM and 595 (1.52 × 368.400 + 34.88 = 595) PM peak hour trips. This results in an additional 164 (634 – 470 = 164) AM and 162 (595 – 433 = 162) PM peak hour trips that should have been included in various volume scenarios used in the development the traffic impact study included in the Transportation Management Plan. It should be noted that the Transportation Plan acknowledged IDA Building 5 would generate approximately 650 peak hour trips even though that volume was not used in the Transportation Management Plan analysis.

Third and finally, the employee population used to develop the estimates of AM and PM peak hour volumes was significantly understated. In general, the transportation studies used in developing the Transportation Plan employed the official BRAC 133 Project Fort Belvoir – Mark Center, Virginia, employee estimate of 6,409 employees. The Transportation Management Plan also added the 150 support personnel that will be on site. However, it was stated by USACE and WHS officials during an August 2011 oral interview[10] that the actual number of support personnel is closer to 400. These additional employees would result in an increase of 57 AM and 55 PM peak hour trips.

The result of these three factors suggests that the peak hour site trip generation is significantly higher than the 1,500 peak hour trips identified in the Transportation Plan.

Finding

The ITE Recommended Practice defines how trip generation shall be determined for site development transportation impact analyses. The Mark Center trip generation used in the development of the Transportation Plan was not determined in accordance with this practice. ITE recommends the use of national trip generation data where possible, and if not, the development of a local trip generation study in accordance with ITE standard practice.

The studies used in the development of the Transportation Plan did not follow these guidelines, but simply estimated peak hour trip generation from total site employment. As a result, the peak hour volumes stated in the Transportation Plan appear to be significantly less than what would be estimated if the ITE procedures and VDOT-recommended guidelines had been used.

Application of ITE rates suggest peak hour volumes of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, could be as high as 3,000 vehicles per hour or approximately double the peak hour volumes represented in the Transportation Plan.

References

1. Transportation Impact Analyses for Site Development: An ITE Recommended, Institute of Transportation Engineers, 2010
2. Final Environmental Assessment (FEA) BRAC 133, Fort Belvoir – USACE/Tetra Tech, July 2008
3. Mark Center Traffic Impact Study (TIS) – Wells & Associates, March 2003
4. Transportation Impact Analyses for Site Development: An ITE Recommended, Institute of Transportation Engineers, 2010: Procedure for Determining Appropriate Trip Generation Estimates (Table 5-1, pg. 36.)
5. BRAC 133 Transportation Improvement & Management Plan (TIMP) – Wells & Associates, July 2008
6. Trip Generation: An Informational Report, 8th Edition, ITE, 2008
7. Trip Generation Handbook, Second Edition: An ITE Recommended Practice, ITE, 2004, pg. 10, Step 2
8. Virginia Department of Transportation Traffic Impact Statement Guidelines (24VAC30-155-60)
9. Transportation Management Plan for BRAC 133 at Mark Center, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010
10. Oral Interview: U.S. Army Corps of Engineers and Washington Headquarters Service, Aug. 19, 2011

4.1.5 Trip Distribution/Traffic Assignment

Issue

The Transportation Plan assumes trip distribution percentages for BRAC employees based on a survey of the residential zip codes of current federal employees relocating to the Mark Center. Traffic assignment was determined through the use of the trip distribution percentages and an assumption of an assumed route from the various residential locations to the Mark Center[1]. Application of this approach is neither consistent with engineering best practices nor likely to provide a reasonable estimate of project impact on the transportation network.

The project influence area must be determined before distributing project trips. The influence area for the Mark Center was based on the residential zip code of the federal employees of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. The zip code data was used to distribute all trips for the 6,559 (6,409 BRAC employees + 150 support personnel = 6,559) employees that will occupy the Mark Center. The 150 support personnel include maintenance, information technology and other support persons. It should be noted that based on recent

communication[2] with WHS staff, the actual support personnel staff is closer to 400 than the 150 used in development of the Transportation Management Plan[3].

Although use of residential zip code data is beneficial in the identification of trip distribution patterns for BRAC employees, the zip code data only included the federal employees and not the defense contractors[2]. Failure to include a sample of the residential zip codes of the defense contractor population compromises the applicability of the data to the entire employment population.

Regarding traffic assignment, site generated traffic was assigned to the regional roadway network based on assumed routes employees and contractors would take from their residences to the Mark Center and vice versa.[1]

Analysis

Residential zip codes were obtained by WHS from personnel records for the federal employees who constitute 69 percent of the total employee population of the Mark Center. Similar records were not available for the defense contractors who comprise 31 percent of the population. Therefore, a considerable difference in the orientation of residential zip codes of defense contractors compared to federal employees has the potential to significantly change the trip distribution patterns used in the analysis of the traffic impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. Assuming there are 6,809 (6,409 BRAC 133 employees + 400 support personnel = 6,809) total employees, of which zip code data was obtained from pay roll records for 4,698 (0.69 × 6809 = 4,698) employees; yet, no data was obtained for 2,111 (0.31 × 6809 = 2,111) employees.

The potential for the defense contractors to have different residential locations than the federal employees is possible due to dissimilar income levels and the short-term nature of the job. To illustrate this point, the following hypothetical argument is offered:

Currently, the Transportation Management Plan assumes 48 percent of the peak hour trips will use I-395, and 52 percent will use the local street network (Transportation Management Plan, pg. 67, ¶2). If a survey of the 2,111 defense contractors indicates that half of the contractors, or 15 percent of the of the total employee population, live in residential locations where use of the surface street network would be more appropriate than the use of I-395, the resultant distribution would dramatically alter the impact to I-395 and the arterial street network.

For example, using Transportation Management Plan data, the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, is estimated to generate 1,500 AM and PM peak hour trips, and 52 percent of site generated peak hour traffic or 780 (1500 × 0.52 = 780) vehicles are expected to use the arterial street network while 48 percent, or 720 (1500 × 0.48 = 720) vehicles will use I-395. Assuming half of the defense contractors would use the arterial streets, and half would use I-395; rather than the 52/48 split suggested by the Transportation Management Plan. This would result in 67 percent of BRAC employees using local arterials, and 33 percent using I-395; i.e., half of the defense contractors – or 15 percent of the total population assumed to have residential

locations different from the federal employee – would use the local arterial street network rather than I-395. The result would be 1,005 (1,500 × 0.67 = 1,005) trips on the local arterial network and 495 (1,500 × 0.33 = 495) trips on I-395. Difference is 225 (720 – 495 = 225) fewer peak hour trips on I-395 and 225 (1,005 – 780 = 225) more peak hour trips on the local arterial network.

The conclusion of this analysis is that the actual residential zip codes of the defense contractors could significantly change the subsequent trip distribution and traffic assignment of the Mark Center peak hour traffic resulting in a significantly different assessment of project impact. Some may argue that the residential location of defense contractors is similar to federal employees but in fact there is no documentation to support that assumption. Standard practice in sampling studies requires a representative sample from the population to draw a conclusion about the population. Failure to proportionately sample the defense contractor population makes any assumption about the population unreliable.

Regarding traffic assignment, the USACE stated that traffic assignment was determined by assigning all traffic from a specific zip code to a specific route rather than assignment of trips to multiple routes based on capacity and other system constraints[1]. The ITE Recommended Practice[4] (pg. 50, ¶8) states, "Traffic assignment should be made considering logical routings, available roadway capacities, left turns at critical intersections and projected relative travel times."

Application of the traffic assignment process used in the development of the Transportation Plan may be acceptable for analyzing a small development in a constrained, uncongested roadway network, but it is not acceptable in a complex, congested network such as the one that serves the Mark Center. The Mark Center is located in an area with extreme traffic congestion that will cause motorists to seek out alternative paths based on a perceived minimum travel time. In order to accurately represent this case, a multiple path assignment technique would be required to evaluate alternative routings to the site with assignments made to each route based on capacity and expected delays. Without such an approach, the resultant traffic assignment process cannot effectively estimate realistic routings for estimated site generated traffic.

Finding

The process used to determine trip distribution/traffic assignment for the Mark Center did not adhere to sound engineering practice in the use of survey data and determination of traffic assignment patterns. The traffic distribution patterns of the entire employee population of federal employees and defense contractors were based on the residential location of the federal employees and did not include a sample of the residential location of the defense contractors. Secondly, traffic assignment patterns for the entire employee population were based on an assumed route from the residential location to the Mark Center without recognition of the possible alternative routes. The result of this approach to trip distribution and traffic assignment will result in unrealistic traffic patterns assumed for project-generated traffic.

References

1. E-mail: James Turkel, U. S. Army Corps of Engineers, Aug. 24, 2011
2. Oral Interview with U.S. Army Corps of Engineers and Washington Headquarters Service, Aug. 19, 2011
3. Transportation Management Plan for BRAC 133 at Mark Center, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010
4. Transportation Impact Analyses for Site Development: An ITE Recommended, Institute of Transportation Engineers, 2010

4.1.6 Transportation Plan

Issue

As stated in the Department of the Army's cover letter to its Transportation Plan, dated May 9, 2011, the purpose of the 17-page document is to address the requirements of Public Law 111-383 which seeks to determine if "ingress and egress of personnel to and from the BRAC 133 project site" is sufficient and whether the costs and programming of short, medium, and long-term projects are sufficient to "to maintain existing levels of service" on the road network serving the site. With this, there is an expectation that the Transportation Plan will provide a rational and reasoned discussion on the goals it seeks to achieve and the methodology and analysis used to meet these goals.

Analysis

For transportation plans, especially with the high complexity issues of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, industry practice dictates a format that is logical, rational and sequenced. Professional transportation plans usually begin with a statement of the goal to be achieved. The body of the plan – which is usually divided into chapters – identifies and quantifies the substance and complexity of each transportation issue and identifies one or several possible alternatives for resolving it. After a review of all alternatives, a preferred alternative is selected with a reasoned discussion on how and why it was selected over other possible options. The analysis and findings are typically summarized in a recommendations or conclusions chapter, which explains how the preferred alternative or alternatives will satisfy the goal and objectives to be achieved.

According to A Transportation Modeling Primer, 2006,[1] transportation planning is "a process that develops information to help make decisions on the future development and management of transportation, especially in an urban area." To achieve this, a professional transportation plan typically follows a format that facilitates decision-making based on a rational presentation of facts and analysis, as follows:

Vision and Goals	The purpose of the plan and what it intends to achieve
Objectives	The steps and actions necessary to achieve the goal
Problem Identification	An explanation and description of the key issues and problems to be resolved
Alternatives Analysis	Data collection, sound research, and development of alternatives for resolving each issue and problem identified. According to Primer, "A good planning effort will identify the trade-offs among alternatives in a clear, concise way to help facilitate decisions."
Recommendation	Recommendation of the best or preferred alternative with stated criteria on how and why the preferred alternative will best meet the plan goal and objective
Implementation Plan	A strategy for implementing the preferred alternative, including a management strategy which identifies a specific period of time for implementing the alternative, who or what will be responsible for implementation, the specific steps required for implementation, how much implementation will cost (usually by line item) and the expected outcome in relation to the goal to be achieved.
Monitoring Plan	A method for reviewing the performance of the preferred alternative, with stated criteria for assessing its performance and productivity

Finding

The Transportation Plan does not comply with standard industry practice for the development of transportation plan documents. The Transportation Plan appears to be a rambling collection of thoughts generally related to the issues surrounding BRAC 133 Project Fort Belvoir – Mark Center, Virginia. The Transportation Plan offers insufficient discussion and justification on how it arrived at recommendations and strategies for accommodating transportation needs of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. The Transportation Plan's use of source documents and its methodology for traffic counts, background traffic, trip generation, trip distribution and trip assignments is questionable and not clearly or fully explained. Without sound application of quantitative methodology, thoughtful consideration of possible alternatives and justification on why certain program strategies were selected over others, the conclusions of the Transportation Plan are weakened and do not meet the requirements of Section 2704 of Public Law 111-383.

References

1. A Transportation Modeling Primer, Center for Urban Transportation Studies, University of Wisconsin-Milwaukee, Edward A. Beimborn, June 2006
2. USDOT Federal Highway Administration, Metropolitan Transportation Planning Process: http://www.planning.dot.gov/Documents/MetroPlanning/metroTrans.htm

4.2 Ingress/Egress

Overview

In accordance with Public Law 111-343, the Transportation Plan is required to address the ingress and egress needs of all personnel to and from the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, project site. To ensure the Transportation Plan responds to this directive, the analysis process must adhere to the standards formulated to prepare and evaluate such analyses. The BRAC 133 Project Fort Belvoir – Mark Center, Virginia, is located within 500 feet of Interstate 395 (I-395) in the City of Alexandria, Va. Naturally, it is expected any traffic studies should address the City requirements. In addition, VDOT requires any site development within 3,000 feet of a state highway adhere to the VDOT traffic impact study requirements. (Virginia Code 24VAC30-155-60)

In addition to the City of Alexandria and VDOT requirements, there are national standards for such analyses prepared by ITE entitled, "Transportation Impact Analyses for Site Development: An ITE Recommended Practice, ITE 2010." The ITE Recommended Practice, used for the purposes of this independent assessment of the studies used to formulate the Transportation Plan, includes guidance on the development and analysis of the following issues:

- High Occupancy Vehicle Access
- Study Area
- Existing Conditions
- Background Conditions
- On-site Circulation
- Site Generated Traffic
- Trip Distribution/Traffic Assignment
- Analysis

4.2.1 High Occupancy Vehicle Access

Issue

The Transportation Plan[1] states, "From the day of substantial tenant occupation…traffic impacts will be mitigated by…an extensive shuttle program that provides service to the BRAC 133 campus from mass transit facilities...One primary shuttle service will operate between the BRAC 133 campus and the Pentagon Reservation every 15 minutes to assist many employees currently using rail transit to continue their existing commute patterns thus eliminating any negative impacts that would have resulted from increased traffic between the two locations. We anticipate many commuters will avail themselves of this option." (Transportation Plan, pg. 9)

Analysis

The Transportation Plan assumes 39 percent or 2,500 (0.39 × 6409 = 2,500) employees of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will use high occupancy vehicles to access the Mark Center. This assumption was based on current mode split choices by federal employees at the Pentagon Reservation. However, at the Pentagon Reservation, employees of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, have close and convenient access to alternative modes of travel. These same alternatives are not easily accessible or available at the Mark

Center. For example, there are no Metrorail facilities in the immediate vicinity of the Mark Center. The nearest one is the King Street Metro Station, located 4.31 miles away. The employee wishing to use Metrorail or Virginia Railway Express (VRE) services first will have to take a shuttle bus through traffic to the rail station. Another example of the access differences is the absence of high occupancy vehicle (HOV) lane access. At the Mark Center, the I-395 HOV lanes do not have northbound/southbound off-ramps to the site for the AM commute or northbound/southbound on-ramps for the PM commute. During the AM peak, this will require a northbound HOV employee of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, to travel to the Pentagon in the HOV lane and then return south to the Seminary Road interchange in the I-395 general-purpose lanes. Southbound HOVs using the HOV lane will be required to travel to the Duke Street interchange to exit the Mark Center.

In sharp contrast to the access profile for the Mark Center, the Pentagon Reservation represents a major confluence of rail, bus and commuter services. It is a commuter station and stop for the regional Metrorail Yellow and Blue lines. There is also direct and immediate I-395 freeway HOV lane access at the Pentagon for carpools, vanpools, and commuters who accept free rides from strangers, colloquially known as "slugs."

■ Finding

The Transportation Plan assumes at least 39 percent of the workforce (2,500 employees) of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will use shuttle, commuter rail, and HOV access for travel to work. This assumption is based on existing mode split choices of federal employees at the Pentagon Reservation. This assumption may be unrealistic. The Transportation Plan incorrectly states the wide range of alternative travel options at the Pentagon Reservation will be the same or similar for employees at the Mark Center. The actual finding is that travel options at the Mark Center are severely limited – rail access is 4.31 miles away, and no HOV freeway lanes directly serve the site. With this existing condition, the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, TDM strategy for achieving 39 percent non-SOV trips may fail.

■ References

1. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011

4.2.2 Study Area

■ Issue

Only six intersections in the vicinity of the Mark Center were analyzed to assess the traffic impact of the 6,409 employees according to the Transportation Plan, (pg. 7, ¶3). These intersections include:

- North Beauregard Street/Mark Center Drive
- North Beauregard Street/Seminary Road
- Seminary Road/Mark Center Avenue
- Seminary Road/I-395 Northbound Entrance Ramp
- Seminary Road/I-395 Northbound Exit Ramp
- Seminary Road/I-395 Southbound Exit Ramp

A seventh intersection, Seminary Road/I-395 Southbound Entrance Ramp was omitted, but it should have been included. This intersection has a significant adverse impact on ingress and egress to the Mark Center.

Analysis

The six intersections analyzed are located in close proximity to the Mark Center and do not represent the full impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. In limiting the extent of the study area to those six intersections, the Transportation Plan fails to comply with the requirements of the ITE Recommended Practice[1] as follows:

> ITE Recommended Practice – Study Area Limits for Transportation Impact Analyses: "Office or industrial park with more than 500 employees: The study area should include all signalized intersections and freeway ramps within two miles of a property line and all major unsignalized access within one mile of a property line of the site.[1]" (ITE Recommended Practice, Table 2-3, pg. 10)

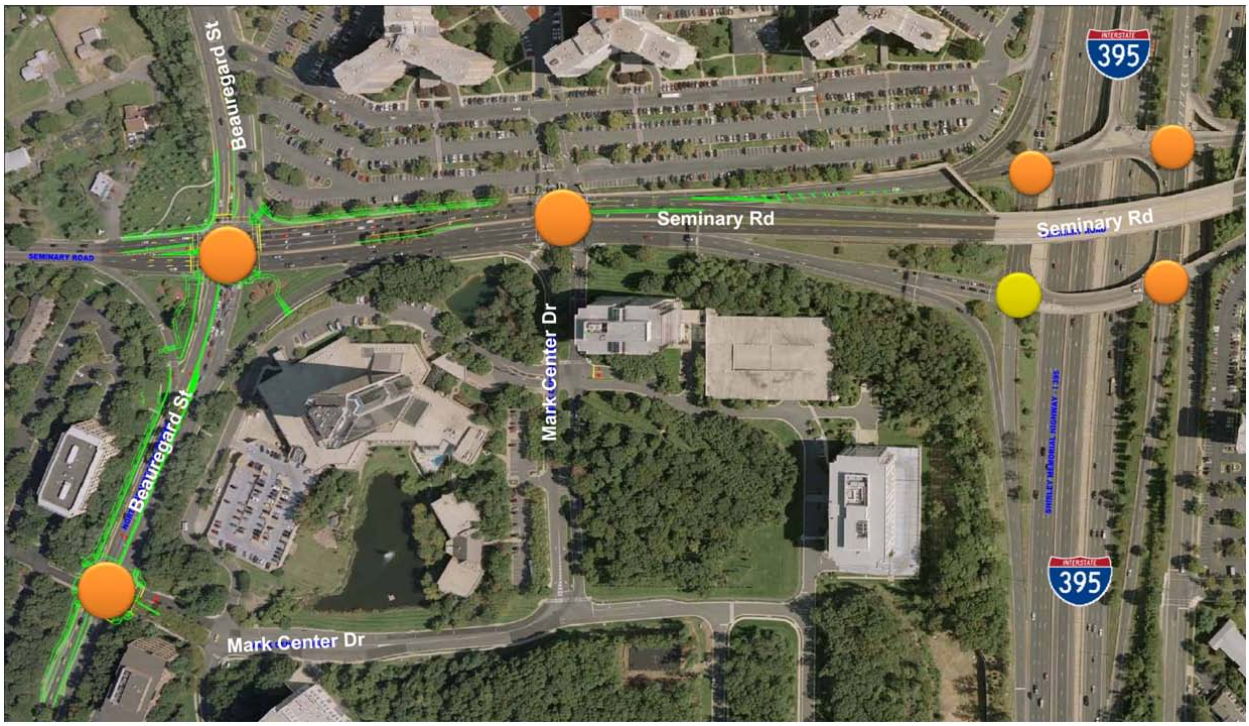

Figure 4-1: *Mark Center Ingress/Egress Intersections*[3]

According to the Transportation Plan, BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will relocate 6,409 employees to the Mark Center. Under ITE Recommended Practice, the study would include, at a minimum, all signalized intersections within a two-mile radius of the site and all unsignalized intersections within one mile of the site. The study area in the Transportation Plan, as defined by the six intersections analyzed, is limited to a distance of approximately 750 feet or 0.14 miles (750 ÷ 5280 = 0.14) from the easterly Mark Center property line to the I-395 northbound entrance ramp which is the intersection furthest from the property line. Two of the six intersections included in the analysis are simply site access intersections with the adjacent local arterials, i.e., Seminary Road and Beauregard Street. The remaining intersections include three located at the I-395/ Seminary Road interchange, and one at the North Beauregard Street/Seminary Road intersection. (Figure 4-1 above.)

