ATTACHMENT 4.0.1.1

I-66 Active Traffic Management

TECHNICAL PROPOSAL CHECKLIST AND CONTENTS

Offerors shall furnish a copy of this Technical Proposal Checklist, including page references, with the Technical Proposal.

Technical Proposal Component	Form (if any)	RFP Part 1 Cross Reference	Included within page limit?	Technical Proposal Page Reference
Technical Proposal Checklist and Contents	Attachment 4.0.1.1	Section 4.0.1.1	no	i
Acknowledgement of RFP, Revisions, and/or Addenda	Attachment 3.6 (Form C-78-RFP)	Sections 3.6, 4.0.1.1	no	2a
Letter of Submittal	NA	Sections 4.1		
Letter of Submittal on Offeror's letterhead	NA	Section 4.1.1	yes	1
Offeror's official representative information	NA	Section 4.1.1	yes	1
Authorized representative's original signature	NA	Section 4.1.1	yes	1
Declaration of intent	NA	Section 4.1.2	yes	1
120 day declaration	NA	Section 4.1.3	yes	1
Principal Officer information	NA	Section 4.1.4	yes	2
Proposal Payment Agreement or Waiver of Proposal Payment	Attachment 9.3.1 or 9.3.2	Section 4.1.5	no	2
Offeror's Qualifications	NA	Section 4.2		3
Confirmation that the information provided in the SOQ submittal remains true and accurate or indicates that any requested changes were previously approved by VDOT	NA	Section 4.2.1	yes	3
Organizational chart with any updates since the SOQ submittal clearly identified	NA	Section 4.2.2	yes	4

ATTACHMENT 4.0.1.1

I-66 Active Traffic Management

TECHNICAL PROPOSAL CHECKLIST AND CONTENTS

Technical Proposal Component	Form (if any)	RFP Part 1 Cross Reference	Included within page limit?	Technical Proposal Page Reference
Revised narrative when organizational chart includes updates since the SOQ submittal	NA	Section 4.2.2	yes	3
Design Concept	NA	Section 4.3		5
Conceptual Project Layout for ITS devices - table and plans	NA	Section 4.3.1	yes	6
Structural Design Concept – description and renderings	NA	Section 4.3.2	yes	29
Project Approach	NA	Section 4.4		36
ITS Deployment Management	NA	Section 4.4.1	yes	36
ITS Operation Continuity	NA	Section 4.4.2	yes	47
Utilities	NA	Section 4.4.3	yes	49
Quality Assurance/ Quality Control (QA/QC)	NA	Section 4.4.4	yes	50
Construction of Project	NA	Section 4.5		58
Sequence of Construction	NA	Section 4.5.1	yes	58
Transportation Management Plan	NA	Section 4.5.2	yes	62
Proposal Schedule	NA	Section 4.6		65
Detailed Work Plan	NA	Section 4.6.1	no	66, 67
Proposal Schedule Narrative	NA	Section 4.6.2	no	65

ATTACHMENT 4.0.1.1

I-66 Active Traffic Management

TECHNICAL PROPOSAL CHECKLIST AND CONTENTS

Technical Proposal Component	Form (if any)	RFP Part 1 Cross Reference	Included within page limit?	Technical Proposal Page Reference
Proposal Schedule in electronic format (CD-ROM)	NA	Section 4.6	no	CD Included
Disadvantaged Business Enterprises (DBE)	NA	Section 4.7		68
Written statement of percent DBE participation	NA	Section 4.7	yes	68
DBE subcontracting narrative	NA	Section 4.7	yes	68

MIDASCO LLC
Building and maintaining America's infrastructure;
Tomorrow's systems today

7121 Dorsey Run Road
Elkridge, MD 21075
410-579-6700
Fax 410-579-6795

4.1: LETTER OF SUBMITTAL

July 27, 2012

Joseph A. Clarke, P.E.
Alternative Project Delivery Office
Virginia Department of Transportation
1221 East Broad Street, 4th Floor
Richmond, VA 23219

RE: Interstate 66 Active Traffic Management RFP
State Project No.: 0066-96A-917, P101, N501
Federal Project No.: IM-5A01(253) & IM-5A01(274)

Dear Mr. Clarke;

The Midasco team is pleased to present this proposal to Virginia Department of Transportation (VDOT) for services for the Interstate 66 Active Traffic Management project. Midasco, teamed with Dewberry & Davis LLC for their accomplished engineering expertise, is a local and dynamic team comprised of industry leaders from the Mid-Atlantic region with a strong desire to address the construction and engineering services requested by VDOT.

Our proposal features industry-leading design and construction techniques and a cost-effective approach. Our strongly believes that we are proposing exactly what VDOT is seeking, a signature project and paradigm for future Active Traffic Management projects.

Please note that Volume 1 of this proposal is the entire submission. There are no scaled drawings in 11" x 17" format, which require the submission of a Volume II.

2

4.1.1: Offeror's Point of Contact: The official representative and main point of contact for the Midasco team is Michael Filipczak. His contact information is listed below:

Michael Filipczak, President / CEO
Midasco, LLC
7121 Dorsey Run Road, Elkridge, MD 21075
(410) 579 – 6719 (Phone) / (410) 579 – 6795 (Fax)
mfilipczak@midasco.net

4.1.2: Offeror's Intent: The Midasco team, if awarded the project, is willing to enter into a contract on the terms outlined within the RFP consistent with the technical and cost proposals.