If the ITE standards had been used to formulate the study area, at least 63 additional signalized intersections should have been evaluated. These include the following:

Seminary Road

- Kenmore Avenue
- Library Lane
- North Pickett Street
- North Jordan Street
- North Howard Street
- St. Stephens Road
- North Quaker Lane
- Echols Avenue
- Dawes Avenue
- South George Mason Drive
- Carlin Springs Road
- I-395 Southbound Entrance Ramp

Beauregard Street

- North Beauregard Street
- Rayburn Avenue
- Reading Avenue
- Sanger Avenue
- North Morgan Street
- North Armistead Street
- Quantrell Avenue
- Lincolnia Road/Gloucester Road
- North Chambliss
- Little River Turnpike
- Filmore Avenue
- West Braddock Street
- King Street

Duke Street

- Van Dorn Street
- North Ripley Street
- South Reynolds Street
- North Paxton Street
- South Pickett Street
- North Pickett Street/Cameron Station
- South Jordan Street
- South Ingram Street
- North Gordon Street
- South Gordon Street
- North Early Street
- South Early Street
- Wheeler Avenue
- North Quaker Lane
- Van Dorn Street
- West Braddock Street
- Seminary Road
- Kenmore Avenue
- Sanger Avenue
- Taney Avenue
- Holmes Run Parkway
- Mall Entrance East
- Mall Entrance West
- Stevenson Avenue

Little River Turnpike

- Oasis Drive
- I-395 southbound on ramp
- I-395 southbound off ramp

West Braddock Road	
• North Hampton Avenue	• Marlee Way
• North Howard Street	• North Quaker Lane
King Street/Leesburg	
• Skyline Drive	• Dawes Avenue
• Carlin Springs	• Sunset Center
• South Jefferson	• Beauregard Street
• South George Mason Drive	
South George Mason Drive	
• Skyline Plaza	

A map illustrating the location of these intersections and the two-mile radius is shown in Figure 4-2.

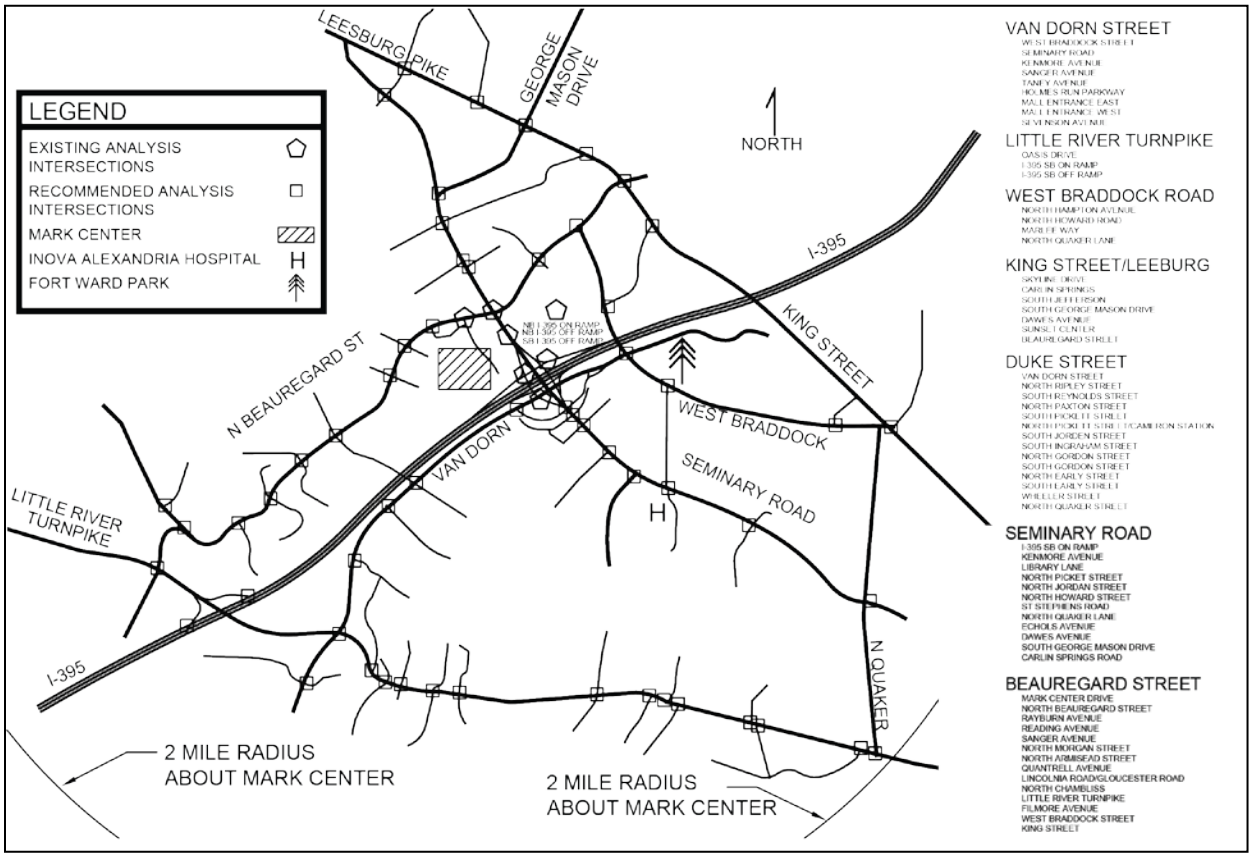

Figure 4-2: *Locations of Recommended Analysis Intersections*

In addition to ITE standards, VDOT requirements[2] should also be met. According to the Traffic Impact Statement guidelines presented in the Virginia Code (24VAC30-155-60), the study area should be based on the anticipated net increase in peak hour vehicle trips. Under VDOT requirements for site impact analyses, the following limits would apply:

- For developments generating 500 to 999 peak hour trips, an evaluation is required of all facilities within 2,000 feet of the site and any roadway on which 10 percent or more of the new vehicle trips are generated by the proposal, not to exceed two miles.
- For developments with more than 1,000 site generated peak hour trips, VDOT staff, in consultation with the local jurisdiction, e.g., City of Alexandria, determines the study area. Note: As stated in the FEA[3], it is assumed that the limits of the study area for a site generating more than 1,000 peak hour trips would be broader than the study area for a site generating less than 1,000 peak hour trips. (FEA, pg. 3-7, ¶6)

Since the Transportation Plan states BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will generate 1,500 peak hour trips (Transportation Plan, pg. 9, ¶1), the required study area would be based on a determination made by VDOT staff. Although it is unknown what requirements VDOT would have made for an analysis of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, application of the VDOT guidelines for a development generating less than 1,000 peak hour trips would significantly increase the size of the study area.

A study area of this magnitude is warranted because of the existing congestion on I-395 and the surrounding arterial network. Congestion on I-395 will result in traffic selecting alternate routes to the site, and the impact of rerouting needs to be addressed. Furthermore, recent studies in the area suggest significant congestion at major intersections. For example, the Mark Center (BRAC 133 Project Fort Belvoir – Mark Center, Virginia) Transportation Study[4], cited significant adverse impacts to the level of service would be created by BRAC at the following locations in 2013:

- Seminary Road/South George Mason Drive (LoS F)
- Seminary Road/Echols Avenue (LoS E) (Mark Center (BRAC 133) Transportation Study, Table 6, pg. 22)

Also, the Beauregard Corridor Traffic Study[5] identified the potential for extreme congestion at the Beauregard Street/Sanger Avenue intersection in the future AM and PM peak hours. (Beauregard Corridor Traffic Study, Table 6, pg. 32). Such conditions suggest an evaluation of the impacts of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, at additional intersections is warranted.

Finding

The ITE Recommended Practice suggests a development of the magnitude of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, include the evaluation of the traffic impacts at all signalized intersections within a study area defined by a two-mile radius around the site. The Transportation Plan limited the analysis to six intersections within 0.14 miles of the site. The Transportation Plan should have considered a much larger study area than six intersections. Application of the ITE Recommended Practice would have resulted in a larger study area that would have included at a minimum an additional 63 intersections. The outcome would have identified significant impacts resulting from BRAC 133 Project Fort Belvoir – Mark Center, Virginia, on the area intersections.

References

1. Transportation Impact Analyses for Site Development: An ITE Recommended Practice, ITE, 2010.
2. Virginia Department of Transportation Traffic Impact Statement Guidelines (24VAC30-155-60)
3. Final Environmental Assessment (FEA) BRAC 133, Fort Belvoir – USACE/Tetra Tech, July 2008
4. Mark Center (BRAC 133) Transportation Study – City of Alexandria/VHB, November 2009
5. Beauregard Corridor Traffic Study Final Report, Wilbur Smith Associates, January 2007

4.2.3 Capacity of I-395

Issue

The Transportation Plan states, "The area of highest public concern in the region is the BRAC 133 traffic impact on I-395. The four separate traffic analyses conducted over the past several years do not show that there will be significant impacts on I-395." (Transportation Plan, pg. 4, ¶13) Conversely, the Transportation Plan identifies capacity of the I-395 southbound mainline and southbound onramp merge as the primary cause of failing operations at the Seminary Road/Mark Center Avenue intersection. (Transportation Plan, pg. 12, ¶3)

The DoD OIG's independent engineering review of the traffic studies that evaluate impacts to I-395 indicates significant congestion exists on I-395 southbound general-purpose lanes and on the Seminary Road/I-395 southbound entrance ramp. The addition of traffic from BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will result in queuing that backs up traffic to the Seminary Road/Mark Center Avenue intersection impacting egress from Mark Center.

The Transportation Plan also states, "Ongoing analysis and decision making by VDOT indicate the proposed direct HOV/bus transit access ramp connection will restore the levels of service at the Seminary Road/Mark Center Avenue and Seminary Road/Beauregard Street intersection [sic] to acceptable levels." (Transportation Plan, pg. 14, ¶1)

The Transportation Plan is not consistent in its representation of impacts on I-395 by BRAC 133 Project Fort Belvoir – Mark Center, Virginia, in its representation of the results of previous traffic studies that evaluated BRAC 133 impact on I-395, or its expectation that VDOT long-range improvement plans will address any LoS deficiencies.

Analysis

The Transportation Plan presents conflicting conclusions regarding traffic flow conditions on I-395. The Transportation Plan states the failing LoS at the Seminary Road/Mark Center Avenue intersection results from the inadequate capacity on the I-395 southbound freeway mainline and

the Seminary Road ramp merge area that causes traffic to backup through the Mark Center Avenue intersection. (Transportation Plan, pg. 12, ¶3) The Transportation Plan assumes this congestion will be resolved through the construction of an I-395/HOV access ramp. However, a review of the facts indicates that construction of the ramp will likely not have a significant impact on the backup to Mark Center.

The I-395 southbound freeway mainline congestion results from a reduction in the number of general-purpose through lanes between the Seminary Road interchange and the Duke Street interchange. In this section, the number of general-purpose through lanes is reduced from four to three in each direction. Using a capacity of 1,900 vehicles per hour per lane, the directional capacity of the I-395 mainline decreases from 7,600 (1,900 × 4 = 7,600) vehicles per hour at Seminary Road to 5,700 (1,900 × 3 = 5,700) vehicles per hour at Duke Street. The current AM peak demand is 6,300 vehicles per hour in the northbound direction. (Transportation Plan, pg. 9, ¶1) The current PM peak is 6,700 vehicles per hour in the southbound direction. There is sufficient capacity to handle the current demand through the Seminary Road section of I-395 mainline; however, the current traffic demand through the Duke Street interchange exceeds the available capacity. The Transportation Plan suggests the proposed I-395 HOV access ramp will resolve this issue.

A review of the traffic forecast for the 2015 horizon year suggests the proposed I-395/Seminary Road HOV access ramp will not mitigate the significant I-395 congestion created from the reduction in mainline capacity at the Duke Street interchange. In the 2015 horizon year, I-395 is estimated to have 6,930 vehicles per hour in the northbound general-purpose lanes during the AM peak and 7,385 vehicles per hour in the southbound general-purpose lanes. (Figure 4-4, Mark Center (BRAC 133) Short/Mid-Term Improvements Technical Memorandum, VDOT, February 2011). To eliminate the potential for congestion at the Duke Street interchange, these volumes would need to be consistent with the available I-395 general-purpose capacity at Duke Street, or 5,700 vehicles per hour. To achieve 5,700 vehicles per hour in the southbound direction, 1,685 (7,385 – 5,700 = 1,685) PM peak hour vehicles would need to shift from the I-395/Seminary Road southbound entrance ramp to the proposed HOV access ramp. The PM peak hour volume of 1,945 vehicles is forecasted for 2015 for the I-395/southbound entrance ramp. Therefore, the majority of the traffic, or 1,685 vehicles of the 1,945 forecasted, would need to use the proposed HOV access ramp.

To put this in context, the total site generated PM peak hour volume (1,500) generated by BRAC 133 Project Fort Belvoir – Mark Center, Virginia, using I-395 southbound is 435 (1,500 × 0.29 = 435) vehicles. (Transportation Plan, pg. 9, ¶1) Even if the total population of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, used the proposed I-395 HOV access ramp, the reduction would not be sufficient to eliminate the I-395 southbound mainline congestion creating the failing LoS at the Seminary Road/Mark Center Avenue intersection.

■ Finding

Responsible transportation planning dictates a proposed development should mitigate significant adverse impacts to the roadway network. The Transportation Plan documents the fact that

BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will create a significant adverse impact on I-395 that will not be mitigated by the proposed HOV access ramp. The Transportation Plan fails to recognize that congestion on the I-395 mainline creates queuing onto Seminary Road impacting the intersection at Mark Center Avenue. Any volume diverted to the proposed HOV ramp will not be significant enough to resolve the mainline congestion on I-395 southbound.

References

No references available.

4.2.4 I-395 Congestion

Issue

The Transportation Plan indicates the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, on I-395 is "relatively minor." (Transportation Plan, pg. 9, ¶1) Conversely, the Transportation Plan also states, ". . . reduction in peak traffic volumes, albeit small, can result in a proportionally larger reduction in delay. For example, a 5 percent reduction in traffic volumes on a congested highway (e.g., from 2,000 to 1,900 vehicles per hour) may cause a 10 to 30 percent increase in average vehicle speeds and provide relatively large reductions in traffic delay." (Transportation Plan, pg. 16, ¶3)

If a small reduction in traffic volume on a congested highway can provide relatively large reductions in traffic delay, the converse is also true; a small increase in traffic volume may also cause a significant decrease in average vehicle speeds and can provide relatively large increases in traffic delay.

Analysis

The Transportation Plan states the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, on I-395 is "relatively minor" because the interstate currently experiences severe congestion and delays during AM and PM peak hour in the vicinity of the Mark Center. (Transportation Plan, pg. 9, ¶1) According to the Transportation Plan, BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will add 190 new trips, or three percent, to I-395 northbound during the AM peak hour and similar amounts to the southbound direction in PM peak hour. (Transportation Plan, pg. 9, ¶1)

The impact of additional traffic on congested freeways is not linear. There is an exponential relationship between speed and traffic volumes. As the volume increases the speed decreases up to the point where capacity is reached. After capacity is reached, both speed and volume decrease at an exponential rate until gridlock occurs.

According to a recent Transportation Research Board (TRB) report, "Travel speeds fall off dramatically at high volumes when new traffic is added. With these congestion levels in place a traffic increase of only five percent or 10 percent could cause a highway facility to transition

from relatively free flow conditions to stop-and-go conditions limiting the maximum number of users."[1] Based on this principle, adding a significant volume of additional traffic to a highway, such as I-395, that is currently operating under low speed conditions could result in near gridlock conditions.

Finding

Transportation planning research indicates that small increases in traffic volume may result in significant impacts on traffic speeds and congestion. The Transportation Plan's assumption that because I-395 is already congested, a relatively modest increase in traffic will have "a relatively minor impact" on traffic operations is not accurate. Additional traffic added to a congested freeway will have a disproportionate impact on freeway operations that could result in gridlock.

References

1. Federal Funding of Transportation Improvements in BRAC Cases, Transportation Research Board (TRB) Special Report 302, 2011
2. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011

4.2.5 Mitigation

Issue

The Transportation Plan[1] states that, "With the implementation of the VDOT recommended short-and mid-term improvements, long-term I-395 HOV access ramp improvement, and the enhanced Transportation Demand Management (TDM) and transit options provided by the Army, City of Alexandria and other agencies, VDOT transportation officials have acknowledged that the potential traffic problems generated by BRAC 133 will be adequately mitigated." (Transportation Plan, pg. 15, ¶3)

Currently, the Transportation Plan indicates a failing LoS will exist at the Seminary Road/Mark Center Avenue intersection with implementation of VDOT's short and mid-term improvements. Even though the study has not been completed and the results are unknown, the Transportation Plan assumes acceptable levels of service will be achieved with the implementation of the I-395 HOV access ramp. (Transportation Plan, pg. 4, ¶1)

Analysis

There is no documentation to support the contention that the proposed I-395 HOV access ramp will mitigate the projected LoS deficiency at the Seminary Road/Mark Center Avenue intersection. Furthermore, VDOT staff stated they would not know what benefits will be achieved, if any, with the implementation of the proposed I-395 HOV access ramp until the study is complete at the end of 2011.[2]

Although $80 million has been allocated to the I-395 HOV access ramp project, according to VDOT[2], the project is in the study and Environmental Assessment (EA) stage as of the writing of this report. The actual benefits of the proposed ramp are unknown. Furthermore, public acceptance of the concept is yet to be determined.

Finding

The Transportation Plan incorrectly asserts that Virginia Department of Transportation indicates that with the short/mid-term and long-term improvements, the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will be adequately mitigated. With the proposed short/mid-term improvements, the Seminary Road/Mark Center Avenue intersection is estimated to operate at LoS F. According to VDOT, the impact of the proposed I-395 HOV access ramp is currently unknown.

References

1. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011
2. Oral Interview: Tom Fahrney, Virginia Department of Transportation BRAC Coordinator, Aug. 5, 2011

4.2.6 Parking Supply

Issue

A key element of the Transportation Management Plan[1] is the limited number of parking stalls provided for BRAC employees at Mark Center. The Transportation Plan states that a key feature of the Transportation Management Plan is "a self-imposed, significant restriction on employee parking at the facility wherein the total number of parking spaces is more than 1,000 below the number of spaces permitted by the City of Alexandria prior to purchase of the property by the Army."

A reduction of 1,000 parking spaces below the City of Alexandria's zoning ordinance requirement will create a significant problem. If the SOV goals are not achieved, the parking problem will shift throughout the area resulting in frustrated employees, businesses and residents.

Traditionally, when there is insufficient parking supply, motorists look for alternatives within the area to park their cars. This may be in residential neighborhoods or in under-used parking facilities at shopping malls, churches or other office complexes. In general when there is inadequate parking at the project site, the parking problem is simply spread to other locations.

Analysis

According to the 2008 Transportation Improvement and Management Plan[2] (TIMP), prior to the BRAC 2005 decision, the Mark Center project was approved for 4,839 parking spaces. The proposed BRAC 133 Project Fort Belvoir – Mark Center, Virginia, parking spaces represented in the TIMP number 3,904, and 3,747 in the Transportation Management Plan or 1,092 (4,839 – 3,747 = 1,092) fewer parking spaces than what was initially approved by the City of Alexandria.

According to the City of Alexandria's Zoning Ordinance[3], Mark Center, located in Parking Zone 5, requires one parking space for every 475 gross square feet (gsf) of building space. According to the Zoning Ordinance, 3,745 parking spaces would be required or two fewer spaces than proposed. Calculations for these number follow: BRAC 133 Project Fort Belvoir – Mark Center, Virginia, includes 1,779,000 gsf of office space and provides 3,747 parking spaces (per Transportation Management Plan), whereas Alexandria's Zoning Ordinance for Parking Zone 5 requires one space per 475 gsf for a total of 3,745 (1,779,000 ÷ 475 = 3,745) parking spaces or two (3,747 – 3,745 = 2) parking spaces fewer than what is proposed.

The Transportation Plan has established a goal of 57 percent of the employees and visitors arriving by SOV and 43 percent arriving by non-SOV. (Transportation Plan, pg. 7, ¶3) The automobile-oriented non-SOV portion is estimated to include five percent carpools, three percent vanpools and three percent "slugs."

According to Washington Headquarters Service (WHS)[4], there will be a total of 6,409 employees of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, and another 400 support personnel allocated to the Mark Center. This results in a total of 6,809 people assigned to the Mark Center.

The Transportation Management Plan assumptions, with the WHS employee count adjustments, made in determining the required number of parking spaces follows:

- 90 percent of the total employees (6,809) will be on site daily for a total of 6,128 (6,809 × 0.90 = 6,128 employees)
- Five percent of the daily population will be visitors (6,128 × 0.05 = 306)
- The total number of people traveling daily to the Mark Center is 6,434 (6,128 + 306 = 6,434), and they will utilize the same mode split

Based on these calculations, the number of parking spaces required for each mode follows:

- 57 percent SOV = 3,667 (6,434 × 0.57 = 3,667) employees and visitors
- Five percent carpools with a minimum of three employees = 322 (6,434 × 0.05 = 322) resulting in a need for 107 (322 ÷ 3 = 107) parking spaces
- Three percent vanpools with a minimum of seven employees = 193 (6,434 × 0.03 = 193) resulting in a need for 28 (193 ÷ 7 = 28) parking spaces
- Three percent "slugs" need for HOV-3 on I-395 = 193 (6,434 × 0.03 = 193) employees resulting in the need for 64 (193 ÷ 3 = 64) parking spaces

Therefore, if a 57 percent SOV goal is desired, a total of 3,866 (3,667 + 107 + 28 + 64 = 3,866) parking spaces are required to meet employee needs. In addition, the Transportation Management Plan estimates that 150 parking spaces will be set aside for government vehicles resulting in a total parking demand of 4,016 (3,866 + 150 = 4,016) parking spaces. This results in a shortfall of 269 (4,016 – 3,747 = 269) parking spaces beyond what was estimated by the Transportation Management Plan.

Based on conversations with WHS[4], it is expected that the available parking spaces will be assigned to employees. If parking spaces are assigned, a 10 percent reduction in parking spaces to reflect a 90 percent daily employee attendance is not applicable. If the spaces are assigned, the parking spaces would be reserved whether the employee is on site or not and reducing estimated parking space requirements by 10 percent is not appropriate. Assigning parking spaces will increase the parking space demand by a minimum of 10 percent of the anticipated SOV demand or 367 (3,667 × 0.10 = 367) spaces.

Therefore, the parking demand exceeds supply by 636 (269 + 367 = 636) parking spaces.

■ Finding

The Transportation Plan states that sufficient parking supply will be provided to accommodate all vehicles with an assumed 57 percent SOV mode split. In fact, the Mark Center will have 636 fewer parking spaces than is needed to accommodate the workforce under the proposed SOV goal. The proposed parking supply of 3,747 parking spaces is approximately 636 spaces fewer than what is required to meet the projected demand even with the "self imposed stringent requirement" of 57 percent SOVs. The result of this requirement will be employees seeking parking off site and placing pressure on adjacent residential neighborhoods, shopping malls, churches, and other commercial complexes.

■ References

1. Transportation Management Plan for BRAC 133 at Mark Center, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010
2. BRAC 133 Transportation Improvement & Management Plan (TIMP) – Wells & Associates, July 2008
3. City of Alexandria's Zoning Ordinance
4. Oral Interview: U.S. Army Corps of Engineers and Washington Headquarters Service, Aug. 19, 2011

4.2.7 On-Site Circulation (Vehicle and Pedestrian)

■ Issue

A critical component of ingress and egress for employees of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, is the ability for SOV and non-SOV traffic, including buses and shuttles,

to move efficiently and without delay around the Mark Center – particularly as it relates to access to available parking facilities and bus/shuttle stop locations.

Two specific studies related to on-site circulation were prepared as part of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, analyses to address the sufficiency of on-site circulation. The studies included:

- WHS Internal Roadway Network Traffic Evaluation, Wells & Associates, August 2009; and
- Transportation Management Plan for BRAC 133 at Mark Center, Section 4.4.7, Benham Companies, July 2010.

Both analyses concluded that with minor improvements on-site circulation would accommodate anticipated traffic volumes. In review of these studies, significant errors and oversights in the analysis process were identified which would invalidate their conclusions.

Analysis

In general, each of the studies failed to include the impact of potential queuing on the surrounding arterial network, which has the potential to back-up onto the site and exacerbate on-site intersection operations. The potential for queuing was identified in the VDOT February 2011 Study[1] for the intersections of Mark Center Drive/Beauregard Street and Mark Center Avenue/Seminary Road where projected PM peak hour queues will impact on-site circulation.

Below are other problems with the individual studies.

WHS Internal Roadway Network Traffic Evaluation[2]

The fundamental issues with the WHS study's level of service analysis for the Mark Center Drive/WHS Circle intersection include:

- The impact of pedestrian volume on traffic signal operations and resultant capacity does not appear to be addressed. Increased pedestrian activity will impact traffic operations. The impact of buses on intersection LoS, does not appear to be addressed. The Transportation Management Plan[3] anticipates a significant volume of bus traffic, which should be represented in the capacity analysis
- Model default peak hour factor values of 0.95 were used when actual traffic counts[3] on adjacent streets indicate the peak hour factor may be as low as 0.91 during the AM peak and as high as 0.97 during the PM peak. The difference in these values will significantly alter the volumes used in the LoS calculations. The application of model default values suggests the analyst was not sufficiently rigorous in their analysis to reflect actual traffic volume conditions.
- Anticipated queues from the Seminary Road/Mark Center Drive intersection are expected to extend beyond and block the intersection at 4900 Drive. The analysis failed to identify a solution to these issues other than to install "Do Not Block Intersection" signs.

For additional discussion on pedestrian and public bus services, refer to Section 4.4 Use of Other Methods of Transportation that are Necessary to Maintain Existing LoS, page 69 - 4.4.6, and page 59 4.4.2, respectively.

Transportation Management Plan for BRAC 133, Section 4.4.7[4]

The Transportation Management Plan provides a CORSIM evaluation, which is a microscopic traffic simulation of the site roadway network. The evaluation of the on-site intersections generally concluded "projected traffic conditions show the proposed internal roadways operating at acceptable conditions with free flowing traffic throughout the internal roadways." (Transportation Management Plan pg. 91, ¶1) However, there are several factors that challenge that conclusion:

- The corridor simulation (CORSIM) model used to analyze on-site circulation does not "explicitly" model roundabout operations. (Transportation Management Plan, pg. 72, ¶7) Therefore the model needs to be revised to accommodate the proposed modeling of the roundabout at Mark Center Drive/WHS Circle and the entrances to the North and South Parking Garages.
- The capacity constraint resulting from the South Garage security gate and the LoS evaluation of the roundabout do not appear to be included in the analysis.
- The impact of increased transit and shuttle dwell times and operational impacts in the overall site circulation do not appear to be represented in the model.
- The operation of the roundabout was coded into the model as a one-way, counter-clockwise link (Transportation Management Plan pg. 91, ¶1); this is not consistent with actual operation.
- The City of Alexandria[5] stated that the results of the traffic impact analysis are not reliable because the micro-simulation model (CORSIM) was not adequately calibrated.

Independent Evaluation of the Roundabout Design

As shown in Figure 4-3 below, the roundabout was not designed consistent with standard design practice for roundabouts. The dimensions of the roundabout are not sufficient to provide efficient traffic flow through the roundabout and into the North and South Parking Garages as well as IDA Drive. These design deficiencies will result in inefficient circulation and unnecessary congestion.

The following is not intended as a rigorous design review of the proposed roundabout, but rather an overview of the critical design elements. The analysis is based on the Washington State Department of Transportation Design Manual[6]. The WSDOT is a national leader in the design and installation of roundabouts. WSDOT has done extensive national and international research in the development of roundabout design criteria. A cursory review of the Virginia Department of Transportation found no reference to roundabouts or roundabout design parameters. Thus, the proposed WHS Circle roundabout was compared against WSDOT design standards.

The WHS Circle roundabout is a two-lane four-leg roundabout serving WHS Circle, IDA Drive and access to the North Parking Garage. Immediately to the east of the roundabout is the security gate to the South Parking Garage. A summary of the critical roundabout design features is presented in Table 4-2 below.

		Recommended[1]	Actual[2]
A	Circulating Roadway Width	29 feet	27 feet
B	Central Island	90 feet	32 feet
C	Entry Width	25 feet	20 feet
A+B+A	Inscribed Circle Diameter	150 feet	86 feet

Table 4-2: *Summary of Critical Roundabout Design Features*

1) Source: Washington State Department of Transportation Design Manual, Chapter 1320, Exhibit 1320-8
2) Source: USACE, BRAC 133 Mark Center Design Plans.

As shown in Figure 4-3, the proposed WHS Circle roundabout is deficient in all the pertinent design parameters. According to the WSDOT Design Manual[7], small changes in geometry can result in substantial changes in operational performance.

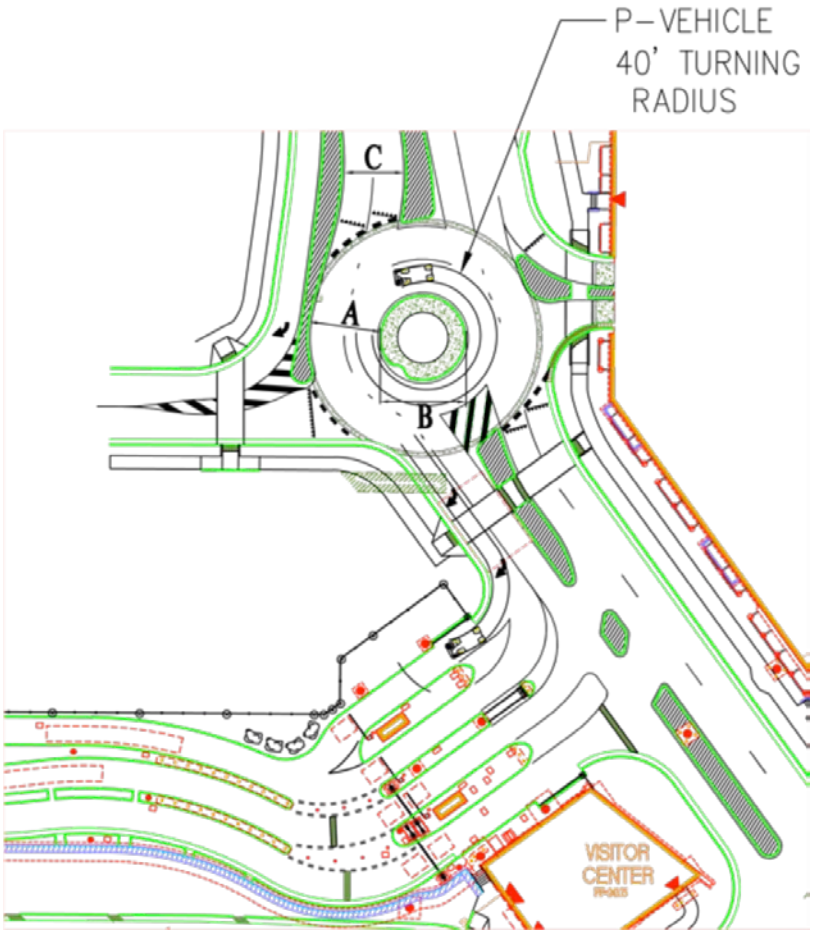

Figure 4-3: *Independent Evaluation of the Roundabout*

It is recommended that the designer revisit the design of the roundabout and make necessary changes to improve operational performance which will maximize gate processing operations and overall traffic circulation on WHS Circle.

Finding

Several studies have been conducted to assess on-site circulation at the Mark Center. All of the studies concluded that with BRAC 133 Project Fort Belvoir – Mark Center, Virginia, there should be no adverse circulation issues. However, these analyses have failed to 1) consider the impact of queuing created by congestion on the surrounding arterial street network; 2) use appropriate assumptions and analysis tools; 3) recognize design deficiencies in the on site roadway network; and 4) mitigate the resultant adverse impacts. As a result, the full impact of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, traffic on the on-site street system is unknown. Extensive on-site delay is expected based on anticipated on-site queuing resulting from the site access intersections and the substandard roundabout design.

References

1. Mark Center (BRAC-133) Short/Mid-Term Improvements Alternatives Technical Memorandum, VDOT, February 2011
2. Washington Headquarters Service Internal Roadway Network Traffic Evaluation, Wells & Associates, August 2009
3. BRAC 133 Transportation Improvement & Management Plan (TIMP) – Wells & Associates, July 2008; Technical Appendix - Traffic Counts, Seminary Road/Mark Center Dr.
4. Transportation Management Plan for BRAC 133 at Mark Center, Benham Companies, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010
5. City of Alexandria Staff Comments in Response to Transportation Management Plan, Aug. 19, 2010, pg. 21, Item 1
6. Washington State Department of Transportation Design Manual, August 2011, Chapter 1320, Roundabouts.
7. Washington State Department of Transportation Design Manual, August 2011, Chapter 1320, Roundabouts, page 1320-11, Section 1320.06.

4.2.8 Safety

Issue

The Transportation Plan and the studies used to develop the Plan do not include an assessment of safety of the transportation facilities serving the site. According to the ITE Recommended Practice[1] (pg. 76, ¶3) a review should be made of the study area to "identify locations where transportation safety should be given extra consideration." This analysis was not provided.

Analysis

A recent traffic study[2] prepared for the City of Alexandria indicated that the Seminary Road/Beauregard Street intersection has a significant crash history with 86 crashes at the Seminary Road/Beauregard Street intersection during the two-year analysis period from January 2003 to December 2004. That represents 43 percent of the total crashes in both corridors over this time period. These crashes occur as motorists attempt to merge from the designated eastbound and northbound right turn lanes. These movements will be significantly impacted by BRAC 133 Project Fort Belvoir – Mark Center, Virginia, traffic, which will add approximately 1,900 vehicles[3] to this intersection in the AM peak and 500 in the PM peak.

Although the data is seven years old, it indicates that safety issues do exist in the vicinity of the site which warrant consideration. According to ITE Recommended Practice, the studies prepared for BRAC 133 Project Fort Belvoir – Mark Center, Virginia, should have reviewed the existing crash history within the study area to determine if there were safety issues that needed to be addressed.

Finding

The ITE Recommended Practice suggests that the traffic impact studies should identify locations within the study area where extra attention should be given to safety issues. None of the traffic studies used in the formulation of the Transportation Plan gave any consideration to safety at the analysis intersections. Within the vicinity of the Mark Center, there are high crash locations that will be significantly impacted by additional traffic generated by BRAC 133 Project Fort Belvoir – Mark Center, Virginia. The safety issues at these locations will adversely affect ingress and egress to the site. The high crash locations should be identified, and appropriate mitigation measures applied to reduce, if not eliminate, these safety hazards.

References

1. Transportation Impact Analyses for Site Development: An ITE Recommended Practice, ITE 2010.
2. Seminary Road/Beauregard Street Corridor Traffic Study, Wilbur Smith, 2007
3. Transportation Management Plan for BRAC 133 at Mark Center, Benham Companies, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010, Figure 4-6.

4.2.9 Impact on Emergency Response

Issue

The impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, on emergency response services was not identified in the transportation studies used to develop the Transportation Plan.

Analysis

The proposed impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, on emergency service is comprised of two elements. First, the addition of an office building development that will include 6,809[1] employees must be assumed to have a significant impact on the volume of calls for emergency response to the site.

Secondly, with the additional traffic congestion generated by BRAC 133, the response time for emergency services could be significantly impacted. Intersection delays and extensive queuing could significantly impact the ability of emergency response services to access the Mark Center.

Finding

A development of the magnitude of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will have a significant impact on emergency services including fire, aid and serving the site. It is expected the volume of emergency response calls will increase proportionately with the increased employee population. With the estimated traffic congestion and its resulting impact on ingress and egress, a significant impact on emergency vehicle response times to the site can be anticipated. These impacts should be identified and mitigated as part of the Transportation Plan.

References

1. Oral Interview: U.S. Army Corps of Engineers and Washington Headquarters Service, Aug. 19, 2011

4.2.10 Construction Impacts

Issue

The Transportation Plan failed to identify the impact of construction activities on the surrounding roadway network during the interim period from 2011 when BRAC 133 Project Fort Belvoir – Mark Center, Virginia, is occupied, and 2013[1] when the VDOT short- and mid-term improvements are completed, and in 2016[2] when the I-395 HOV access ramp is completed. Note: If the project receives public approval.

Analysis

The transportation studies used in the development of the Transportation Plan indicated that until the VDOT short- and mid-term improvements are completed, the study area intersections, in general, would operate at unacceptable levels of service. While the proposed improvements are constructed, it is assumed that lane closures, construction activity, and potential detours will have a significant impact on traffic circulation in the vicinity of Mark Center. The impact of the construction activity and necessary mitigation measures to address construction impacts has not been identified.

Finding

The ITE Recommended Practice[3] identifies the need to provide acceptable levels of service at the time of site occupancy. The Transportation Plan indicates unacceptable and failing levels of service will exist at study area intersections until the VDOT Short/Mid-Term Improvements and long-range improvements are completed. The Transportation Plan states that the Short/Mid-Term improvements are to be complete by late 2013 and VDOT suggests the long-range improvements, if approved, could be complete by 2016. The Transportation Plan, however, fails to address the impact of construction activity between 2011, when BRAC 133 Project Fort Belvoir – Mark Center, Virginia, is occupied, and 2016, when all improvements are complete. Construction activity will affect ingress and egress to the site. The impact of construction activity on the study area and site access intersections should be determined and appropriate mitigation measures identified and included in the Transportation Plan.

References

1. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011, page 5, bullet 1.
2. Oral Interview: Tom Fahrney, Virginia Department of Transportation BRAC Coordinator, Aug. 5, 2011
3. Transportation Impact Analyses for Site Development: An ITE Recommended Practice, ITE 2010.

4.3 Assessment of Costs

Overview

Public Law 111-383 required the Transportation Plan provide an assessment of the "costs and programming of short-, medium-, and long-term projects" necessary to maintain existing level of service at the six intersections analyzed. For the purposes of this discussion, the assessment of costs includes:

- An evaluation of the horizon years used in the evaluation of BRAC 133
- Assessment of the level of service with proposed improvements
- Cost estimates identified to fund the improvements
- Documentation of the source of the proposed funds and determination if they are programmed

4.3.1 Horizon Year

Issue

The transportation studies used to develop the Transportation Plan had horizon years ranging from 2003 to 2035 and various years in between. Identification of appropriate time horizons is important in assessing the true impact of the proposed development and in identifying necessary transportation improvements to be included in the planning horizon of the impacted jurisdictions.

The studies used in the development of the Transportation Plan do not appear to have a well-reasoned understanding of the need for or the benefit of an adopted horizon year.

Analysis

Horizon years should be established to meet policies, needs and issues. The identification of horizon years should consider compatibility with funding programs, available planning data, and community needs. For the purposes of the traffic analysis of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, the ITE Recommended Practice[1]provides guidance.