4.1.3: Proposal Submission Date: The Midasco team hereby declares that the offer represented by the Technical and Price Proposals will remain in full force and effect for 120 days after the date of this Technical Proposal, July 27, 2012.

4.1.4: Legal Entity Contact: If awarded a Design-Build contract with VDOT, the Principal Officer of the legal entity would be written as follows:

Michael Filipczak, President / CEO
Midasco, LLC
7121 Dorsey Run Road, Elkridge, MD 21075
(410) 579 – 6719 (Phone)

4.1.5: Proposal Payment Agreement: Attached within the Appendices section of the submittal is an executed Proposal Payment Agreement form (**Attachment 4.1.5(a)**) on the following page.

As president of Midasco I can assure you that our team is dedicated to delivering a high standard of performance and support to VDOT. We look forward to the opportunity to participate in this project. You have my commitment that the full resources of the Midasco team will be available to deliver VDOT a world class project.

Best Regards,
Midasco, LLC

Michael Filipczak
President / CEO

ATTACHMENT 3.6

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF TRANSPORTATION

RFP NO. C00098017DB46

PROJECT NO.: 0066-96A-917, P101, N501

ACKNOWLEDGEMENT OF RFP, REVISION AND/OR ADDENDA

Acknowledgement shall be made of receipt of the Request for Proposals (RFP) and/or any and all revisions and/or addenda pertaining to the above designated project which are issued by the Department prior to the Letter of Submittal submission date shown herein. Failure to include this acknowledgement in the Letter of Submittal may result in the rejection of your proposal.

By signing this Attachment 3.6, the Offeror acknowledges receipt of the RFP and/or following revisions and/or addenda to the RFP for the above designated project which were issued under cover letter(s) of the date(s) shown hereon:

1. Cover letter of April 6, 2012 - RFP
   (Date)
2. Cover letter of June 22, 2012 – Addendum No. 1
   (Date)
3. Cover letter of July 06, 2012 – Addendum No. 2
   (Date)

Michael Filipczak — 7/25/12

SIGNATURE — DATE

MICHAEL FILIPCZAK, PRESIDENT

PRINTED NAME AND TITLE

ATTACHMENT 9.3.1
PROPOSAL PAYMENT AGREEMENT

THIS PROPOSAL PAYMENT AGREEMENT (this "Agreement") is made and entered into as of this ____ day of _____, 20__, by and between the Virginia Department of Transportation ("VDOT"), and _____ ("Offeror").

WITNESSETH:

WHEREAS, Offeror is one of the entities who submitted Statements of Qualifications ("SOQs") pursuant to VDOT's **October 25, 2011** Request for Qualifications ("RFQ") and was invited to submit proposals in response to a Request for Proposals ("RFP") for the **I-66 Active Traffic Management, Project No. 0066-96A-917, P101, N501** ("Project"), under a design-build contract with VDOT ("Design-Build Contract"); and

WHEREAS, as part of the procurement process for the Project, Offeror has already provided and/or furnished to VDOT, and may continue to provide and/or furnish to VDOT, certain intellectual property, materials, information and ideas, including, but not limited to, such matters that are: (a) conveyed verbally and in writing during proprietary meetings or interviews; and (b) contained in, related to or associated with Offeror's proposal, including, but not limited to, written correspondence, designs, drawings, plans, exhibits, photographs, reports, printed material, tapes, electronic disks, or other graphic and visual aids (collectively "Offeror's Intellectual Property"); and

WHEREAS, VDOT is willing to provide a payment to Offeror, subject to the express conditions stated in this Agreement, to obtain certain rights in Offeror's Intellectual Property, provided that Offeror submits a proposal that VDOT determines to be responsive to the RFP ("Offeror's Proposal"), and either (a) Offeror is not awarded the Design-Build Contract; or (b) VDOT cancels the procurement or decides not to award the Design-Build Contract to any Offeror; and

WHEREAS, Offeror wishes to receive the payment offered by VDOT, in exchange for granting VDOT the rights set forth in this Agreement.

NOW, THEREFORE, in consideration of the mutual covenants and agreements set forth in this Agreement and other good and valuable consideration, the receipt and adequacy of which are acknowledged by the parties, the parties agree as follows:

1. **VDOT's Rights in Offeror's Intellectual Property**. Offeror hereby conveys to VDOT all rights, title and interest, free and clear of all liens, claims and encumbrances, in Offeror's Intellectual Property, which includes, without restriction or limitation, the right of VDOT, and anyone contracting with VDOT, to incorporate any ideas or information from Offeror's Intellectual Property into: (a) the Design-Build Contract and the Project; (b) any other contract awarded in reference to the Project; or (c) any subsequent procurement by VDOT. In receiving all rights, title and interest in Offeror's Intellectual Property, VDOT is deemed to own all intellectual property rights, copyrights, patents, trade secrets, trademarks, and service marks in Offeror's Intellectual Property, and Offeror agrees that it shall, at the request of VDOT, execute all papers and perform all other acts that may be necessary to ensure that VDOT's rights, title and interest in Offeror's Intellectual Property are protected. The rights conferred herein to VDOT include, without limitation, VDOT's ability to use Offeror's Intellectual Property without the obligation to notify or seek permission from Offeror.

2. **Exclusions from Offeror's Intellectual Property**. Notwithstanding Section 1 above, it is understood and agreed that Offeror's Intellectual Property is not intended to include, and Offeror does not convey any rights to, the Escrow Proposal Documents submitted by Offeror in accordance with the RFP.

3. **Proposal Payment**. VDOT agrees to pay Offeror the lump sum amount of Thirty~~Fifty~~ **Thousand and 00/100 Dollars ($350,000.00)** ("Proposal Payment"), which payment constitutes payment in full to Offeror for the conveyance of Offeror's Intellectual Property to VDOT in accordance with this Agreement. Payment of the Proposal Payment is conditioned upon: (a) Offeror's Proposal being, in the sole discretion of VDOT, responsive to the RFP; (b) Offeror complying with all other terms and conditions of this Agreement; and (c) either (i) Offeror is not awarded the Design-Build Contract, or (ii) VDOT cancels the procurement or decides not to award the Design-Build Contract to any Offeror.

4. **Payment Due Date**. Subject to the conditions set forth in this Agreement, VDOT will make payment of the Proposal Payment to the Offeror within forty-five (45) days after the later of: (a) notice from VDOT that it has awarded the Design-Build Contract to another Offeror; or (b) notice from VDOT that the procurement for the Project has been cancelled and that there will be no Contract Award.

5. **Effective Date of this Agreement**. The rights and obligations of VDOT and Offeror under this Agreement, including VDOT's ownership rights in Offeror's Intellectual Property, vests upon the date that Offeror's Proposal is submitted to VDOT. Notwithstanding the above, if Offeror's Proposal is determined by VDOT, in its sole discretion, to be nonresponsive to the RFP, then Offeror is deemed to have waived its right to obtain the Proposal Payment, and VDOT shall have no obligations under this Agreement.

6. Indemnity. Subject to the limitation contained below, Offeror shall, at its own expense, indemnify, protect and hold harmless VDOT and its agents, directors, officers, employees, representatives and contractors from all claims, costs, expenses, liabilities, demands, or suits at law or equity ("Claims") of, by or in favor of or awarded to any third party arising in whole or in part from: (a) the negligence or wilful misconduct of Offeror or any of its agents, officers, employees, representatives or subcontractors; or (b) breach of any of Offeror's obligations under this Agreement, including its representation and warranty under Section 8 hereof. This indemnity shall not apply with respect to any Claims caused by or resulting from the sole negligence or wilful misconduct of VDOT, or its agents, directors, officers, employees, representatives or contractors.

7. Assignment. Offeror shall not assign this Agreement, without VDOT's prior written consent, which consent may be given or withheld in VDOT's sole discretion. Any assignment of this Agreement without such consent shall be null and void.

8. Authority to Enter into this Agreement. By executing this Agreement, Offeror specifically represents and warrants that it has the authority to convey to VDOT all rights, title, and interest in Offeror's Intellectual Property, including, but not limited to, those any rights that might have been vested in team members, subcontractors, consultants or anyone else who may have contributed to the development of Offeror's Intellectual Property, free and clear of all liens, claims and encumbrances.

9. Miscellaneous.

a. Offeror and VDOT agree that Offeror, its team members, and their respective employees are not agents of VDOT as a result of this Agreement.

b. Any capitalized term used herein but not otherwise defined shall have the meanings set forth in the RFP.

c. This Agreement, together with the RFP, embodies the entire agreement of the parties with respect to the subject matter hereof. There are no promises, terms, conditions, or obligations other than those contained herein or in the RFP, and this Agreement shall supersede all previous communications, representations, or agreements, either verbal or written, between the parties hereto.

d. It is understood and agreed by the parties hereto that if any part, term, or provision of this Agreement is by the courts held to be illegal or in conflict with any law of the Commonwealth of Virginia, validity of the remaining portions or provisions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the Agreement did not contain the particular part, term, or provisions to be invalid.

e. This Agreement shall be governed by and construed in accordance with the laws of the Commonwealth of Virginia.

IN WITNESS WHEREOF, this Agreement has been executed and delivered as of the day and year first above written.

VIRGINIA DEPARTMENT OF TRANSPORTATION

By: _____

Name: _____

Title: _____

[Insert Offeror's Name]

By: _____

Name: MICHAEL FILIPCZAK

Title: PRESIDENT

4.2: OFFEROR'S QUALIFICATIONS

4.2.1: SOQ Information:

The Midasco team confirms that all information contained within our Statement of Qualifications (SOQ) remains true and accurate in accordance with Section 11.4.

4.2.2: Organizational Chart:

Attached to this section is the Midasco team's organization chart (*following page)*, which contains two small differences from the SOQ submittal. On the construction side of the chart within a non-critical position, Midasco has replaced Ron Wagner, our ITS/Electrical Assistant, with John Harty.