For large single-phased development (>1,000 peak hour trips) such as BRAC 133, ITE Recommended Practice suggests the selection of a horizon based on the following criteria (ITE Recommended Practice, Table 3-1. pg. 15):

- Anticipated opening year, assuming full build-out and occupancy
- Five years after full build-out and occupancy
- Adopted transportation plan horizon year, if the development is significantly larger than that included in the adopted plan or travel forecasts for the area

None of the previous individual studies prepared for the analysis of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, included the suggested horizon years identified by the ITE Recommended Practice. Each study provided an evaluation of a horizon year or multiple horizon years, but the horizon years suggested in the ITE Recommended Practice were not included in any one document. While the VDOT studies[2] did not include an evaluation of the opening year of the BRAC site, they did include an evaluation of the regional system for the 2015 and 2035 planning horizons. Therefore, a case can be made that the impact on regional planning and funding of necessary regional scale transportation facility improvements has been addressed. The long-range impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, on the local arterial network was not addressed. The Transportation Management Plan[3] used in the development of the Transportation Plan provided a traffic impact study of the opening year, but not of future years.

With this approach to horizon years, the reviewer is not provided with a clear picture of the traffic related impacts of the subject development, and the impacted jurisdictions are unclear as to when necessary improvements are required and should be programmed.

Finding

The ITE Recommended Practice recommends that transportation impact analyses include an analysis at the opening of the site and at a minimum five years in the future. The traffic studies used in the development of the Transportation Plan failed to provide an impact analysis at both the opening and five years in the future. Thus, these studies did not provide a comprehensive understanding of the actual traffic related impact of the proposed BRAC 133 Project Fort Belvoir – Mark Center, Virginia, development. The result of this approach complicates the determination of required project mitigation, scheduling of programmed improvements, and related funding requirements.

References

1. Transportation Impact Analyses for Site Development: An ITE Recommended Practice, ITE, 2010.
2. Mark Center (BRAC 133) Access Study-Operational Analysis Report / IJR – VDOT, February 2010. Mark Center (BRAC 133) Short/Mid-Term Improvements Alternatives Technical Memorandum, VDOT, February 2011.
3. Transportation Management Plan for BRAC 133 at Mark Center, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010

4.3.2 Maintaining Existing Level of Service (LoS)

Issue

Public Law 111-383[1] required the Transportation Plan to identify necessary improvements to maintain the existing LoS at the following six intersections:

- The intersection of Beauregard Street and Mark Center Drive
- The intersection of Beauregard Street and Seminary Road
- The intersection of Seminary Road and Mark Center Avenue
- The intersection of Seminary Road and the northbound entrance ramp to I-395
- The intersection of Seminary Road and the northbound exit ramp from I-395
- The intersection of Seminary Road and the southbound exit ramp from I-395

A review of the Transportation Plan indicates existing LoS has not been maintained.

Analysis

As shown in the Transportation Plan[2], the VDOT proposed short/mid-term improvements will not maintain the existing LoS at all six analysis intersections. Even with the proposed improvements, the existing LoS will be degraded at three intersections during the AM peak hour and two intersections in the PM peak hour.

The existing AM peak hour LoS decreased at the following intersections:

- Beauregard Street/Mark Center Drive dropped from LoS A to LoS D
- Beauregard Street/Seminary Road dropped from LoS D to LoS E
- Seminary Road/I-395 northbound entrance ramp dropped from LoS A to LoS C

The existing PM peak hour LOS decreased at the following intersections:

- Seminary Road/Mark Center Avenue dropped from LoS D to LoS F
- Seminary Road/I-395 northbound entrance ramp dropped from LoS B to LoS C
- Seminary Road/I-395 southbound exit ramp dropped from LoS C to LoS D

LoS	Control Delay/Vehicle (sec)	Qualitative Description
A	≤10	Good progression, few stops, and short cycle lengths
B	>10 - 20	Good progression and/or short cycle lengths; more vehicle stops
C	>20 - 35	Fair progression and/or longer cycle lengths; some cycle failures; significant portion of vehicles must stop
D	>35 - 55	Congestion becomes noticeable; high volume-to-capacity ratio; longer delays; noticeable cycle failures
E	>55 - 80	At or beyond limit of acceptable delay; poor progression; long cycles; high volumes; long queues
F	> 80	Unacceptable to drivers; arrival volume greater than discharge capacity; long cycle lengths; unstable – unpredictable flows

Table 4-3: *Level of Service Definitions*[3]

Therefore, the proposed short/mid-term improvements have not accomplished the public law's requirement of maintaining existing LoS at the analysis intersections. In addition, VDOT is currently studying a proposal to improve access from Seminary Road to the I-395 HOV lanes. As of the writing of this report, this project is in the analysis stage, and the impact on intersection LoS is unknown.

Finding

According to Public Law 111-383, the Transportation Plan was mandated to assess the cost of funding short-, medium-, and long-term projects necessary to maintain the existing level of service at the six analysis intersections. The Transportation Plan failed to accomplish this requirement. Although the Transportation Plan identified $112 million for short-, medium- and long-term infrastructure improvements to address the traffic related impacts of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, this funding is not adequate to provide necessary improvements to maintain the existing LoS at the six analysis intersections. Additional funding will be necessary to relieve anticipated congestion and to maintain existing levels of service.

Reference

1. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011, pg. 2, ¶b
2. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011, pg. 12
3. Transportation Research Board, 2000

4.3.3 Cost Estimates

Issue

Public Law 111-383[1] requires an assessment of the costs necessary to maintain the existing LoS at the six intersections analyzed. The Transportation Plan identified costs for short, mid-, long-range improvements plus program costs for the proposed Transportation Management Plan as follows:

- City of Alexandria Required Short-Range - $12 million
- VDOT Short/Mid-Range - $20 million
- VDOT Long-Range - $80 million
- Transportation Management Program - $4 million

The purpose of assessing the costs of short-, medium-, and long-term projects is to determine if the funds identified are adequate to construct the identified improvements.

Analysis

Cost Estimates for Short Range Improvements

The short-range improvements, based on the original permit requirements of the City of Alexandria, are complete. The estimated $12 million improvements included:

- Construction of a third westbound left-turn lane from Seminary Road to North Beauregard Street
- Construction of a second southbound left-turn lane at the North Beauregard Street/Mark Center Drive intersection
- Construction of a physical barrier to restrict I-395 north and south ramp traffic from the rotary traveling westbound on Seminary Road from the Seminary Road and Mark center Drive intersection
- Construction of a well-connected, continuous sidewalk system to access the Mark Center from the adjacent roadway network

VDOT identified a list of short- and mid-range improvements[2] to address the impacts of BRAC 133. These improvements are referred to as Alternative E and include:

- Widening the northbound I-395 off ramp at Seminary Road from two lanes to three lanes and improving rotary capacity to allow dual left turn lanes throughout the rotary
- Widening Seminary Road/North Beauregard Street intersection to provide a deceleration lane and widening northbound North Beauregard Street to provide an acceleration lane for the westbound to northbound right turn traffic
- Widening Seminary Road/Mark Center Avenue intersection to allow three through-lanes and the northbound Mark Center Avenue to provide four approach lanes to include three right turn lanes
- Widening northbound Beauregard Street between Mark Center Drive and Seminary Road to provide a dedicated right turn lane onto Seminary Road for eastbound Seminary Road flyover traffic
- Widening eastbound Seminary Road and the southbound I-395 on ramp from Mark Center Drive to the ramp meter signal to provide a continuous two lane ramp from Seminary Road to the ramp meter
- Providing a pedestrian bridge across Seminary Road just west of the Mark Center Drive intersection

These improvements, according to the Transportation Plan[3], are estimated to cost $20 million and are being funded by the Defense Access Roads (DAR) program and constructed as a design-build project under the management of the Federal Highway Administration (FHWA). A breakdown of the cost of these improvements is shown in Table 4-4.

Construction	$8.50 million
Right of Way	$1.61 million
Utilities	$3.50 million
Design	$1.02 million
Quality Assurance/Quality Control	$0.85 million
Design-Build indirect (Bonds, Risk, Warranty, Field Office)	$1.28 million
Administration (Procurement, Preliminary Design, NEPA oversight)	$1.00 million
Total Cost	**$17,755,000**

Table 4-4: *Alternative E Costs*[4]

An assessment of the cost estimate suggests these estimated costs may be higher than what is likely to be realized. First, the total cost estimate is $2,245,000 ($20,000,000 – $17,755,000 = $2,245,000) less than the $20 million stated in the Transportation Plan.

Secondly, a footnote on the cost estimate states the estimate is based on the total utility relocation cost estimated at $3,500,000. However, it is estimated that the majority of the utility relocations can be avoided or allocated by the utility owner. If so, the cost of utility adjustments can be significantly reduced.

Finally, a review of the detailed cost estimate indicates the designated westbound right turn lane on Seminary Road at the Southern Towers entrance was included in the cost estimate ($682,691), even though it had been removed from the proposed improvement program.

Subtracting these costs from the proposed cost estimate for the VDOT Short/Mid-Term Improvements results in an adjusted cost estimate of $13,572,309 ($17,755,000 – $3,500,000 – $682,691 = $13,572,309). It should be noted that the construction cost estimate included a 50 percent contingency on the direct construction costs.

In conclusion, it appears the proposed cost estimate for the construction of the VDOT Short/Mid-Term Improvements should be more than adequate, although the proposed improvements are not adequate to maintain existing level of service at the six analysis intersections.

Shuttle-Bus Program Cost Estimates for BRAC 133 Project Fort Belvoir – Mark Center, Virginia

The Transportation Plan indicates its transportation demand management program and strategies will cost $4 million (Transportation Plan, pg. 9, ¶3). However, according to USACE, most of this cost is allocated for local bus and shuttle services. These costs only cover services through fiscal year (FY) 2012. A breakdown of the cost by route is presented in the Table 4-5 below:

Route/Provider	FY 2011 Cost	FY 2012 Cost
Franconia-Springfield Route and West Falls Church Route (W&T Transportation)	$552,499.98 (8/1/11– 11/1/11)	$1,350,000 (11/2/11 – 11/1/12)
Pentagon Route (WMATA Metrobus)	$129,393 (8/1/11 – 9/30/11	$623,729 (10/1/11 – 6/30/12)
King Street Metro Station Route (Alexandria – DASH)	$137,250 (8/8/11 – 9/30/11)	$549,000 (10/1/11 – 8/7/12)
TOTAL	$819,142.98	$2,522,729.00

Table 4-5: *Bus and Shuttle Program Cost Estimates for the BRAC 133 Project Fort Belvoir – Mark Center, Virginia*[5]

The proposed shuttle program has contracts and funding from August 2011 to November 2012, or one and a half years. The total estimated shuttle cost is $3,341,871.98. There were no administrative costs included in the information submitted by USACE. Given the Transportation Management Plan program requires considerable and sustained administrative support, the absence or lack of accountability of these administrative costs creates uncertainty on whether the program is funded adequately and will be administered effectively.

Cost Estimates of Long Term Improvements for BRAC 133 Project Fort Belvoir – Mark Center, Virginia

According to the Transportation Plan[6] VDOT is currently studying long-term improvements that include a direct HOV access ramp from I-395 to Seminary Road. The impact of this project on existing LoS at the six intersections analyzed will not be known until the study is completed, which is scheduled for the end of this year (2011). If the project receives public approval, which is undetermined as of the writing of this report, construction is expected to begin in 2013 with completion by late 2014. At this time, $80 million has been identified in the VDOT Six Year Transportation Program[7]. Upon completion of the study, the design process will begin and the preliminary cost estimate of the proposed action will be prepared.

Finding

The Transportation Plan was mandated by Public Law 111-383 to assess the cost of the improvements necessary to maintain existing levels of service at the six analysis intersections. The costs were divided into:

- Short Range Improvements – City of Alexandria mandated improvements
- Short/Mid-Term Improvements – VDOT identified arterial improvements
- Long-Range Improvements – VDOT identified HOV ramp improvements
- Transportation Management Plan costs – TDM measures intended to reduce SOV's

The Short Range Improvements estimated to cost $12 million have been completed.

The cost estimates of the VDOT short/mid-term improvements appear to be more than adequate to fund the identified improvements. The cost estimates were prepared according to industry standards, but the proposed short/mid-term improvements will not maintain existing levels of service at the six analysis intersections.

The funding and programming for the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, shuttle-bus program appear adequate, but it is only programmed for fiscal years 2011 and 2012. There is no cost accountability or programming for future years. Additionally, funding for the administrative elements of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, TDM program are not known and were not provided. This would include the costs for staffing, program marketing, and program oversight and monitoring. Without this cost information, it is not known if this critical element of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, relocation effort is adequately or appropriately funded and programmed.

The cost estimate for the long-range improvement is only a planning-level estimate. The actual improvement and cost will not be known until the design studies and environmental assessment are complete at the end of 2011. Furthermore, the benefits, if any, of the proposed HOV ramp will not be known until that time as well.

In conclusion, the Transportation Plan did not meet the Public Law mandate to assess the cost of necessary improvements to maintain existing levels of service at the six analysis intersections.

References

1. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011, pg. 2, ¶b
2. Mark Center (BRAC-133) Short/Mid-Term Improvements Alternatives Technical Memorandum, Virginia Department of Transportation, February 2011, pg. 6, ¶1
3. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011, pg. 11, ¶2
4. Table 2-1, Mark Center (BRAC-133) Short/Mid-Term Improvements Alternatives Technical Memorandum, Virginia Department of Transportation, February 2011.
5. James S. Turkel, United States Army Corps of Engineers, E-Mail Correspondence: Transportation Program Questions / Answers, Aug. 18, 2011.
6. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011, pg. 13, ¶2
7. Virginia Department of Transportation Six-Year Transportation Program

4.3.4 Programming of Project Funding

Issue

Public Law 111-383[1] requires an assessment of the programming of the short-, mid, - and long-term projects. Determination must be made whether the proposed improvements have been appropriately programmed in the transportation improvement plan to allow expenditure of spending public funds.

Analysis

- Programming of the City of Alexandria required short-term improvements is complete
- Programming of the $20 million for the VDOT Short/Mid-Term Improvements has been included in the Defense Access Roads Needs Report and is currently under design by the Federal Highway Administration (FHWA), U.S. Department of Transportation (USDOT)
- Programming of the $80 million for the VDOT I-395 HOV access ramp is included in the VDOT STIP or Six-Year Transportation Improvement Plan. The actual cost of this improvement is unknown as of the writing of this report, as it is currently in the preliminary design phase. Construction is expected for 2013 pending normal approvals
- Though requested, no information has been provided on the programming and source of funds to cover the administrative elements of the TDM program. This includes funding for the Employee Transportation Coordinator, support staff, marketing and program monitoring.

- Cooperative agreements with WMATA and the Alexandria Transit Company and private operator contracts have been executed for the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, bus-shuttle program, however these operating funds are programmed only through to 2012.[2]

Finding

Public Law 111-383 mandated the Transportation Plan provide an assessment of the programming of improvements necessary to maintain existing levels of service at the six analysis intersections. The short-, mid- and long-term improvements have been programmed according to industry standards. Additionally, the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, shuttle-bus cooperative agreements and service contracts with providers have been executed. It is not known if the administrative and management elements of the Transportation Management Plan program have been adequately funded or programmed. This information was requested, but it was not provided. However, the identified improvements are not adequate to maintain the existing levels of service at the six analysis intersections.

References

1. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011, pg. 2, ¶b
2. James S. Turkel, United States Army Corps of Engineers, E-Mail Correspondence: Transportation Program Questions/Answers, Aug. 18, 2011.

4.4 Use of Other Methods of Transportation that are Necessary to Maintain Existing LoS

Overview

According to the Transportation Plan[1], the goal of the $4 million BRAC 133 Project Fort Belvoir – Mark Center, Virginia, TDM program is to reduce employee SOV commuting trips by 40 percent (pgs. 7, 9). To achieve this, the TDM program features:

- Shuttle service
- Connections to commuter rail service
- Carpool, vanpool, "slug," bicycle and pedestrian services
- Express and local bus service
- Flexible work hours and telecommuting programs, where applicable

The Transportation Plan states (pg. 9) the TDM program will be administered by an Employee Transportation Coordinator (ETC). As envisioned in the Transportation Plan, eight percent of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, workforce, or 512 employees, will be permitted to park onsite at the Mark Center via vanpools and carpools. A greater number, 35 percent or 2,243 (0.35 × 6,409 = 2,243) employees, will not have parking privileges and are expected to walk, bike, bus and/or "slug" to work. These assumptions are summarized in Table 4-6.

Alternative Mode	% of All Employees	# of Employees
Shuttle-Rail	23.0	1,474
Transit Bus	5.0	320
Car Pool	5.0	320
Van Pool	3.0	192
Slug	3.0	192
Walk	2.0	128
Bicycle	2.0	128
TOTAL	**43.0**	**2,754**

Table 4-6: *Employee Mode Splits of BRAC 133 Project Fort Belvoir – Mark Center, Virginia*

References

1. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mar Center, Virginia, Office of the Secretary of the Army, May 9, 2011, page 7
2. Washington Metropolitan Area Transit Authority, http://www.wmata.com/references

4.4.1 National Capital Planning Commission (NCPC) Compliance

Issue

As stated in the Transportation Plan (pgs. 4, ¶2, pg. 7, ¶1), the TDM program was approved by the NCPC in September 2010[1]. The NCPC is the only public agency noted in the Transportation Plan to have approved the program. The commission is authorized by law to review federal development projects within the NCR. Additionally, projects that increase work site populations to 500 or more must submit a transportation management plan to the NCPC for approval. The BRAC 133 Project Fort Belvoir – Mark Center, Virginia, project fits within this category. Elements of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, Transportation Management Plan do not comply with NCPC policy.

Analysis

To assist federal agencies develop effective transportation management plans, and to facilitate review of the same, the NCPC published "Implementing a Successful TMP (ISTMP)" in 2008 that draws from the federal policies of the "Comprehensive Plan for the National Capital – Transportation Element."[2]. The Transportation Plan and its July 2010 Transportation Management Plan comply with some, but not all, of the NCPC policies. The documents are compliant in providing:

- Stated goals for SOV trip reduction (pg. 7, ¶3)
- Evaluation of projected transportation impacts and description of proposed mitigation measures (pg. 8, ¶3)

- Scenarios that incorporate data on employee home zip codes, nearby bus routes, Metrorail and Virginia Railway Express (VRE) lines and their respective schedules, and identifying existing and planned HOV or high occupancy toll (HOT) lanes (pg. 9, ¶1)

The Transportation Plan and its Transportation Management Plan are **not** compliant with NCPC policy in the following areas

NCPC Policy: "Update TMPs at least every two years to reflect the most current employee information."[3]

The Transportation Plan and Transportation Management Plan provide no timeline for updating the TDM program. There are procedures in the Transportation Management Plan for adjusting the program if necessary (pgs. 130-131), but there are no provisions in either document to update the program every two years per NCPC policy.

NCPC Policy: "Reflect, within TMPs, planned regional transportation infrastructure or service improvements within five miles of the federal facilities."[4]

The Transportation Plan does not discuss transportation or service improvements within the five-mile radius recommended in NCPC policy. There is general discussion (Transportation Plan - pgs. 15, 16) on possible VDOT freeway improvements and requirements near and at the site, but there is no discussion on needs within a five-mile radius.

NCPC Policy: "Select reasonable goals and objectives, plan appropriate strategies and tasks for carrying them out, and develop a timetable and establish a budget."[5]

A scenario for achieving mode split objectives is presented in the Transportation Plan (pg. 7, ¶3) and the 2010 Transportation Management Plan[6] (Chapter 5.0). However, there is no timetable for achieving these objectives.

The annual cost of the TDM program "is estimated at $4 million" (Transportation Plan, pg. 9, ¶3), but no information is presented in the Transportation Plan on the administrative costs of the program. Moreover, there is no explanation on how these funds will be allocated or programmed. In a subsequent inquiry resulting from this engineering assessment, after publication of the Transportation Plan, USACE[7] reported the cost to contract the TDM shuttle services as $3,341,871.90, covering a period from August 2011 to November 2012. There is no discussion on TDM administrative costs.