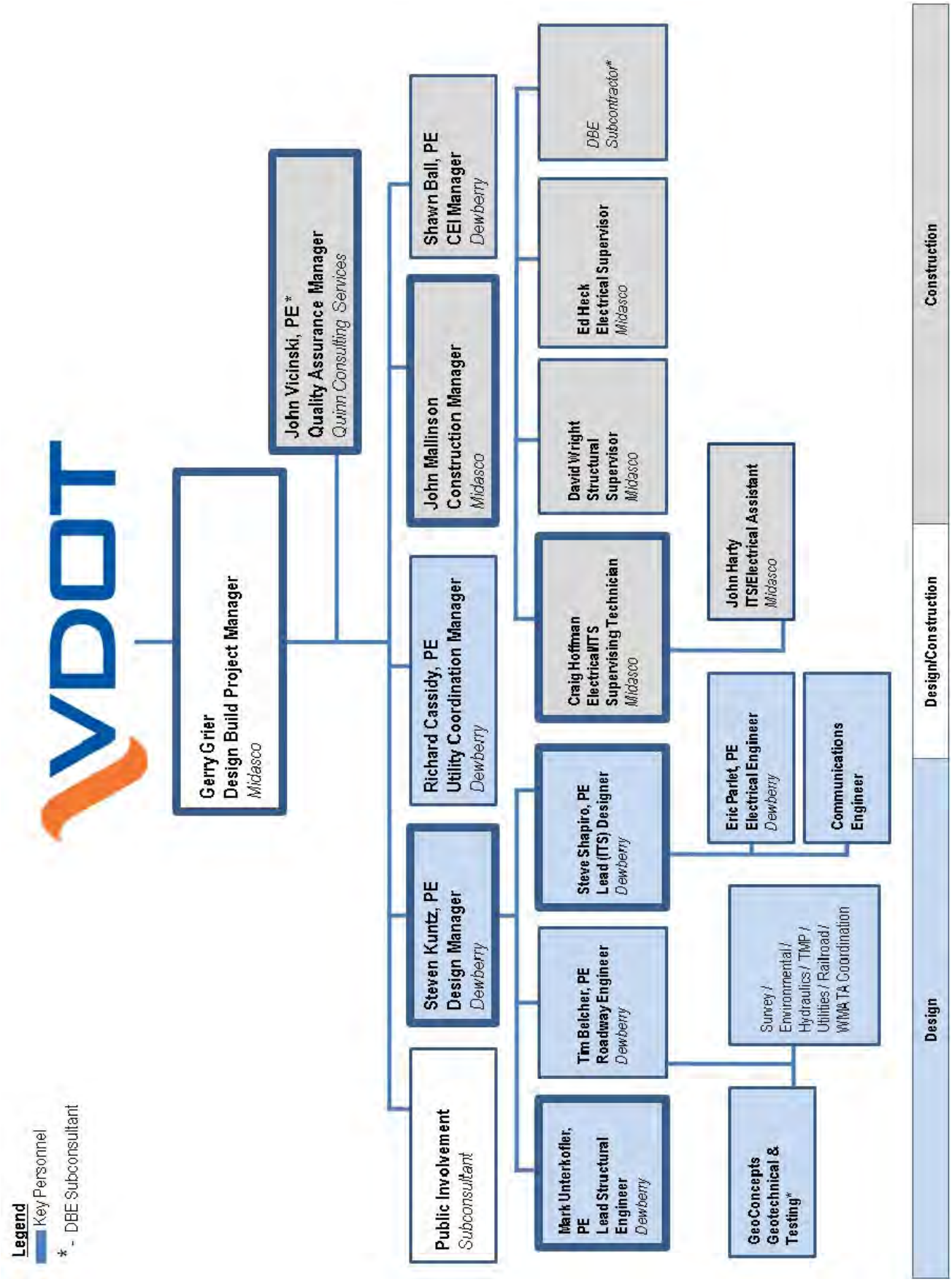
In addition to his in-depth of understanding of ITS networks, John has over 20 years experience working with VDOT on numerous ITS and communications projects, both during his time at Midasco and Dynalectric in Virginia. These include the Springfield Interchange Phase II project; the NOVA Traffic Signal Upgrade project that installed 170 controllers at more than 700 traffic signals; and his current work on the I-95/Telegraph Road project and the I-66 Third Lane Widening inside the Beltway. Through his work on these and other projects, John has gained an extensive understanding of the requirements and protocols throughout the Commonwealth. Because this position is not labeled as Key Personnel, his resume is not included in this submission.

We are also showing an additional high-level position; Richard Cassidy of Dewberry will serve as the Utility Coordination Manager, a role he served in on the SHA InterCounty Connector Contract C project. His efforts coordinating the relocation of multiple electric service companies on the $513M project aided the team's successful delivery of the project on time. Midasco and Dewberry know that installing new power drops and relocating utilities are long-lead time items that can pose major risks to the project schedule.

As expressed in the SOQ, the people listed below have achieved the following certifications:

- Construction Manager – John Mallinson (Midasco, LLC)
  - OSHA Electrical Safety – Arc Flash Protection Certification
  - OSHA Electrical Safety – Lockout/Tagout Certification
- Electrical/ITS Supervising Technician – Craig Hoffman (Midasco, LLC)
  - OSHA Electrical Safety – Arc Flash Protection Certification
  - OSHA Electrical Safety – Lockout/Tagout Certification

It is still anticipated that public involvement will be performed by a subconsultant. The selection of that subconsultant is on-hold pending discussions with VDOT about the specific needs for public involvement of this project. Both on other design-build and design-bid-build projects, our team members have offered nearly every aspect of public involvement services, and will provide as-needed support to VDOT and the public involvement subconsultant.


VDOT
Gerry Grier
Design Build Project Manager
Midasco
John Vicinski, PE *
Quality Assurance Manager
Quinn Consulting Services
Shawn Ball, PE
CEI Manager
Dewberry
John Mallinson
Construction Manager
Midasco
Richard Cassidy, PE
Utility Coordination Manager
Dewberry
Steven Kuntz, PE
Design Manager
Dewberry
Public Involvement
Subconsultant
Mark Unterkofler, PE
Lead Structural Engineer
Dewberry
Tim Belcher, PE
Roadway Engineer
Dewberry
Steve Shapiro, PE
Lead (ITS) Designer
Dewberry
Craig Hoffman
ElectricalITS
Supervising Technician
Midasco
David Wright
Structural
Supervisor
Midasco
Ed Heck
Electrical Supervisor
Midasco
DBE
Subcontractor*
John Harty
ITS/Electrical Assistant
Midasco
Eric Parlet, PE
Electrical Engineer
Dewberry
Communications
Engineer
GeoConcepts
Geotechnical &
Testing*
Survey /
Environmental /
Hydraulics / TMP /
Utilities / Railroad /
WMATA Coordination
Legend
Key Personnel
* - DBE Subconsultant
Design
Design/Construction
Construction

4.3: DESIGN CONCEPT

For ease of design and construction, we've divided the 34-mile section of Interstate 66 into four segments to take into account many factors, including historic traffic volumes, allowable right-of-way, ease of construction and design, installation of ITS components, possible ramp and lane closures, permitting and plan review process, and concurrent projects. Starting at the west and moving east, the segments are broken down in the following table and graphically represented in **Figure 4.3-1** (*below*):

Segment	Description	Miles
A	Rt. 15 to Route 50	16.6
B	Rt. 50 to Blake Lane	3.5
C	Blake Lane to Westmoreland Street	6.9
D	Westmoreland Street to DC Line / Potomac River	7.0

We believe that segmenting also allows for independent reviews and early openings of portions of the project. In Segment C, which incorporates the entire WMATA section required to submit for review, and many of the ATMS elements – both the design and construction will be complex. In recognition of these complexities and the review requirements, we have isolated the design activities and construction work in this Segment. This approach limits these complexities and reviews to the smallest area possible, allowing us to work on the larger areas of the project.

Design Approach – The overall approach to the final design of the project will follow the procedures that Our Team has used successfully on multiple design-build projects, where it was also critically important that the owner was an integral part of the design effort. ***The Midasco Team views VDOT as a partner on this project and we welcome their input in the design process.***

The starting point for design of the final improvements will be based on the 30% design documents and specifications which accompanied the RFP (the "basic Design Concept"). The road and sign construction aspects of the ATM project, and the construction of other features that are not affected by the design of the ATM system's ITS field equipment will immediately be developed to a 90% complete status, and will be submitted for formal review and comment. The 90% Submission will include the detailed design of the roadway related features, structures, auxiliary power systems, as well as the ITS elements of the ATM system, and the communications networks (conduit, fiber, cabinets, etc.) that will link the new field elements with the existing communications system.

The first milestone in our design of the

Figure 4.3-1: Map of the Project

ATM's ITS Field Equipment will be a Definitive Design, which will determine the locations of the devices. The development of this Definitive Design will be based on ATM Design Meetings incorporating input from the Contractor and the Client, as well as relevant input from key equipment and system vendors. These ATM Design Meetings will be held on a weekly or bi-weekly basis to identify the challenges and critical aspects associated with the design and identify solutions and details which will allow for proper installation, operation, and coordination between elements once constructed and installed. We anticipate that the first significant coordination effort will be in identifying the exact placement of the new structures for the Dynamic Message Signs, and Lane Control Signal Gantries, as well as other sign support structures. Following this, we will identify the desired/required locations for the Shoulder Lane Monitoring Cameras, which will consider and incorporate input from our Shoulder Lane Monitoring Software Provider. The locations of the other ITS elements of the ATM system will be finalized following location of these devices and equipment. The culmination of the Definitive Design process will be a formal submission to VDOT for review and comment.

This Definitive Design document will be the basis for survey, stakeouts, test bores and other general pre-construction tasks, as well as the identification of locations where additional power drops and upgrades to the existing electrical service will be required.

Following submission of the definitive design submission, The ATM Design Meetings will continue during the development of the 90% submission to quickly resolve any issues that are identified during this stage of the design.

Following submission of each package, comments will be incorporated or addressed as needed prior to submission of the subsequent 100% Plan Packages. Individual submissions will be made at the 90% and 100% submissions for each of the Segments, as well as the ITS Field Element packages. All formal submissions will be transmitted for review in both hard copy and electronic format.

Upon submission of the 100% plans and final comment response documents, we will work with VDOT to ensure all comments are closed, allowing for the plans to be released for construction. All released for construction plans will be marked clearly in red ink as "RELEASED FOR CONSTRUCTION" so that no confusion arises regarding which documents are the approved plans intended for construction. This process is identical to that which our team has used successfully on multiple design build projects with great success.

A description of the design work in each segment follows.

4.3.1 (a) Conceptual Project Layout - ITS Device Layout Table and Narrative

Segment A: Route 15 to Route 50 MM 42.8 – 57.7 (Sheets 4 – 61)

Segment A includes almost all of the project systems and features: two new CCTV cameras; 14 MVD units; a one line DMS; Lane Control Signal Gantries; four staging areas; one Auxiliary Power site; installation of new signs; and removal of old ones. A summary of the ITS device locations, direction, spacing and other important characteristics is shown in **Table 4.3A - Summary of ITS Equipment** on the following fold-out page.