To comply fully with the NCPC policy, all TDM program costs should be identified and explained. For example, throughout the Transportation Plan and its Transportation Management Plan there are references to the Employee Transportation Coordinator's (ETC) responsibilities and programs. (Transportation Plan - pgs. 7, Bullet 4; 9, ¶3; 10, ¶ 1 and ¶2; and Transportation Management Plan - pgs. ES-1, ¶ 2 and ¶3; ES-2, ¶1; Chapter 5.0). The ETC's role is so extensive it is difficult to envision how the program will be effectively managed or executed with one coordinator. The number of staff assigned to assist the ETC is unclear. These concerns

are expressed in an assessment of the 2010 Transportation Management Plan conducted by the DoD OIG in 2011, as follows:

> "The responsibilities described for the Transportation Coordinator position are varied, time intensive and go beyond the two main objectives…the monitoring and evaluation plan…adds further responsibilities. The three persons assumed to fill this role and the many anticipated responsibilities may be insufficient, particularly given the tight time frame between the hiring of the Transportation Coordinators and BRAC relocation." [8]

The following management features of the TDM program are missing in the Transportation Plan and should be supplied in accordance with NCPC policy:

Management Plan	• Discussion on how the TDM program will be successfully administered; • Identification of the critical tasks to be undertaken; • Prioritization of each task by function; and • Identification of criteria for measuring program effectiveness and performance over time.
Program Timetable	Establishment of a time frame for implementing the program with milestones and an explanation of what must be achieved and why.
Budget Plan	Identification of the financial resources needed for the TDM program and how they will be allocated by task and function.
Staffing Plan	Identification of the human resources needed to execute the program and identification of the functions and work the program staff will be expected to perform.
Program Contingencies	Recognition that the program may not proceed exactly as envisioned and provision of strategies for mid-course corrections.

NCPC Policy requires these features to ensure TDM programs are realistic and attainable. The absence of a management framework and plan makes it difficult to determine how, and if, the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, TDM program will succeed.

NCPC Policy: "To facilitate the implementation of selected tasks, [a] work plan for each service/product should be prepared with the following elements…Marketing Plan, Performance Measures and Monitoring Procedures, Budget, Timetable, Responsibilities and Staff Time Allocations, and Priorities." [9]

As noted above, the Transportation Plan fails to provide a management framework in sufficient detail to assess effectiveness or sustainability.

NCPC Policy: "In many areas weather conditions, the unavailability of safe travel routes…make conditions difficult for walking and bicycling…An ETC should use good judgment when promoting these options…and...realize that walking and bicycling might only provide seasonal alternatives to driving alone and might not be year round options." [10]

The Transportation Plan assumes four percent of employees (256 total) of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will walk or bicycle to work every day. It states bicycle amenities such as showers will be provided on-site within the Mark Center (Transportation Plan, pg. 10). However, it does not address the adequacy or safety of pedestrian and bicycle services and facilities at or near the work site. While the 2010 Transportation Management Plan offers more discussion (pgs. 29 – 31, Appendix G), it too fails to address the adequacy of the adjoining road system to accommodate these modes. Moreover, the Transportation Plan and its 2010 Transportation Management Plan do not address the seasonality of pedestrian and bicycle travel. There is no contingency for inclement weather and how this eventuality will affect mode split assumptions. This failure to adhere to NCPC policy (walk-bicycle safety and seasonality) is noteworthy. It is discussed in more detail in the pedestrian and bicycle in 4.4.6 and 4.4.7 of this report.

NCPC Policy: "Consult with local jurisdiction planning and transportation officials that would be impacted by the development to identify current plans and programs, available congestion mitigation/travel management techniques, and any required TMP-related implementation commitments."[11]

It is noteworthy that key transportation agencies within the NCR reported little or no involvement in the preparation or review of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, Transportation Plan and/or its Transportation Management Plan. Agency statements are presented below in Table 4-7:

Agency	Statement	Reference
Fairfax County	"Fairfax County was not consulted in the development of the TMP. Fairfax County BRAC Coordinator was not asked to provide information or get involved. There should have been regional scoping meeting, so they know regionally what is going on."	Interview, 11-19-10. (Ref #1-A below).
Fairfax County	"The Draft TMP was provided to Fairfax County by the City of Alexandria and the Final Transportation Plan was provided by Congressman Moran's office, not by DoD. The county received reports via third party in both cases and does not seem to have been perceived as a primary stakeholder by DoD in either case."	Written response, 8-5-11. (Ref #2-A below)
MWCoG Transportation Planning Board	"Neither the Transportation Planning Board (TPB) nor any of its subcommittees reviewed the TMP or any sub-component thereof. No consultation meetings occurred."	Written responses, 11-12-10. (Ref. #1-B below)
VDOT / Virginia Department of Rail and Public Transportation (DRPT)	VDOT did not have opportunity to review the scope of work or the TMP or the TIA included in the Transportation Management Plan. DRPT should have been consulted early to discuss the multi-modal scope because a successful Transportation Management Plan hinges upon transit. Most local and state agencies have a TDM agency. VDOT and DRPT do not think that the TDM agencies were consulted.	Interview summary, 11-17-10. (Ref. #1-C below)

Agency	Statement	Reference
Washington Metropolitan Area Transit Authority (WMATA)	▪ "WMATA is not aware of having any role in determining, reviewing or approving transit elements as part of the BRAC TMP process." ▪ "If any informal consultation occurred between WMATA and WHS/USACE on the TMP, there is no staff recollection of participating or being invited to participate." ▪ "WHS organized or requested roundtable discussion on May 18, June 8, June 16 and November 3 to discuss alternative for providing shuttle services to the Mark Center. However there is no staff recollection of these meetings being designated or identified as part of the TMP process."	Written response, 12-16-10. (Ref. #1-D below)
Virginia Railway Express (VRE)	▪ "VRE's role in the TMP development and review process was minimal." ▪ "From the limited direct contact with the BRAC 133 team preparing the TMP and discussions with colleagues at other transit agencies, it appears there was not much of an attempt made to engage the transit community in the development of the TMP, which is disappointing."	Written response, 11-18-10. (Ref.# 1-E below)

Reference #1: Professional Engineering Assessment of the Final Environmental Assessment, dated July 2008, and the Final Transportation Management Plan, dated July 2010, for BRAC 133 at Mark Center, Acelsior, Inc., Office of the Inspector General, U.S. Department of Defense, Feb. 14, 2011.

- 1-A: Mark Canale, BRAC Coordinator, Fairfax County
- 1-B: Andrew Austin, Transportation Planner IV, Metropolitan Washington Council of Governments
- 1-C: Lisa DuMetz, Mobility Program Administrator, Chris Arabia, Mobility Program Manager – Virginia Department of Rail and Public Transit; Thomas Fahrney, BRAC Coordinator, Valerie Pardo, Multimodal Coordinator – Virginia Department of Transportation
- 1-D: Nat Bottigheimer, Assistant General Manager, Planning and Joint Development, Washington Metropolitan Area Transit Authority
- 1-E: Christine Hoeffner, Virginia Railway Express, Planning Manager, Virginia Railway Express

Reference #2: Independent Engineering Assessment of the Army's Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Va., Strategy and Management Services, Inc., Office of the Inspector General, U.S. Department of Defense, 2011.

- 2-A: Mark Canale, Chief, Special Projects Division (BRAC and Dulles Rail), Fairfax County Department of Transportation

Table 4-7: *Agency-Reported Involvement in the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, Transportation Plan and/or Transportation Management Plan*

Finding

NCPC policies are the federal standard for ensuring federal development projects built in the National Capital Region comply with traffic management and mitigation objectives. The Transportation Plan does not comply with six NCPC policies and is in violation of this federal standard. NCPC was the only agency that approved the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, Transportation Management Plan.

References

1. Minutes of the National Capital Planning Commission, Sept. 2, 2010, pgs. 1 -151
2. Comprehensive Plan for the National Capital – Transportation Element, 2004 (CPNC-TE)
3. ISTMP Section 1- pg. 3, ¶3, and CPNC-TE, Pg. 87, Item #7
4. ISTMP Section 1 – pg. 3, ¶2, and CPNC-TE, pg. 87, Item #5
5. ISTMP Section 2 – pg. 11 – Bullet 2
6. Transportation Management Plan for BRAC 133 at Mark Center, Benham Companies, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010
7. James S. Turkel, United States Army Corps of Engineers, E-Mail Correspondence: Transportation Program Questions / Answers, Aug. 18, 2011
8. Professional Engineering Assessment of the Final Environmental Assessment dated July 2008 and the Final Transportation Management Plan dated July 20 for BRAC 133 at Mark Center, Acelsior, Inc., April 20, 2011, pg. 3-65 – Item #1.
9. ISTMP Section 1 – pg. 7, left column
10. ISTMP Section 3 - pg. 28, ¶2, right column
11. ISTMP Section 2 – pg. 9, ¶5, right column
12. National Planning Act - 40 U.S.C. §§8701 et seq.

4.4.2 Public Transportation - Shuttle and Bus Strategy

Issue

Public Transportation and Shuttle Services

One critical element of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, TDM strategy is the availability of frequent, reliable and convenient public transportation and shuttle service at the Mark Center Transit Station, which links to intermodal rail and bus connections. With these services, the TDM strategy will fail with a greater number of employees traveling to work in single occupant vehicles.

Analysis

This analysis addresses the planned public transportation services first, followed by planned shuttle services.

Public Transportation Services

The Transportation Plan assumes five percent of the workforce (320 employees) of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will use these services. (Pg. 7) To facilitate connectivity, DoD has subsidized two express bus routes through cooperative agreements with the Alexandria Transit Company. One route is Alexandria DASH AT2X-Express. At a cost of

$686,250, the route is intended to provide peak AM and PM express service at 15-minute intervals between the Mark Center Transit and King Street Metrorail stations. The other DoD-subsidized service is WMATA Metrobus 7M with an annual operating cost of $753,122. It is intended to run express service between the Pentagon Metrorail and Mark Center Transit Stations in 10-minute intervals in the AM and PM peaks and in 15-minute intervals mid-day.

As envisioned by the Transportation Plan and the Transportation Management Plan[1], a total of 10 bus routes will provide service to the Mark Center. Five will pick-up and drop-off directly at the Mark Center Transit Station. The remaining five will pick-up and drop-off at the Southern Towers apartment complex immediately north of the Mark Center and within walking distance. All of the routes connect to one or more Metrorail stations (Van Dorn, Eisenhower, King Street and/or Pentagon)[2] and enable continued travel on the Metrorail Blue, Yellow and Orange lines. BRAC 133 Project Fort Belvoir – Mark Center, Virginia, employees and contractors presenting a DoD Common Access Card (CAC) identification will travel free on the Alexandria DASH and the Metrobus 7M buses.

Service directly to/from Mark Center Transit Station	
• DASH AT1	• DASH AT2
• DASH AT2X	• Metrobus 7M and 7W/X

Service to/from Southern Towers	
• Metrobus 7A-E-F-Y	• Metrobus 28A, 28F-G
• Metrobus 7B	• Metrobus 25B

One additional component of the TDM strategy is the availability of Virginia Railway Express (VRE) service at Metrorail stations in Alexandria. The VRE rail lines connect to the communities of Fredericksburg and Manassas.

A summary of the intended BRAC 133 Project Fort Belvoir – Mark Center, Virginia, public transportation services, routes, frequencies, and intermodal connections is presented in the Appendix III - Table B-2: BRAC 133 Commuter Bus and Rail Services and Connections. The table was constructed to facilitate understanding of the complex system of intermodal connections envisioned in the Transportation Plan.

Shuttle and Bus Services

According to the Transportation Plan (pg. 4, ¶2 and pg. 7, 1st Bullet), DoD intends to use private operators for shuttles to complement the public transit services described above. The shuttle system is expected to carry 23 percent of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, workforce (1,474 employees) on a daily basis. It was initially envisioned in the Transportation Management Plan (pg. 42, Table 3-3) as comprising five routes, but this changed to four express routes to and from the Pentagon, King Street, Franconia and West Falls Church Metrorail stations in the AM and PM peaks.3 The shuttle system is illustrated below in Figure 4-4.

Since the issuance of the Transportation Plan, a new development occurred that involved negotiations between the City of Alexandria and BRAC 133 Project Fort Belvoir – Mark Center,

Virginia, management on the use of public buses in lieu of contracted private shuttles. This is described in a City of Alexandria memorandum dated Jan. 5, 2011:

> "City and DASH staff have been in a number of meetings with DoD/WHS staff regarding the merits of subsidizing the expansion of transit service to their site…instead of DoD/WHS operating a fleet of private shuttle buses, exclusive to their employees….DoD has agreed, in principle, that the public transit operation would be more beneficial to its employees and contractors as well as the community itself.[4]"

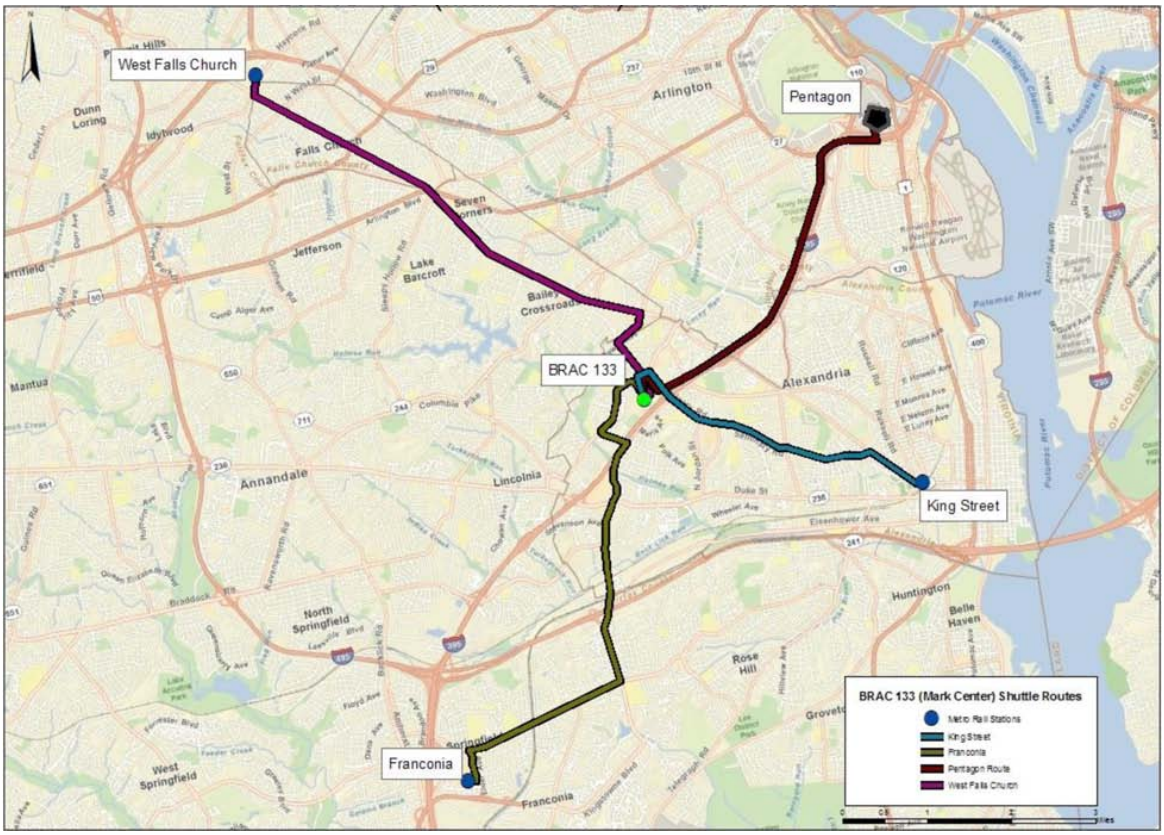

Figure 4-4: *BRAC 133 Mark Center Shuttle Routes*

With this DoD agreement to curtail private operations, the DASH AT2X and Metrobus 7M routes described above (Public Transportation Services) also represent the Blue and Red shuttle routes respectively. These developments are not represented in the Transportation Plan nor the Transportation Management Plan, but confirmed in the Transportation Management Program Reference Guide for BRAC 133 Employees, Working Draft, Washington Headquarter Services, (Feb. 23, 2011, pg. 12, 1st, 2nd, 3rd and 4th Bullets) and by correspondence from James S. Turkel.[5] While each reference differs slightly, the USACE e-mail correspondence was used to describe shuttle services from/to the Mark Center Transit Station, shown in Table 4-8 below:

Route	Destination	Services
Route #1:	Franconia-Springfield	• 15-minute peak and no off-peak service • 55-passenger bus • Service to/from Franconia-Springfield Metrorail Station • Operated by private vendor - W&T Transportation
Route #2:	West Falls Church	• 15-minute peak and no off-peak service. • 55-passenger bus. • Transportation. • Service to/from West Falls Church Metrorail Station • Operated by private vendor - W&T
Route #3:	King Street	• 15-minute peak and 30-minute off-peak service • 35-passenger bus • Operated as DASH AT2X by the Alexandria Transit Company. • Service to/from King Street Metrorail Station
Route #4:	Pentagon	• 10-minute peak and 15-minute off-peak service. • 45-passenger bus. • Operated as Route 7M by WMATA • Service to/from the Pentagon Metrorail Station.

Table 4-8: *Shuttle Services From and To the Mark Center Transit Station*

Five bus bays are arranged in saw tooth configuration at the west passenger loading area of the Mark Center Transit Station. Four of the five bays are assigned to a specific bus route. There is no explanation in the Transportation Plan on the status of the unassigned bus bay. For purpose of analysis, it is assumed the bay will accommodate the two contracted shuttles originating from the West Falls Church and Franconia-Springfield Metrorail Stations. Given this, the expected AM peak hour arrivals at the bays are summarized in Table 4-9.

Bay	Service	Expected AM Peak Frequency
1	DASH AT2X/AT2	15 min
2	DASH AT1	20-30 min
3	Metrobus 7W/7X	10 min
4	Metrobus 7M	10 min
5	DoD Private Shuttles (2)	15 min each

Table 4-9: *Mark Center Transit Station - Bus Bay Assignments and Expected AM Peak Hour Frequencies*

Bus service frequency is defined as the number of arriving vehicles per hour and is a common criterion for measuring LoS as perceived by passengers. The Level of Service values are shown in Table 4-10.

LoS	Headway (min)	Vehicles Per Hour	Indicators
A	<10	>6	Schedules not needed by passengers
B	10 - 14	5-6	Frequent service, passengers consult schedules
C	**15-20**	**3-4**	**Maximum desirable time to wait if bus missed**
D	21 - 30	2	Service unattractive to choice passengers
E	31- 60	1	Service available during hour
F	> 60	<1	Service unattractive to all passengers

Table 4-10: *Service Frequency LoS – Urban Scheduled Transit Service*[6]

If the expectations and goals stated in the Transportation Plan are realized, two of the bus routes will have 10-minute headways, three will have 15-minute headways, and one will have roughly 25-minute headways. This represents an average 15-minute headway for all routes combined arriving in the AM peak hour [(20 + 45 + 25) ÷ 6 = 15]. This represents LoS C.

If the expectations and goals stated in the Transportation Plan are realized, two of the routes will generate six bus arrivals each in the AM peak hour; three will generate four bus arrivals, and one will generate two bus arrivals. Thus, the average number of vehicles arriving at the Mark Center station bus bays in the AM peak hour is 4.33 vehicles [(12 + 12 + 2) ÷ 6 = 4.33]. This represents LoS C. The frequencies – 15-minute average headway and 4.33 average vehicles per hour – if realized, suggest an acceptable LoS will be perceived by passengers at the Mark Center Transit Station in the AM peak hour.