After Table 4.3A, we further explore pertinent aspects of the ITS-related systems and features of the work to be completed.

Table 4.3A - Conceptual Project Layout and Summary of ITS Equipment **SECTION A Sheets 4 THRU 61**

Sheet #	Mile Marker		Notes	CCTV			Microwave Video Detection					Direct Messaging/Variable Messaging Signs					Lane Control Signals (LCS)					Notes
								East Bound		West Bound			East Bound		DMS WB			East Bound		West Bound		
	Start	End		ID	Location	Spacing ↓	ID	Location	Spacing ↓	Location	Spacing ↑	ID	Location	Spacing ↓	Location	Spacing ↑	ID	Location	Spacing	Location	Spacing ↑	
5	42.95	43.20	No ITS Work	*No numb.*	***43.10***																	
7	43.46	43.72	No ITS Work	*No numb.*	***43.55***	*0.45*																
8	43.72	43.96	No ITS Work				*No numb.(2)*	*43.9*	*0*	*43.9*	*3.92*											
9	43.96	44.22	No ITS Work	*No numb.*	***44.17***	*0.62*																
12	44.73	44.99	No ITS Work	*No numb.*	***44.85***	*0.68*																
14	45.25	45.50	No ITS Work	*No numb.*	***45.45***	*0.60*																
15	45.50	45.80	No ITS Work	*No numb.*	***45.70***	*0.25*																
18	45.25	46.41	No ITS Work	*No numb.*	***46.30***	*0.60*																
19	46.41	46.70										*No numb.*	*46.61*									
21	47.00	47.31	Stag'g Area	*CCTV-450(2)*	*47.25*	*0.95*																
24	47.82	48.08		*CCTV-020*	*47.88*	*0.63*	**MVD001**	**47.82**	**3.92**	**47.82**	**0.46**											
25	48.08	48.34	No ITS Work				*No numb.*			*48.28*	*4.33*	*020 / 690*	*48.09*	*1.48*	*48.27*	0.20						
26	48.34	48.60	No ITS Work									*VMS-680*			*48.47*	1.53						
27	48.60	48.87	No ITS Work	*CCTV-030*	*48.79*	*0.91*																
29	49.12	49.39		**CCTV-001**	**49.22**	0.43	*No numb.*	*49.18*	*1.36*			*VMS-030*	*49.20*	*1.11*								
30	49.39	49.64	No ITS Work				*No numb.*	*49.62*	*0.44*													
32	49.92	50.17	No ITS Work	*CCTV-0040*	*50.13*	*0.91*	*No numb.*	*50.12*	*0.50*			*VMS-670*			*50.00*	4.62						
33	50.17	50.42	No ITS Work									*VMS-040*	*50.32*	*1.12*								
34	50.42	50.69					*No numb.*	*50.59*	*0.47*													
35	50.69	50.95	No ITS Work	*CCTV-0050*	*50.81*	*0.68*																
36	50.95	50.21	No ITS Work									*VMS-050*	*51.03*	*0.71*								
38	51.47	51.73		**CCTV-002**	**51.48**	**0.67**	*No numb.*	*51.49*	*0.90*													
40	52.00	52.27	No ITS Work	*CCTV-440*	*52.16*	*0.68*																
41	52.27	52.50		*CCTV-060*	*52.34*	*0.18*	*No numb.*	*52.34*	*0.85*								G-001	**52.47**				Type 1 Gantry
42	**52.50**	**52.77**					**MVD002**	**52.61**	**0.27**	**52.61**	**0.36**	*VMS-060*	*52.60*	*1.57*			G-002			**52.61**	0.45	Type 1 Gantry
43	52.77	53.01		*CCTV-070*	*52.96*	*0.62*	**MVD003**	**52.97**	**0.36**	**52.97**	**0.32**						G-003	**52.97**	0.5			Type 1 Gantry
44	53.01	53.26		*CCTV-430*	*53.11*	*0.15*											G-004			**53.06**	0.64	Type 1 Gantry
45	53.26	53.52					**MVD004**	**53.29**	**0.32**	**53.29**	**0.29**											
46	53.52	53.80					**MVD005**	**53.58**	**0.29**	**53.58**	**0.30**						G-005	**53.70**	**0.73**	**53.70**	0.49	Type 2C Gantry, EGR
47	53.80	54.06		*CCTV-420*	*53.88*	*0.77*	*No numb.(2)*	*53.88*	*0.30*	*53.88*	*0.27*											
48	54.06	54.34		*CCTV-415*	*54.15*	*0.27*	**MVD006**	**54.15**	**0.27**	**54.15**	0.60						007/006	**54.23**	0.53	**54.19**	0.66	2 Type 1 Gantries, Remove VMS
49	54.34	54.64	No ITS Work									*080/640,340*	*54.62*	*2.02*	*54.62*	*0.68*						
50	54.64	54.90		*CCTV-410*	*54.87*	*0.72*	*No numb.*	*54.75*	*0.60*	*54.75*	*0.39*						G-008	**54.85**	0.62	**54.85**	0.63	Type 2C Gantry, EGR2
51	54.90	55.14					**MVD007**	**55.14**	**0.39**	**55.14**	**0.34**											
52	55.14	55.40	No ITS Work									*VMS-620*			*55.30*	0.52						
53	55.40	55.67		*CCTV-100*	*55.55*	*0.68*	**MVD008**	**55.48**	**0.34**	**55.48**	**0.34**						G-009	**55.48**	0.63	**55.48**	0.49	Type 2C Gantry, EGR
54	55.67	55.92					**MVD009**	**55.82**	**0.34**	**55.82**	**0.68**	*VMS-610*			55.82	1.00						
55	55.92	56.15		*CCTV-110*	*55.93*	*0.38*	*No numb.*	*56.12*	*0.30*								G-010	**55.97**	0.49	**55.97**	0.53	Type 2C Gantry, EGR
57	56.42	56.69		*CCTV-390*	*56.49*	*0.56*	**MVD010**	**56.50**	**0.38**	**56.50**	**0.32**	*090,* **120**	**56.63**	2.01			G-011	**56.50**	0.53	**56.50**	0.46	Type 2C Gantry, NGR, Relocate VMS-120 from MM 57.06
58	56.69	56.94					**MVD011**	**56.82**	**0.32**	**56.82**	**0.35**	*600,* **590**			**56.82**	0.7						VMS-590 is a one line VMS
59	56.94	57.19		*CCTV-120*	*56.99*	*0.50*	**013, 012**	**57.17**	**0.35**	**57.17**	**0.23**						014/013	**57.05**	0.55	**56.96**	0.80	Type 1 Gantry, Remove VMS 110 & 120
60	57.19	57.43					**MVD014**	**57.40**	**0.23**	**57.40**	**0.33**											
61	57.43	57.66		*CCTV-130*	*57.60*	*0.61*						***VMS-580***			*57.52*		G-015	**57.54**	0.49			Type 1 Gantry
									next WB at 57.73										Prior WB at 57.76			
				Avg Spacing		**0.58**	Avg East of 29 Centerv		0.34		0.37	***Avg Spacing***		**1.43**		**1.32**	***Avg Spacing***		**0.56**		**0.57**	

Notes:

Existing Equipment and descriptive parameters

Sheets with No ITS Work and no field equipment have been omitted

Mile marker of existing equipment is approximate

Type 2C Gantry is a Type 2 Gantry with a supporting column in the median

EGR indicates Existing Guardrail on one side of median

EGR2 indicates Existing Guardrail on both sides of median

NGR indicates No Guardrail in median

Closed Caption TV (CCTV) The new CCTV units are being installed to reduce the long distance between existing CCTV units. CCTV-001 at MM 49.22 is in a coverage gap that is 1.33 miles long, and the CCTV at MM 51.48 fills a 1.35 mile long coverage gap. The remaining gap of 0.9 miles between CCTV-001 and CCTV-040 at MM 50.13 could be reduced without sacrificing coverage by shifting CCTV-001 to the east.

Microwave Vehicle Detectors (MVD) All but one of the new MVDs in Segment A is installed east of Route 29 interchange in Centreville. The spacing of the combined system of existing and new MVD units between Centreville and Route 50 is approximately 0.4 mile. The spacing is slightly larger in the westbound direction than the eastbound direction.

Dynamic Message Signs (DMS) A one line DMS will be installed on an existing westbound sign gantry at MM 56.82 to supplement the HOV information and Stringfellow Road exit ramp information. This one-line DMS and the other one-line DMS in Segment B will be provided by Daktronics.

Lane Control Signals and Gantry Assemblies There are a series of 14 new Gantry structures supporting Lane Control Signals and Small DMS (SDMS) units. Five of these Gantries are Type 2 or 2A units that span the entire width of the eastbound and westbound roadways. We will fully investigate the possibility of providing a center column(s) in the median for these Type 2/2A gantries to facilitate their design and construction. Guardrails will be provided as needed for all support columns. Dewberry, the design firm for the team, has designed many structures in this segment of I-66, and has previously received approval for structures with columns in the median by placing these columns along the median shoulder, so as to not preclude the expansion of Metrorail within the median. The average spacing for the lane control signals on these gantries is 0.56 miles in the eastbound direction and 0.54 miles westbound.

Staging Area Monitoring As required in the Part 2 – Technical Information and Requirements, we will also install a shoulder lane monitoring camera and detection electronics for the four Segment A staging areas.

Communications and Power for ITS Field Equipment Almost all of the new ITS field equipment is located at or near existing ITS field equipment. Wherever possible communications for the new field equipment will take advantage of the existing cabinets and splice points. We anticipate the new field equipment will be attached to new communications "rings" formed by new conduit fiber-optic cables and level 2 switches for these devices. Each ring will terminate at a level 2 switch/ring master, which will interface with the level 3 switch at MM 57.5. (The switch in this cabinet is identified as Node 2 - I66/Rte 123 even though it's west of Route 50).

Power service will also make use of service drops for existing field equipment, which is in close proximity to almost all new equipment in this segment. Wherever needed, existing VDOT owned services will be modified by adding properly rated service equipment to the existing racks. We will accomplish this by adding a wire through to the metered side of the service, and installing new appropriately sized conduits and cables to the new and existing service equipment. All taps will be made in the wire by using NEC approved devices. Prior to any modifications being made, load tests will be performed to determine the available spare capacity of the existing service. Ground resistance tests will be performed and if necessary ground rods

will be added to bring the service into compliance with VDOT and NEC standards.