In continuing this assessment, it appears the expected supply (bus service) satisfies the expected demand (mode split or number of passengers) at the Mark Center Transit Station in the AM peak hour, as follows in Figure 4-5:

Assume:
Number of passengers per bus: Metrobus – 45; DASH – 35; Private Shuttles = 55
Vehicle Arrivals during AM peak hours: Metrobus – 12; Shuttle – 8; DASH – 4; DASH – 2
Percent of Total Passengers during AM peak hours: 50% or 897

Cp = R(Vp x Va)
Cp = Metrobus + Shuttle + DASH + DASH
Cp = [2 (45 × 6)] + [2 (55 × 4)] + [1 (35 × 4)] + [1 (35 × 2)]
Cp = 540 + 440 + 140 + 70
Cp = 1,190

Legend:

Cp	=	System Capacity (passenger)
Vp	=	Vehicle Capacity (passenger)
Va	=	Number of Vehicles (arrivals)
R	=	Number of Routes

Figure 4-5: *Estimation of Bus and Shuttle Carrying Capacity – AM Peak Hour*
BRAC 133 Project Fort Belvoir – Mark Center, Virginia

This capacity calculation indicates the shuttles and buses assigned to the Mark Center Transit Station will have more than adequate capacity to accommodate the 50 percent BRAC 133 Project Fort Belvoir – Mark Center, Virginia, employees (897) expected to use the service in the AM peak hour. Thus supply (shuttle - bus services) exceeds demand (passengers) with the system having capacity to serve as many as 290 additional passengers in the AM peak hour.

It is noted that some of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, workers will use bus service arriving at Southern Towers and walk to work, slightly reducing the AM peak hour demand estimate at the Mark Center Station. It is also noted that non BRAC 133 employees within the Mark Center complex may elect to use the service, thus slightly increasing demand. Overall, capacity calculations show the system as designed, should accommodate demand of BRAC 133 Project Fort Belvoir – Mark Center, Virginia.

With this finding, however, it is noted that the Transportation Plan does not account for delay and congestion on the roadways on which the shuttles and public buses must travel. If roadway LoS falls to unacceptable levels, the 10-minute and 15-minute frequencies intended for the express bus and shuttle routes will not be realized. An administrator of an agency currently located at Mark Center, as follows, expresses this concern:

> "…With existing traffic today there are times when the Seminary Road traffic trying to enter I-395 South is backed up beyond Mark Center Avenue. Now add an additional 1,000 or so cars also trying to get out the same way. Another simple example of this shortfall is the plan to have a shuttle bus at King Street Metro every 10 minutes using four DASH buses. During rush hour, it generally takes 25 to 30 minutes each way to transit between Mark Center and the King Street Metro. That type of transit time does not support a 10-minute schedule."[7]

Finding

The public bus and shuttle services designed for the Mark Center Transit Station have adequate frequencies and capacity to accommodate the number of employees designated to use them. It is noted that the 10- and 15-minute frequencies for these services – which are designed to quickly move employees to and from the site – will be severely compromised should LoS on roadways serving BRAC 133 Project Fort Belvoir – Mark Center, Virginia, fail. There are no HOV lanes directly serving the site. The bus and shuttle services will be required to use the freeway general-purpose lanes. If freeway and local roadways operate at failing service levels, this will undermine the efficiency of the bus and shuttle system. The 1,794 BRAC 133 Project Fort Belvoir – Mark Center, Virginia, employees expected to use these services may not do so, as the service will be perceived as inefficient and unreliable. There is no contingency plan to address this eventuality.

References

1. Transportation Management Plan for BRAC 133 at Mark Center, Benham Companies, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010
2. Transportation Management Plan for BRAC 133 at Mark Center, Washington Headquarters Services, United States Army Corps of Engineers, July 2010, pg. 33, ¶4
3. Transportation Management Program Reference Guide for BRAC 133 Employees, Working Draft, Washington Headquarters Services, Feb. 23, 2011, pg. 13, Figure 2).
4. Memorandum from James K. Hartmann, City Manager, City of Alexandria, Va., Jan. 5, 2011
5. James S. Turkel, U.S. Army Corps of Engineers, E-Mail Correspondence: Transportation Program Questions/Answers, Aug. 18, 2011
6. Transit Capacity and Quality of Service Manual, Transit Cooperative Research Program, Transportation Research Board, Kittelson & Associates, 1999, pgs. 5 – 16
7. Chet Humberd, Director of Administration, Institute for Defense Analysis, Response to Interview Questions, Aug. 15, 2011.
8. Washington Headquarter Services, Transportation Management Program Reference Guide for BRAC 133 Employees, Working Draft, 2011, (pg. 12)
9. E-mail: James Turkel, U.S. Army Corps of Engineers, Aug. 17, 2011.
10. City of Alexandria communications dated Jan. 5, 2011
11. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011
12. Transportation Management Plan for BRAC 133 at Mark Center, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010
13. Washington Metropolitan Area Transit Authority, Maps for Routes 7M and 7W-X
14. DASH – Alexandria Transit Web site http://www.commuterpage.com/schedules/route.cfm?op=4
15. LOCALMOTION "Mark Center Transportation Options," Aug. 8, 2011, http://www.alexandriava.gov/localmotion
16. www.dashbus.com/news/newsDisplay.aspx?id=50572
17. K. Johnston, Washington Metropolitan Area Transit Authority, Email Correspondence, Aug. 10, 2011
18. Written Response to Interview Question: Chet Humberd, Director of Administration, Institute for Defense Analysis, Aug. 15, 2011.
19. Washington Metropolitan Area Transit Authority Route Maps, 2011, http://www.wmata.com/

4.4.3 Transportation Demand Management Goal

Issue

There are conflicts in how the Transportation Plan defines the single occupancy vehicle (SOV) goal for its TDM strategy. The Transportation Plan refers to the goal as a 40 percent reduction in SOV trips (pg. 4, ¶1). Later in the Transportation Plan, the goal is referred to as a "40 percent non-SOV mode choice." (Pg. 7, ¶1).[1]

Analysis

Variations in mode split goals, which is the relative share of each mode of transportation, will produce significant variations in the peak hour traffic generated by BRAC 133. For example, a goal of 60 percent SOV traffic would result in 3,845 employees driving to the site by themselves on a daily basis (6,409 × 0.6 = 3,845). Conversely, if the goal were to reduce existing SOV trips by 40 percent, the following would result if the 2010 WHS survey of employee commuting patterns were used for the calculation:

- 70 percent of the employees, or 4,486 (6,409 × 0.70 = 4,486) employees are currently in SOVs
- A reduction of 40 percent would yield 2,692 (4,486 × 0.4 = 2,692) SOVs
- Which equates to a difference of 1,794 (4,486 – 2,692 = 1,794) SOVs

The difference between the two goals is 1,794 SOVs.

Finding

The TDM goals for employee SOV trips are contradictory and ill defined. BRAC 133 Project Fort Belvoir – Mark Center, Virginia, may generate 1,794 more SOV trips than intended, depending on which goal is realized. The SOV goal should be corrected and clarified in the Transportation Plan.

References

1. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011

4.4.4 Mode Choice Assumptions

Issue

The Transportation Plan states (pg. 7, ¶3) 43 percent of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, workforce (2,754 employees) will be required to use alternative transportation modes to access the work site. The Transportation Plan reports most of the

employees (34 percent) will use HOVs in the form of shuttles, vanpools, carpools and the "slug" system. It is not certain that these alternative transportation goals will be achieved.

Analysis

The Transportation Plan states the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, mode split assumptions were based on an employee commuter survey, a review of employee origin zip codes, and commuter travel pattern statistics for the Washington, D.C., metropolitan area (pg. 7, ¶3). The Transportation Plan then establishes that 34 percent of all BRAC 133 Project Fort Belvoir – Mark Center, Virginia, workers will use the shuttle, rail, van pool, car pool and "slug" modes. This estimate is much higher than the U.S. Census commute-to-work data for the region. According to the U.S. Census, 11 percent of workers in Fairfax County, 8.3 percent of workers in the City of Alexandria and eight percent of workers in Arlington County commute via HOV. These percentages are much lower than the 34 percent HOV goal cited in the Transportation Plan.

The five percent of workers assumed in the Transportation Plan to use public transportation as their principal mode is much lower than U.S. Census data showing 26.6 percent of workers in Arlington County, 21.7 percent in the City of Alexandria and 8.9 percent in Fairfax County use public transportation. The assumption in the Transportation Plan on the percent of workers using "other" modes such as bicycle is higher than U.S. Census percentages. These comparisons are shown in Table 4-11.

Mode	Transportation Plan	U.S. Census		
	BRAC 133	City of Alexandria	Fairfax County	Arlington County
HOV Modes	34.0%	8.8%	11.0%	8.0%
Public Transportation	5.0%	21.7%	8.9%	26.6%
Walk	2.0%	2.9%	1.8%	5.3%
Other	2.0%	1.8%	1.1%	1.9%

Table 4-11: *Comparative Commute-to-Work Mode Percentages for BRAC 133 Project Fort Belvoir – Mark Center, Virginia, and Study Area Jurisdictions*[1]

Finding

When compared with U.S. Census information, BRAC 133 Project Fort Belvoir – Mark Center, Virginia, mode split assumptions appear overly optimistic in HOV use and noticeably lower in public transportation use. This finding is significant as any error or miscalculation in estimating mode split may have a negative impact on the regional and local road network serving the site.

References

1. U.S. Census Bureau, American Community Survey, Selected Economic Characteristics, 2005-2009 for Alexandria City, Arlington County and Fairfax County, Va.

4.4.5 TDM Marketing Strategy

Issue

The Transportation Plan offers no compelling reason for why 43 percent or 2,756 (0.43 × 6,409 = 2,756) employees will alter or modify their travel behavior in accordance with the mode split assumptions listed on pg. 7. The Transportation Plan assumes the absence of on-site parking for 35 percent of the employees coupled with an increase in shuttle, carpool, vanpool, and public transportation services will induce behavior change. Yet as noted in the previous report section, the Transportation Plan mode split goals deviate significantly from U.S. Census mode split data for the region.

Analysis

To assist employee adaption to new or different travel behaviors, BRAC 133 Project Fort Belvoir – Mark Center, Virginia, program managers published the Transportation Management Program Reference Guide for BRAC 133 Employees, Working Draft[1], which outlines the availability, cost and schedules of various transportation services. This document will be disseminated to BRAC 133 employees as they move to the site. The Transportation Plan also identifies an Employee Transportation Coordinator (ETC) to assist the employees in their transitions to new or other modes. While the ETC has a wide range of responsibilities, the effort appears fragmented and unfocused. For example, Transportation Management Plan Section 5.9.3 describes the TDM marketing effort as acquiring and preparing bicycle maps, developing relationships with bicycle advocacy groups to organize health fairs and training seminars on bicycle and walking safety, organizing an annual Bike-to-Work day "pit-stop" at the Mark Center, and overseeing a walk-buddy program.

According to the research report, Individualized Marketing Demonstration Project (IMDP),[2] in order to meaningfully modify commute travel behavior – at the level and magnitude proposed in the Transportation Plan – a scientific marketing approach is the best method to meet the specific needs of each targeted employee. According to the referenced report, "…utilizing a dialog-based technique for promoting the use of public transport, the program provides targeted, personalized, customized marketing tailored for individuals that are most likely to change their travel behavior."

Effective, individualized marketing focuses on the individual employee who is determined to be most susceptible to change and concentrates program resources on that individual through controlled interventions. In contrast, the Transportation Plan TDM approach casts a wide net over all of the 2,756 employees.

Individualized Marketing – when correctly applied – has proven successful in Europe, Australia and in U.S. test cities such as Portland, Ore., and Cleveland, Ohio. In Cleveland, the change in mode choice, in terms of trips per person per year, included a four percent reduction in car (as driver) use and a five percent increase in car (as passenger) mode. Walking increased by 13 percent, bicycling by 33 percent and public transportation by 26 percent.

The first U.S. Individualized Marketing pilot project – SmartTrips Downtown[3] – was conducted in Portland, Ore., and resulted in a reduction in car travel of eight percent and an increase in travel by environmentally friendly modes by 27 percent. Seventy-five percent of the program's survey respondents reported motivation to drive alone less or continue not to drive to work. SmartTrips Downtown used market segmentation with targeted messaging and continuous modal promotions, informed by focus groups. This doubled transit and carpool usage among the targeted participants.

Finding

Given the large number of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, employees (2,756) assumed to voluntarily convert to non-SOV modes for their daily commute to BRAC 133, a fine-tuned Individualized Marketing approach is required. The approach described in the Transportation Plan cast a wide net over all of the employees with ill-defined or possibly ineffective strategies, such as mass marketed employee directories and modal promotions. A more scientific, structured and tested approach is recommended, such as customized and targeted individualized marketing.

References

1. Transportation Management Program Reference Guide for BRAC 133 Employees, Working Draft, Washington Headquarter Services, Feb. 23, 2011
2. Individualized Marketing Demonstration Project (IMDP), Final Report, U.S. Department of Transportation, Federal Transit Administration, 2006
3. SmartTrips Downtown – Final Report, City of Portland, Oregon November 2006 – June 2009
4. Transportation Management Plan for BRAC 133 at Mark Center, Washington Headquarters Services, U.S. Army Corps of Engineers, New York District, July 2010

4.4.6 Pedestrian Service

Issue

According to the Transportation Plan, an estimated two percent of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, employees (128 workers) will walk to work on a daily basis (pg. 7, ¶3). Due to unsafe walk conditions leading to and from the site, it is not certain the walk goal will be achieved.

Analysis

The Transportation Plan states "construction of a well-connected, continuous sidewalk system to access the site from the adjacent roadway network" will be completed "before tenants begin occupying the BRAC 133 facility" (pg. 8, 4th bullet). These improvements are part of a $20 million appropriation authorized by the U.S. Department of the Army, as stated in a Base Realignment and Closure 2005 - Construction Reprogramming Request dated April 2011.

According to the request, the road network serving the Mark Center is certified, under Defense Access Road (DAR) program criteria, as "important to national defense." The anticipated DoD improvements related to pedestrian facilities include:

- Intersection improvements at Seminary Road and Mark Center Drive, including pedestrian access
- Intersection improvements at Seminary Road and North Beauregard Street, including pedestrian access
- Intersection improvements at North Beauregard Street and Mark Center Drive

According to the City of Alexandria, these improvements will not be completed until 2013, two years after the scheduled Sept. 15, 2011, relocation of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. Specifically: "The local improvements to roads in the vicinity of the Mark Center that were part of the developer-proffered improvements have been completed. Still pending are the $20 million short- and mid-term road improvements to local intersections being funded through the DAR program, which are anticipated to be completed in December 2013.[1]"

According to the 2001 USDOT Federal Highway Administration publication Designing Sidewalks and Trails for Access Part II of II: Best Practices Design Guide, "integrating pedestrians, including pedestrians with disabilities, into the project planning process is critical to the success of a transportation network." (Pg. 3-1). This tenet is forged in federal law such as the Americans with Disabilities Act (ADA), national transportation legislation such as the Intermodal Surface Transportation Efficiency Act – Local Use (ISTEA-LU) and the Virginia Department of Transportation Design Specifications, Section 200.

Federal standards in pedestrian system design generally require:

- Wide pathways
- No obstacles and protruding objects
- Moderate grades and cross slopes
- Tight corner radii
- Firm, stable and uniform slip resistant surfaces
- Good lighting and adequate sight lines

Within a pedestrian corridor, a minimum sidewalk width of five feet is recommended. In locations with pedestrian concentrations and for the handicapped, wider widths of six to nine feet are warranted. Federal guidelines also advise the environment for pedestrians should be well signed and include elements such as:

- Pedestrian traffic control devices
- Crosswalks, curb ramps
- Refuge islands
- Street trees, landscaping, traffic side buffer strips
- Benches and public art

Field Observations of Pedestrian Facilities and Services

Field observations were performed Aug. 4 and 7, 2011, after the developer-proffered improvements noted above were completed. The purpose of the field visit was to document walking conditions on roadways, crosswalks and sidewalks within 0.15 miles of the site. Field review involved observations of six roadways: Mark Center Drive-east and west; Mark Center

Avenue; Seminary Road; North Beauregard Street-north; North Beauregard Street – east; and Rayburn Avenue. The following services and facilities were observed:

- Crosswalk ramps, slopes and conditions
- Sidewalk widths, slopes and conditions
- Sidewalk curb radii
- Pedestrian traffic and signal control devices
- Transit bus stop locations and conditions
- Handicapped access provisions
- Traffic turn movements and lanes
- Pedestrian, traffic and way-finding signage
- Building 133 garage access locations
- Building 133 Transit Center bus bays, passenger load and wait areas
- General roadway conditions

It should be noted that the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, facility was under construction during the field visits on Aug. 4 and 7, 2011. Full occupancy conditions could not be observed or experienced.

The deficient locations observed on the road network at and near the site are identified in Figure 4-6 below. Written descriptions of these locations is presented in the Appendix B: Table B-1: Pedestrian Service Field Observations At and Near the site of BRAC 133 Project Fort Belvoir – Mark Center, Virginia.

Finding

The Transportation Plan's assertion that "a well-connected continuous sidewalk system" will be available "before tenants begin occupying the BRAC 133 facility" (pg. 8, 4th bullet) is not correct. An August 2011 review inventory of pedestrian facilities at and near the site found a series of ADA-deficient and unsafe conditions including hazardous pedestrian crossing locations, substandard sidewalk widths, substandard bus stop locations, substandard crosswalk ramp facilities, substandard (or non-existent) pedestrian traffic control devices, and absence of pedestrian way finding. Additionally, the proposed Seminary Road pedestrian overpass has not been built, requiring BRAC 133 Project Fort Belvoir – Mark Center, Virginia, workers to cross the heavily traveled, multi-lane traffic arterial at-grade. This will make it difficult to safely accommodate the 128 employees expected to walk to the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, work site on a daily basis.

References

1. Interview: Mark Jinks, Deputy City Manager, City of Alexandria, Va., Aug. 5, 2011.
2. BRAC 133 Field Observations, Valerie J. Southern – Transportation Consultant, LLC, Alexandria, Va., Aug. 4 and 7, 2011
3. Special Report: Accessible Public Rights-of-Way Planning and Design for Alterations, Public Rights-of-Way Access Advisory Committee (PROWAAC), Subcommittee on Technical

4. Designing Sidewalks and Trails for Access, Part I of II: Review of Existing Guidelines and Practices, 1999: http://www.fhwa.dot.gov/environment/sidewalks/index.htm
5. Designing Sidewalks and Trails for Access, Part II of II: Best Practices Design Guide, 2001, http://www.fhwa.dot.gov/environment/sidewalk2/
6. Special Report: Accessible Public Rights-of-Way Planning and Design for Alterations, Chapter 5, http://www.access-board.gov/prowac/alterations/guide.htm#5
7. Virginia Department of Transportation, Design Specifications, Section 200, Curbs, Medians and Entrance Gutters: http://www.extranet.vdot.state.va.us/LocDes/Electronic%20Pubs/2008Standards/CSection200.pdf
8. Transportation Management Plan for BRAC 133 at Mark Center, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, New York District, July 2010

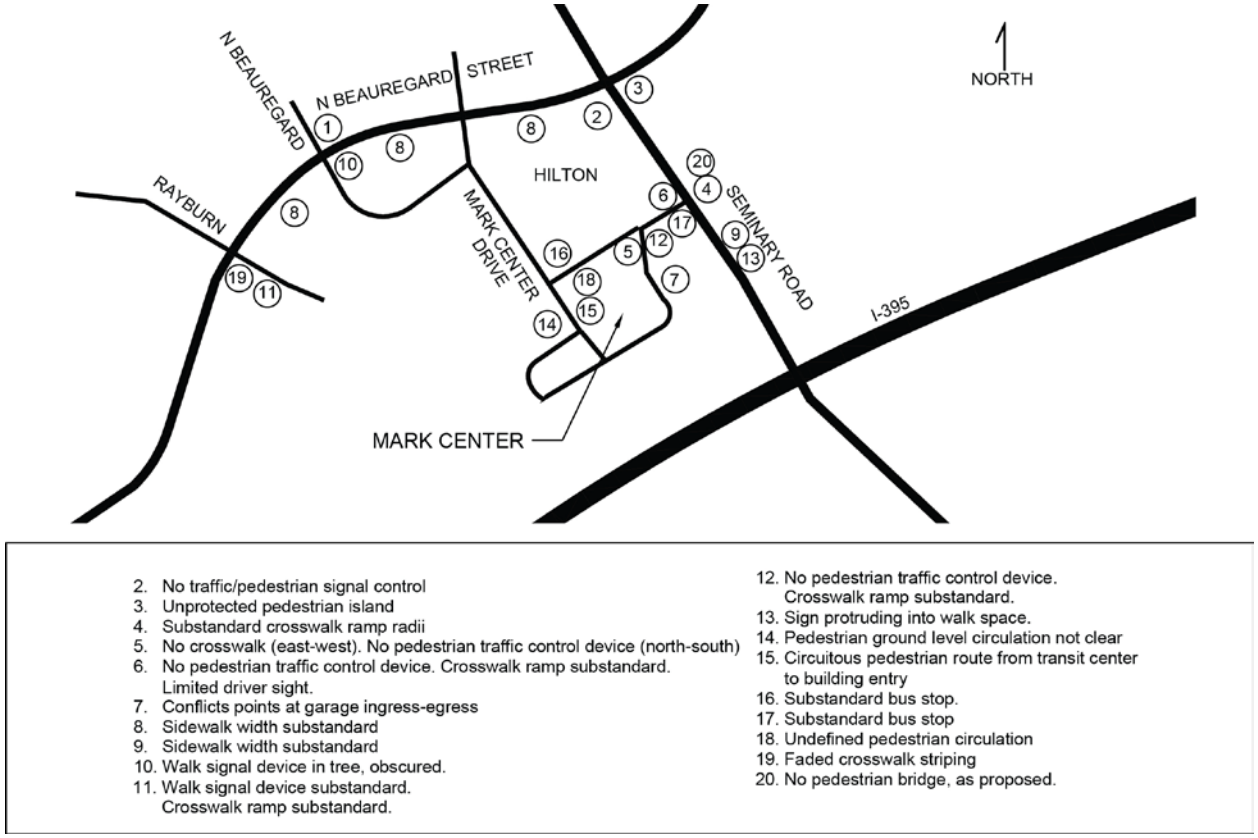

Figure 4-6: *Locations of Observed Pedestrian Service Deficiencies*[2]

4.4.7 Bicycle Service At or Near Site

Issue

According to the Transportation Plan[1], an estimated two percent of total employees (128) of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will bicycle to work on a daily basis (pg. 7). The Transportation Plan states, "Many bicycle paths and routes are located within one mile of the BRAC 133 site." The 2010 Transportation Management Plan[2] supports this assertion (pgs. 124-125), however there is no bicycle circulation and access plan in the Transportation Plan or the Transportation Management Plan. Please see Section 4.4, page 53 of this report, for additional discussion on pedestrian and bicycle services.

Analysis

Field observations were performed within 0.15 miles of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, on Aug. 4 and 7, 2011. The purpose of the field visit was to document bicycle services and conditions on roadways near and at the site. This involved observations on six roadways:

- Mark Center Drive-east and west
- Mark Center Avenue
- Seminary Road
- North Beauregard Street - north
- North Beauregard Street - east
- Rayburn Avenue

While several of the roadways were recently modernized and upgraded by the developer of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, no bicycle facilities or amenities were found on the roadways serving the site. Additionally, there were no way-finding signs on the roadways or at garage entrances.

Finding

One hundred and twenty-eight employees are expected to bicycle to BRAC 133 Project Fort Belvoir – Mark Center, Virginia, on a daily basis. Field observations found no bicycle service on the roadways serving the site. Moreover, the Transportation Plan does not provide a bicycle circulation and access plan for preferred or recommended movements within, to and through the campus.

References

1. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011
2. Transportation Management Plan for BRAC 133 at Mark Center, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, July 2010

4.4.8 Bicycle Routings in Proximity to Site

Issue

The Transportation Plan[1] states, "Many bicycle paths and routes are located within one mile of the BRAC 133 site…" (pg. 10, 6th bullet) and the 2010 Transportation Management Plan[2] (Appendix G) illustrates the suggested bicycle routes employees may use for accessing the site. These suggested routes are repeated in Transportation Management Program Reference Guide for BRAC 133 Employees, Working Draft,[3] (pgs. 51 - 55). They are:

- Southbound Route from Columbia Pike/Bailey's Crossroads via Lacy Boulevard
- Eastbound Route from Glen Hills Park via Holmes Run Stream Valley Trail
- Westbound Route from Arlington County via Four Mile Run
- Northbound Route from Seminary Hill via Seminary Road

These bicycle routes do not offer safe or convenient travel to the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, work site.

Analysis

Though some sections of the suggested bicycle routes are on city-designated bikeways (such as the Holmes Run Trail), the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, users must eventually divert to traffic arterials that lack the width to safely accommodate vehicles and bicycles. A commenter on the Transportation Management Plan bicycle policies – characterized, as a Mark Center employee who bicycles to work, shared his/her thoughts as follows:

> "The flaw in the transportation plan with respect to bicycling is not the number of racks or the availability of showers, but the lack of bicycle access to the site. Only those who are comfortable riding in heavy traffic can get there now, and the situation is likely to get worse. From no direction is bicycling easy, and I don't consider riding on sidewalks an option. That is safe for neither bicycles nor pedestrians, and none of the sidewalks in the area is wide enough or recognized for mixed use…From the north west, Seminary has four narrow lanes that make it difficult for cars to pass bicyclists safely. Beauregard Street to the northeast is ridable, but only for those skilled in traffic. …If the Plan were serious regarding bicycling as a mode of transportation, there would be more…regarding road improvements to ensure bicycle access…." (Transportation Management Plan - pg. A-25, Item 134)

The official BRAC 133 Project Fort Belvoir – Mark Center, Virginia, management response to these comments was:

> "Adjustments have been made to the Transportation Management Plan to remove any instances of the word "safe" and to remove language referring to the use of sidewalks by bicycles….DoD is not funding offsite bicycle access improvements. Onsite safety improvement will be coordinated between the City Biking and Pedestrian Coordinator

and the WHS Transportation Coordinator(s). WHS will closely monitor the use of bicycles as one of its transportation demand management strategies…." (Transportation Management Plan - pg. A-26, Bullets 1, 2 and 3)

In lieu of the bicycle routes suggested in the Transportation Management Plan, an assessment was performed on the viability of using city-designated bikeways within and near the site. It was determined that examining the designated bikeways as a starting point, would offer insight on the quality of bicycle service available to employees. A portion of the City of Alexandria Bicycle Map, closest to BRAC 133 Project Fort Belvoir – Mark Center, Virginia,, is presented in Figure 4-7 below.

A description of the city-designated on-roadway and off-roadway bikeways near BRAC 133 is provided here.

Designated Off-Roadway Bikeways

- **Holmes Run Trail:** At its closest point, this designated north-south bikeway and trail is roughly one mile south of BRAC 133. From the south, the trail crosses I-395. In inclement weather, the crossing is flooded and closed. From this crossing, the trail runs west. To access the Mark Center, users would divert to North Beauregard Street then north to Mark Center Drive-west, then east to the work site. The final two links are on unprotected traffic streets necessitating travel in traffic lanes or on sidewalks. As noted in the pedestrian section of this report, the south section of North Beauregard Street has narrow sidewalk widths at three and a half to four feet on either side. The route length as described is roughly one mile.

- **Washington and Old Dominion (W&OD) Trail:** At its closet point, this designated off-road bikeway is roughly two miles north west of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. Travel to the site would require connection to South Walter Reed Drive at King Street. At this location there is a warning to "use extra caution." From this point, there are two travel options:
    - Shorter Route: Exit the designated bikeway and travel on two traffic roadways (southeast on North Beauregard Street then east on Mark Center Drive-west). This route as described is roughly two miles in length.
    - Longer Route: This option enables more travel on designated bikeways, but the last two links are on unprotected traffic streets. Users would first travel on two designated on-road bikeways (west on West Braddock Road and south on Dawes Avenue), then on two traffic streets (east on Seminary Road and south on North Mark Center Drive). The route as described is roughly three miles in length.

- **Four Mile Run:** At its closest point, this designated off-road bikeway is roughly two miles north west of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. The route options and lengths discussed for the Washington and Old Dominion Trail would apply here.

Designated On-Road Bikeway

- **Sanger Avenue:** At its closest point, this designated east-west bikeway is roughly 0.75 miles south of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. From the southeast, it crosses I-395 where there is a "use extra caution" warning. It then runs west where users would divert to two traffic streets (north on North Beauregard Street and east on West Mark Center Drive) to the Mark Center. This option is roughly one and a half miles in length from the I-395 crossing.

Figure 4-7: *City of Alexandria Bike Map (Excerpt) Designated Trails and Routes in proximity to BRAC 133 Mark Center*[4]

Finding

The Transportation Plan statement that "Many bicycle paths and routes are located within one mile of the BRAC 133 site" is misleading. There are paths and routes in the vicinity of the site but none offer safe or direct connections to the Mark Center. A reassessment of the bicycle element of the Transportation Plan is warranted given the absence of bicycle service near and at the Mark Center. This creates an unsafe condition for the 128 employees of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, expected to bicycle to work on a daily basis.

References

1. Transportation Plan for BRAC Recommendation #133 Project Fort Belvoir-Mark Center, Virginia, A Report to Congress Pursuant to the National Defense Authorization Act for Fiscal Year 2011 – Public Law 111-383, May 2011
2. Transportation Management Plan for BRAC 133 at Mark Center, Prepared for Washington Headquarters Services, in association with Department of the Army, U.S. Army Corps of Engineers, July 2010
3. Transportation Management Program Reference Guide for BRAC 133 Employees, Working Draft, Washington Headquarter Services, Feb. 23, 2011
4. City of Alexandria, Va., Bikeways Network, http://alexandriava.gov/localmotion/info/default.aspx?id=11546

5.0 Findings and Conclusions

5.1 Conclusion: Process

Much of the data, analysis, and information contained in the Transportation Plan are unreliable and questionable. The volume of transportation studies prepared to address the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, create an illusion that the transportation issues have been thoroughly addressed and mitigated. However, any sound analysis must begin with sound data. Data for traffic counts, background traffic, trip generation, trip distribution and traffic assignments was not developed using industry standards or recommended engineering practice. Further hindering the Transportation Plan's message is the absence of a logical, reasoned and sequential discussion on the goal, the alternatives that were considered based on rigorous analysis, the recommendation on which alternative would, most effectively achieve the transportation goal and objectives required by federal law.

5.1.1 Finding: Traffic Studies

The volume of transportation studies prepared to address the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, creates an illusion that the transportation issues have been thoroughly addressed and mitigated. This is not correct. It appears the Transportation Plan cherry-picked the various traffic studies listed in Table 4-1 to formulate the findings expressed. All of the studies were based on faulty baseline data, including existing peak hour traffic volumes. Many of the studies were flawed in their assessment of the issues, which led to inaccurate conclusions. None of the studies, individually or collectively, provided a thorough and accurate analysis of the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia.

5.1.2 Finding: Traffic Counts

The traffic counts used in the transportation studies prepared to address the traffic impacts of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, did not comply with requirements of ITE recommended standards for collecting such data. The traffic counts were taken during time periods when traffic volumes are impacted by national holidays and summer vacations. The resultant peak hour turning movement volumes did not reflect an average peak hour traffic conditions for the study area. As a result, there was an understatement of existing AM and PM peak hour traffic volumes which was perpetuated through all other volume scenarios used to evaluate the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia.

5.1.3 Finding: Background Traffic

Site development transportation impact analyses require the inclusion of background traffic growth to provide an understanding of overall traffic impact in the development's horizon year: defined as the time the proposed development is occupied. The transportation studies used to develop the Transportation Plan did not adhere to the ITE Recommended Practice in the development of background traffic volumes for the assessment of project impact. Not all studies

used in the development of the Transportation Plan included ambient growth, and none of the studies evaluated the impact of the four million gross square feet (gsf) of pipeline development identified in the Transportation Plan.

The 2011 horizon year peak hour traffic volumes used in the development of the Transportation Plan are significantly less than the anticipated peak hour volumes. Consequently, the level of service will be significantly lower than those used in the development of the Transportation Plan. Therefore this creates an inaccurate representation of project impact in the horizon year.

5.1.4 Finding: Trip Generation

The ITE Recommended Practice defines how trip generation shall be determined for site development transportation impact analyses. The Mark Center trip generation used in the development of the Transportation Plan was not determined in accordance with this practice. ITE recommends the use of national trip generation data where possible, and if not, the development of a local trip generation study in accordance with ITE standard practice.

The studies used in the development of the Transportation Plan did not follow these guidelines, but simply estimated peak hour trip generation from total site employment. As a result, the peak hour volumes stated in the Transportation Plan appear to be significantly less than what would be estimated if the ITE procedures and VDOT-recommended guidelines had been used. Application of ITE rates suggest peak hour volumes of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, could be as high as 3,000 vehicles per hour or approximately double the peak hour volumes represented in the Transportation Plan.

5.1.5 Finding: Trip Distribution/Traffic Assignment

The process used to determine trip distribution/traffic assignment for the Mark Center did not adhere to sound engineering practice in the use of survey data and determination of traffic assignment patterns. The traffic distribution patterns of the entire employee population of federal employees and defense contractors were based on the residential location of the federal employees and did not include a sample of the residential location of the defense contractors. Secondly, traffic assignment patterns for the entire employee population were based on an assumed route from the residential location to the Mark Center without recognition of the possible alternative routes. The result of this approach to trip distribution and traffic assignment will result in unrealistic traffic patterns assumed for project-generated traffic.

5.1.6 Finding: Transportation Plan

The Transportation Plan does not comply with standard industry practice for the development of transportation plan documents. The Transportation Plan appears to be a rambling collection of thoughts generally related to the issues surrounding BRAC 133 Project Fort Belvoir – Mark Center, Virginia. The Transportation Plan offers insufficient discussion and justification on how it arrived at recommendations and strategies for accommodating transportation needs of BRAC 133 Project Fort Belvoir – Mark Center, Virginia. The Transportation Plan's use of source

documents and its methodology for traffic counts, background traffic, trip generation, trip distribution and trip assignments is questionable and not clearly or fully explained. Without sound application of quantitative methodology, thoughtful consideration of possible alternatives and justification on why certain program strategies were selected over others, the conclusions of the Transportation Plan are weakened and do not meet the requirements of Section 2704 of Public Law 111-383.

5.2 Conclusion: Ingress/Egress

The efficient ingress and egress of all personnel to and from BRAC 133 Project Fort Belvoir – Mark Center, Virginia, is dependent upon the provision of a safe and highly functional roadway network.. The Transportation Plan fails to adequately address expected congestion on adjacent arterial roadways serving the site and on the roadways within the site itself. Projected queuing on the adjacent arterials will back up on to the site internal roadways and create severe congestion; resulting in near gridlock conditions in peak periods. This will hamper the high frequency express bus and shuttle services envisioned to move employees quickly to and from the site in the AM and PM.

The Transportation Plan fails to analyze the complete impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, by limiting its analysis to the six adjoining intersections as if they existed in isolation. In order for any traffic analysis to be realistic and complete, standard engineering practice dictates the Transportation Plan should have included an evaluation of traffic impacts at both signalized and unsignalized intersections within a radius of 2 miles from the Mark Center. An additional issue is parking. The insufficient supply of parking at BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will likely have a deleterious impact on adjoining neighborhood traffic and parking conditions as Mark Center employees seek parking on their own. Other safety concerns related to ingress/egress, but not addressed in the Transportation Plan, are the historically high crash locations on roadways within the vicinity of Mark Center.

Each of these issues will exacerbate congestion on the local road network, have a significant impact on emergency response, and create an unsafe environment for BRAC employees and the immediate community.

5.2.1 Finding: High Occupancy Vehicle Access

The Transportation Plan assumes at least 39 percent of the workforce (2,500 employees) of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will use shuttle, commuter rail, and HOV access for travel to work. This assumption is based on existing mode split choices of federal employees at the Pentagon Reservation. This assumption may be unrealistic. The Transportation Plan incorrectly states the wide range of alternative travel options at the Pentagon Reservation will be the same or similar for employees at the Mark Center. The actual finding is that travel options at the Mark Center are severely limited – rail access is 4.31 miles away, and no HOV freeway lanes directly serve the site. With this existing condition, the BRAC 133

Project Fort Belvoir – Mark Center, Virginia, TDM strategy for achieving 39 percent non-SOV trips may fail.

5.2.2 Finding: Study Area

The ITE Recommended Practice suggests a development of the magnitude of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, include the evaluation of the traffic impacts at all signalized intersections within a study area defined by a two-mile radius around the site. The Transportation Plan limited the analysis to six intersections within 0.14 miles of the site. The Transportation Plan should have considered a much larger study area than six intersections. Application of the ITE Recommended Practice would have resulted in a larger study area that would have included at a minimum an additional 63 intersections. The outcome would have identified significant impacts resulting from BRAC 133 Project Fort Belvoir – Mark Center, Virginia, on the area intersections.

5.2.3 Finding: Capacity of I-395

Responsible transportation planning dictates a proposed development should mitigate significant adverse impacts to the roadway network. The Transportation Plan documents the fact that BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will create a significant adverse impact on I-395 that will not be mitigated by the proposed HOV access ramp. The Transportation Plan fails to recognize that congestion on the I-395 mainline creates queuing onto Seminary Road impacting the intersection at Mark Center Avenue. Any volume diverted to the proposed HOV ramp will not be significant enough to resolve the mainline congestion on I-395 southbound.

5.2.4 Finding: I-395 Congestion

Transportation planning research indicates that small increases in traffic volume may result in significant impacts on traffic speeds and congestion. The Transportation Plan's assumption that because I-395 is already congested, a relatively modest increase in traffic will have "a relatively minor impact" on traffic operations is not accurate. Additional traffic added to a congested freeway will have a disproportionate impact on freeway operations that could result in gridlock.

5.2.5 Finding: Mitigation

The Transportation Plan incorrectly asserts that Virginia Department of Transportation indicates that with the short/mid-term and long-term improvements, the impact of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will be adequately mitigated. With the proposed short/mid-term improvements, the Seminary Road/Mark Center Avenue intersection is estimated to operate at LoS F. According to VDOT, the impact of the proposed I-395 HOV access ramp is currently unknown.

5.2.6 Finding: Parking Supply

The Transportation Plan states that sufficient parking supply will be provided to accommodate all vehicles with an assumed 57 percent SOV mode split. In fact, the Mark Center will have 636 fewer parking spaces than is needed to accommodate the workforce under the proposed SOV goal. The proposed parking supply of 3,747 parking spaces is approximately 636 spaces fewer than what is required to meet the projected demand even with the "self imposed stringent requirement" of 57 percent SOVs. The result of this requirement will be employees seeking parking off site and placing pressure on adjacent residential neighborhoods, shopping malls, churches, and other commercial complexes.

5.2.7 Finding: On-Site Circulation (Vehicle and Pedestrian)

Several studies have been conducted to assess on-site circulation at the Mark Center. All of the studies concluded that with BRAC 133 Project Fort Belvoir – Mark Center, Virginia, there should be no adverse circulation issues. However, these analyses have failed to 1) consider the impact of queuing created by congestion on the surrounding arterial street network; 2) use appropriate assumptions and analysis tools; 3) recognize design deficiencies in the on site roadway network; and 4) mitigate the resultant adverse impacts. As a result, the full impact of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, traffic on the on-site street system is unknown. Extensive on-site delay is expected based on anticipated on-site queuing resulting from the site access intersections and the substandard roundabout design.

5.2.8 Finding: Safety

The ITE Recommended Practice suggests that the traffic impact studies should identify locations within the study area where extra attention should be given to safety issues. None of the traffic studies used in the formulation of the Transportation Plan gave any consideration to safety at the analysis intersections. Within the vicinity of the Mark Center, there are high crash locations that will be significantly impacted by additional traffic generated by BRAC 133 Project Fort Belvoir – Mark Center, Virginia. The safety issues at these locations will adversely affect ingress and egress to the site. The high crash locations should be identified, and appropriate mitigation measures applied to reduce, if not eliminate, these safety hazards.

5.2.9 Finding: Impact on Emergency Response

A development of the magnitude of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, will have a significant impact on emergency services including fire, aid and serving the site. It is expected the volume of emergency response calls will increase proportionately with the increased employee population. With the estimated traffic congestion and its resulting impact on ingress and egress, a significant impact on emergency vehicle response times to the site can be anticipated. These impacts should be identified and mitigated as part of the Transportation Plan.

5.2.10 Finding: Construction Impacts

The ITE Recommended Practice identifies the need to provide acceptable levels of service at the time of site occupancy. The Transportation Plan indicates unacceptable and failing levels of service will exist at study area intersections until the VDOT Short/Mid-Term Improvements and long-range improvements are completed. The Transportation Plan states that the Short/Mid-Term improvements are to be complete by late 2013 and VDOT suggests the long-range improvements, if approved, could be complete by 2016. The Transportation Plan, however, fails to address the impact of construction activity between 2011, when BRAC 133 Project Fort Belvoir – Mark Center, Virginia, is occupied, and 2016, when all improvements are complete. Construction activity will affect ingress and egress to the site. The impact of construction activity on the study area and site access intersections should be determined and appropriate mitigation measures identified and included in the Transportation Plan.

5.3 Conclusion: Assessment of Costs

The Transportation Plan assessed the costs and programming of short-, medium-, and long-term projects according to industry standards generally, however horizon year studies did not adhere to industry standards that call into question the determination of required project mitigation, scheduling of programmed improvements and related funding requirements. According to the Transportation Plan, the $112 million identified for short-, mid- and long-term infrastructure improvements of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, project is **not** adequate to maintain the existing LoS at the six analysis intersections. Additional funding will be necessary to relieve anticipated congestion and maintain existing levels of service.

5.3.1 Finding: Horizon Year

The ITE Recommended Practice recommends that transportation impact analyses include an analysis at the opening of the site and at a minimum five years in the future. The traffic studies used in the development of the Transportation Plan failed to provide an impact analysis at both the opening and five years in the future. Thus, these studies did not provide a comprehensive understanding of the actual traffic related impact of the proposed BRAC 133 Project Fort Belvoir – Mark Center, Virginia, development. The result of this approach complicates the determination of required project mitigation, scheduling of programmed improvements, and related funding requirements.

5.3.2 Finding: Maintaining Existing Level of Service (LoS)

According to Public Law 111-383, the Transportation Plan was mandated to assess the cost of funding short-, medium-, and long-term projects necessary to maintain the existing level of service at the six analysis intersections. The Transportation Plan failed to accomplish this requirement. Although the Transportation Plan identified $112 million for short-, medium- and long-term infrastructure improvements to address the traffic related impacts of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, this funding is not adequate to provide necessary improvements to maintain the existing LoS at the six analysis intersections. Additional funding will be necessary to relieve anticipated congestion and to maintain existing levels of service.

5.3.3 Finding: Cost Estimates

The Transportation Plan was mandated by Public Law 111-383 to assess the cost of the improvements necessary to maintain existing levels of service at the six analysis intersections. The costs were divided into:

- Short Range Improvements – City of Alexandria mandated improvements
- Short/Mid-Term Improvements – VDOT identified arterial improvements
- Long-Range Improvements – VDOT identified HOV ramp improvements
- Transportation Management Plan costs – TDM measures intended to reduce SOV's

The Short Range Improvements estimated to cost $12 million have been completed.

The cost estimates of the VDOT short/mid-term improvements appear to be more than adequate to fund the identified improvements. The cost estimates were prepared according to industry standards, but the proposed short/mid-term improvements will not maintain existing levels of service at the six analysis intersections.

The funding and programming for the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, shuttle-bus program appear adequate, but it is only programmed for fiscal years 2011 and 2012. There is no cost accountability or programming for future years. Additionally, funding for the administrative elements of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, TDM program are not known and were not provided. This would include the costs for staffing, program marketing, and program oversight and monitoring. Without this cost information, it is not known if this critical element of the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, relocation effort is adequately or appropriately funded and programmed.

The cost estimate for the long-range improvement is only a planning-level estimate. The actual improvement and cost will not be known until the design studies and environmental assessment are complete at the end of 2011. Furthermore, the benefits, if any, of the proposed HOV ramp will not be known until that time as well.

In conclusion, the Transportation Plan did not meet the Public Law mandate to assess the cost of necessary improvements to maintain existing levels of service at the six analysis intersections.

5.3.4 Finding: Programming of Project Funding

Public Law 111-383 mandated the Transportation Plan provide an assessment of the programming of improvements necessary to maintain existing levels of service at the six analysis intersections. The short-, mid- and long-term improvements have been programmed according to industry standards. Additionally, the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, shuttle-bus cooperative agreements and service contracts with providers have been executed. It is not known if the administrative and management elements of the Transportation Management Plan program have been adequately funded or programmed. This information was requested, but

it was not provided. However, the identified improvements are not adequate to maintain the existing levels of service at the six analysis intersections.

5.4 Conclusion: Use of Other Methods of Transportation Necessary to Maintain Existing LoS

The use of alternative modes of transportation to support the goal to significantly reduce single occupancy vehicles generated by BRAC 133 Project Fort Belvoir – Mark Center, Virginia, has not been well defined. Moreover it is questionable whether the goal can be achieved, given that the Transportation Plan offers contradictory non-SOV goal statements. Further, the Transportation Plan fails to comply with several federal standards for developing Transportation Management Plan programs. There are also deficiencies and/or an absence of bicycle and pedestrian facilities and services at and near BRAC 133 Project Fort Belvoir – Mark Center, Virginia. This will hinder the employee walk and bicycle goals established in the Transportation Plan. Each of these factors in combination with the inability of the proposed employee bus and shuttle services to achieve proposed headways due to expected roadway congestion suggests the aggressive non-SOV goals established in the Transportation Plan may not be achieved or sustained.

5.4.1 Finding: National Capital Planning Commission (NCPC) Compliance

NCPC policies are the federal standard for ensuring federal development projects built in the National Capital Region comply with traffic management and mitigation objectives. The Transportation Plan does not comply with six NCPC policies and is in violation of this federal standard. NCPC was the only agency that approved the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, Transportation Management Plan.

5.4.2 Finding: Public Transportation - Shuttle and Bus Strategy

The public bus and shuttle services designed for the Mark Center Transit Station have adequate frequencies and capacity to accommodate the number of employees designated to use them. It is noted that the 10- and 15-minute frequencies for these services – which are designed to quickly move employees to and from the site – will be severely compromised should LoS on roadways serving BRAC 133 Project Fort Belvoir – Mark Center, Virginia, fail. There are no HOV lanes directly serving the site. The bus and shuttle services will be required to use the freeway general-purpose lanes. If freeway and local roadways operate at failing service levels, this will undermine the efficiency of the bus and shuttle system. The 1,794 BRAC 133 Project Fort Belvoir – Mark Center, Virginia, employees expected to use these services may not do so, as the service will be perceived as inefficient and unreliable. There is no contingency plan to address this eventuality.

5.4.3 Finding: Transportation Demand Management Goal

The TDM goals for employee SOV trips are contradictory and ill defined. BRAC 133 Project Fort Belvoir – Mark Center, Virginia, may generate 1,794 more SOV trips than intended, depending on which goal is realized. The SOV goal should be corrected and clarified in the Transportation Plan.

5.4.4 Finding: Mode Choice Assumptions

When compared with U.S. Census information, BRAC 133 Project Fort Belvoir – Mark Center, Virginia, mode split assumptions appear overly optimistic in HOV use and noticeably lower in public transportation use. This finding is significant as any error or miscalculation in estimating mode split may have a negative impact on the regional and local road network serving the site.

5.4.5 Finding: TDM Marketing Strategy

Given the large number of BRAC 133 Project Fort Belvoir – Mark Center, Virginia, employees (2,756) assumed to voluntarily convert to non-SOV modes for their daily commute to BRAC 133, a fine-tuned Individualized Marketing approach is required. The approach described in the Transportation Plan cast a wide net over all of the employees with ill-defined or possibly ineffective strategies, such as mass marketed employee directories and modal promotions. A more scientific, structured and tested approach is recommended, such as customized and targeted individualized marketing.

5.4.6 Finding: Pedestrian Service

The Transportation Plan's assertion that "a well-connected continuous sidewalk system" will be available "before tenants begin occupying the BRAC 133 facility" (pg. 8, 4th bullet) is not correct. An August 2011 review inventory of pedestrian facilities at and near the site found a series of ADA-deficient and unsafe conditions including hazardous pedestrian crossing locations, substandard sidewalk widths, substandard bus stop locations, substandard crosswalk ramp facilities, substandard (or non-existent) pedestrian traffic control devices, and absence of pedestrian way finding. Additionally, the proposed Seminary Road pedestrian overpass has not been built, requiring BRAC 133 Project Fort Belvoir – Mark Center, Virginia, workers to cross the heavily traveled, multi-lane traffic arterial at-grade. This will make it difficult to safely accommodate the 128 employees expected to walk to the BRAC 133 Project Fort Belvoir – Mark Center, Virginia, work site on a daily basis.

5.4.7 Finding: Bicycle Service At or Near Site

One hundred and twenty-eight employees are expected to bicycle to BRAC 133 Project Fort Belvoir – Mark Center, Virginia, on a daily basis. Field observations found no bicycle service on the roadways serving the site. Moreover, the Transportation Plan does not provide a bicycle circulation and access plan for preferred or recommended movements within, to and through the campus.

5.4.8 Finding: Bicycle Routings in Proximity to Site

The Transportation Plan statement that "Many bicycle paths and routes are located within one mile of the BRAC 133 site" is misleading. There are paths and routes in the vicinity of the site but none offer safe or direct connections to the Mark Center. A reassessment of the bicycle element of the Transportation Plan is warranted given the absence of bicycle service near and at the Mark Center. This creates an unsafe condition for the 128 BRAC 133 Project Fort Belvoir – Mark Center, Virginia, employees expected to bicycle to work on a daily basis.

Appendices

Appendix A: Acronyms

ADA: Americans with Disabilities Act
AM: Morning
BRAC: Base Realignment and Closure
CNA: Center for Naval Analysis
COA: City of Alexandria
CORSIM: Corridor Simulation
CPNC-TE: Comprehensive Plan for the National Capital Transportation Element
DAR: Defense Access Road
DASH: Alexandria, Virginia Transit Company bus service.
DoD: United States Department of Defense
DoD OIG: Department of Defense Office of the Inspector General
EA: Environmental Assessment
ETC: Employee Transportation Coordinator
FEA: Final Environmental Assessment
FHWA: Federal Highway Administration
FONSI: Finding of No Significant Impact
FTA: Federal Transit Administration
GP: general-purpose
gsf: gross square feet
HOT: High Occupancy Toll Lane
HOV: high occupancy vehicle
IDA: Institute for Defense Analysis, Inc.
IJR: Interchange Justification Report
IM: Individualized Marketing
ISTMP: Implementing a Successful Transportation Management Plan
ITE: Institute of Transportation Engineers
LoS: Level of Service
LU: Land Use
MWCoG: Metropolitan Washington Council of Governments
NCPC: National Capital Planning Commission
NCR: National Capital Region
NEPA: National Environmental Policy Act
PB: Parsons Brinckerhoff
PM: Afternoon/Evening
SAMS: Strategy and Management Services, Inc.
SOV: Single Occupancy Vehicle

TDM: Transportation Demand Management
TIA: Traffic Impact Analysis
TIMP: Transportation Improvement and Management Plan
TIS: Traffic Impact Study
TMP: Transportation Management Plan
TP: Transportation Plan for BRAC 133
TPB: Transportation Planning Board
TRB: Transportation Research Board
USACE: United States Army Corps of Engineers
USDOT: United States Department of Transportation
VAC: Virginia Administrative Code
VDOT: Virginia Department of Transportation
VHB: Vanasse Hangen Brustlin, Inc.
VRE: Virginia Railway Express
WHS: Washington Headquarters Service
WMATA: Washington Metropolitan Area Transit Authority

Appendix B: Tables

Table B-1: Pedestrian Service Field Observations At and Near the site of BRAC 133 Project Fort Belvoir – Mark Center, Virginia

Location		Observation
Hazardous Crossings		
#1	North Beauregard Street-north/North Beauregard Street - east intersection, west side	Complicated configuration on the west leg of intersection with four traffic lanes and islands creating conflicts. Pedestrian ramps at all corners of intersection are not ADA compliant.
#2	North Beauregard Street/Seminary Road intersection - south east corner	Crosswalk across right-turn traffic lane with no traffic or pedestrian signal control device. Driver sight partially obscured at crosswalk on roadway curve.
#3	North Beauregard Street/Seminary Road intersection - north east corner	Crosswalk traverses heavy use right-turn traffic lane making users waiting on island vulnerable.
#4	Seminary Street at Southern Towers entrance - north side	Substandard crosswalk ramp radii with turning Metro buses and automobiles intruding into pedestrian wait space.
#5	Mark Center Avenue/4900 Seminary Road intersection - south east corner	No crosswalk across Mark Center Drive-north at this location. Crosswalk provided for crossing 4900 Seminary Road, but no traffic or pedestrian control devices. Location is a high volume service road for shuttles and vehicles accessing garages.
#6	Seminary Road/Mark Center Avenue - south west corner	Crosswalk to island traverses right turn traffic lane. No traffic or pedestrian control devices at this location. Crosswalk ramp is not ADA compliant. Roadway curve on west side of crosswalk limits driver sight.
#7	4900 Seminary Road - south side	Conflict points on sidewalk at active garage entrance and exit ramps. No audible warning device for drivers or pedestrians.
Sidewalk Widths		
#8	North Beauregard Street from Rayburn Avenue to Seminary Road	Sidewalk widths variable from substandard three and half to four feet (most of length) to five to six feet at Mark Center Drive-west intersection and at bus transit stops.
#9	Seminary Road - east of Southern Towers entrance	North side substandard four feet sidewalk with narrow, ineffective one-foot buffer on traffic side.
Non ADA Compliant Pedestrian - Traffic Control Devices and Facilities		
#10	North Beauregard Street-north/North Beauregard Street - east intersection	Walk signal devices on east side of intersection mounted high in trees, partially or completely obscured.
#11	North Beauregard Street/Rayburn Avenue intersection	Walk signal device out of handicapped user's reach. Crosswalk ramps at all intersection corners are not ADA compliant. No pedestrian traffic control device on east leg of intersection.
#12	Mark Center Avenue/4900 Seminary Road intersection	No pedestrian or traffic control devices at intersection. This location is a high volume service road for shuttles and vehicles accessing multiple garages. Crosswalk ramps on west side of intersection are not ADA compliant.

Location		Observation
Obstructions		
#13	Seminary Road east of Southern Towers entrance - north side sidewalk	Clark/Shirley Construction sign protruding into narrow four feet walk space.
#14	Mark Center Drive-east: pedestrian ground level access to building entrance	Pedestrian path to building frontage unclear and possibly obstructed with south side sidewalk terminating abruptly and traffic rotary and security checkpoint traffic lanes located at building entrance. This uncertainty on access is partially explained in the 2010 Transportation Management Plan (pg. 30): "No pedestrian movement will be allowed at the ground level area between the North and South Parking Garages to prevent any potential conflict with vehicular traffic…A pedestrian bridge will connect the North Campus to the South Campus. Visitors entering the side from the North Parking garage will be able to access the Visitor Control Center located in the main building using the pedestrian bridge."
Signage		
#14	General	Noticeable absence of way-finding signage directing and orienting pedestrians to services, facilities and building entry points near and in the Mark Center campus.
Circuitous Routing		
#15	Mark Center Transit Station	For access to building checkpoint from Transit Center, pedestrian-handicapped route is via escalator and elevator (at south end of Transit Center loading area) up to garage level P5, across garage, across pedestrian bridge, then down escalator to building entry point. Note: This is the pattern described in the 2010 Transportation Management Plan referenced above.
Transit Service		
#16	Mark Center Avenue	On roadway west side, across from Transit Center, Metro bus stop with no weather protection or seating, concrete slab.
#17	Mark Center Avenue/4900 Seminary Road intersection - north of northeast intersection corner	Isolated, unprotected bench on slope at roadway edge at Metro bus stop. Bus stop located in middle of active right turn traffic lane.
#18	Mark Center Avenue at Mark Center Transit Station - east side of roadway	Pedestrian north-south access and circulation on east side sidewalk may be hampered by arriving/departing buses and other mode activity. Another field assessment warranted at this location when building is fully operational.
Other		
#19	North Beauregard Street-north / Rayburn Avenue intersection	Faded crosswalk striping.
#20	Elevated pedestrian bridge from north side of Seminary Road to Mark Center Avenue (identified as short-term improvement.)	Not constructed at time of field visit. Proposed bridge has been recommended as a safety feature for BRAC 133 employees currently required to cross multi-lane traffic arterial at grade. As noted above in City of Alexandria reference, completion of this DoD funded improvement is anticipated in 2013.

Table B-2: BRAC 133 Commuter Bus and Rail Services and Connections

COMMUTER BUS SERVICE				
Route #		**Description**	**Frequency**	**Rail Station**
Alexandria Transit Company - DASH				
1	AT1	Seminary Plaza – Van Dorn/Eisenhower Weekday, Sat, Sun	20-30 Min	Van Dorn/Eisenhower
2	AT2X Express	Mark Center – King Street Metro Weekday: 6-9 a.m. and 3-6 p.m.	15 Min - Peak	King Street
3	AT2	Braddock-Lincolnia Weekday, Sat, Sun	30 Min	Braddock/King Street
Washington Metropolitan Area Transit Authority - METROBUS				
1	7M	Mark Center – Pentagon Weekday	10 Min - Peak 15 Min - Midday	Pentagon
2	7A,E,F,Y	Lincolnia - North Fairlington Weekdays, Sat, Sun	30 Min	Pentagon/ Federal Triangle/ Arlington Cemetery
3	7W, X	Lincolnia Park – Pentagon Weekday	30 Min	Pentagon
4	7B	Lincolnia Park – Pentagon Weekday	35 Min	Pentagon
5	28A	King Street - Tysons Corner Weekday, Sat, Sun	30 Min	King Street
6	28F, G	Skyline - Pentagon Weekday	20-25 Min Peak Only	Pentagon
7	25B	Van Dorn – Ballston Weekday, Sat	35 Min- Peak	Van Dorn/ Ballston

- These bus routes stop at the Mark Center and/or Southern Towers stations.
- DASH: BRAC 133 employees/contractors ride free if boarding at Mark Center Station or King Street Metro after presenting DoD CAC identification weekdays between 6-9 a.m. and 3-6 p.m.
- Metrobus: BRAC 133 employees/contractors ride free on Metrobus 7 lines at Pentagon, Mark Center and/or Southern Towers stations after presenting DoD CAC identification.

COMMUTER RAIL SERVICE			
Station	**Description**	**Frequency**	**Bus Connection to Mark Center**
WMATA - METRORAIL			
Van Dorn	Blue Line	30 Min 30 Min – Peak 1 Hr – Off Peak	AT1 25B
Eisenhower	Yellow Line	2 0 – 30 Min	AT1
King Street	Blue and Yellow Lines	10 Min – Peak 30 Min	AT2 and AT2-X 28A
Pentagon	Blue and Yellow Lines	10 Min – Peak 15 Min – Midday 10 Min – Peak 30 Min – Off Peak 20 -30 Min 20-25 Min – Peak Only	7M 7A, E, F, Y 7B,W, X 28F, G
Ballston	Orange Line	35 Min – Peak 1 Hr – Off Peak	25B
VRE		**OUTBOUND**	**INBOUND**
Fredericksburg	Red Line	11 Trains 1:15 p.m. to 7:15 p.m.	11 Trains 6:07 a.m. to 1:00 p.m.
Manassas	Blue Line	9 Trains 6:42 a.m. to 7:08 p.m.	9 Trains 5:52 a.m. to 5: 52p.m.

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Inspector General
Department of Defense