Other Work in this Segment includes the four staging areas and a new Auxiliary Power at MM 50.43 about 800′ west of Compton Road. There are also three new sign structures to be installed, and 12 signs to be removed (six ground-mounted, one overhead span, two cantilever-mounted, and three bridge- mounted).

Segment B: Route 50 to Blake Lane MM 57.7 – 61.74 (Sheets 62 – 77)

The western end of Segment B was selected to coincide with the beginning of the eastbound shoulder lane; thus, it has several systems and field elements absent from Segment A, including the continuous shoulder lane monitoring, and the Type 3/3A Lane Control Signals (LCS) over the shoulder lane. These field elements are complemented by other field equipment that was also installed in Segment A. A summary of the locations, spacing, and other characteristics of the ATM field equipment to be installed is summarized in **Table 4.3B – Section B Summary of ITS Equipment**.

CCTV Only one new CCTV unit is being installed in this segment. The existing CCTV units in this segment have a spacing of less than 0.6 mile. The new camera will reduce to less than 0.4 mile the coverage gap between the camera on the east side of the Blake Lane overpass and the camera at MM 60.89. The largest coverage gap in this segment is between CCTV-370 at MM 58.60 and CCTV-150 at MM 59.68. We will identify opportunities for more CCTV coverage in this area during the detailed design phase of the project.

Shoulder Lane Monitoring Cameras We will install a series of cameras and associated electronic equipment to monitor shoulder lanes, generally positioned to correspond with the locations shown on Sheet 2D (1) of the Plans in Addendum 1; additional cameras may, however, be needed for continuous coverage of shoulder lanes under the overpasses and pedestrian bridges above I-66.

Each direction will have its own group of cameras. Normally, two cameras will be mounted on poles approximately 1,500’ apart, and the view will be optimized with the cameras facing in the same direction in providing an overlapping view. Our conversations with vendors have indicated that one camera will see incidents from 400’ to 1,000’ away from the pole, and the second will see from 900’ to 2,000’. The area from the base of the pole to the 400’ mark will be viewed by a camera on the pole immediately upstream of this camera pole. This coverage pattern is illustrated in **Figure 4.3-2: Typical Coverage Areas of Shoulder Lane Monitoring Lane Cameras.**

Figure 4.3-2: Typical Coverage Areas of Shoulder Lane Monitoring Lane Cameras

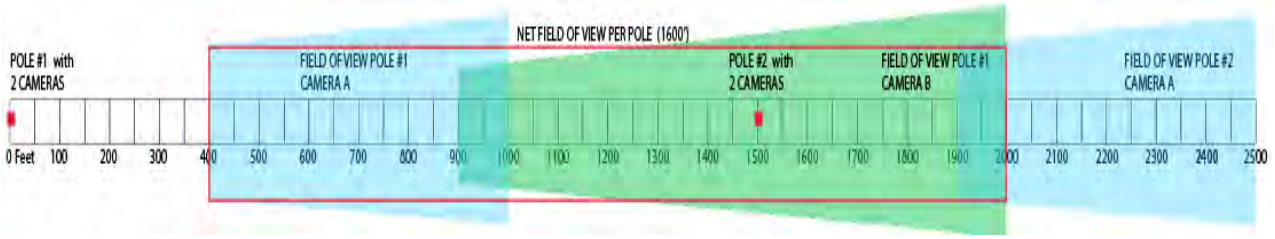


TABLE 4.3B - Conceptual Project Layout and Summary of ITS Equipment SECTION B Sheets 61-77 *Existing*

Sheet #	Mile Marker		Notes	CCTV			Microwave Video Detection				Direct Messaging/Variable Messaging Signs					Lane Control Signals						FXCCTV						Misc. Notes
							East Bound		West Bound			East Bound		West Bound			East Bound			West Bound			East Bound			West Bound		
	Start	End		ID	Location	Spacing ↓	ID	Location	Spacing ↓	Location	Spacing ↑	ID	Location	Spacing ↓	Location	Spacing ↑	ID		Gap ↓			Gap ↑	ID	Location	Spacing ↓		Location	Spacing ↑	
			No Work																										
61	*57.43*	*57.66*	*Sect. A*	*CCTV-130*	*57.60*		MVD014	57.40				Prior VMS	**56.63**					57.54											
62	57.66	57.95					MVD015	**57.73**	**0.33**	**57.73**	**0.73**	*VMS-014*	*57.72*	1.09						**G-17T1**	**57.76**	**0.55**	**FCCTV001**	**57.73**					**Aux Power 1**
63	57.95	58.20		*CCTV-380*	*58.03*	*0.43*						*VMS-570*			*57.99*	0.49	**C-1 T3**	**57.97**	**0.43**				**002 & 03**	**57.98**	**0.13**				
63	57.95	58.20																					**004 & 05**	**58.19**	**0.11**				
64	58.20	58.45					*No numb.*	*58.2*	*0.47*								**G-18 T2**	**58.31**	**0.34**	**G-18 T2**	**58.31**	**0.44**	**006 & 07**	**58.41**	**0.11**				
65	58.45	58.71		*CCTV-370*	*58.6*	*0.57*	*No numb./*PR*	*58.52*	0.32	*58.46*	*0.49*	**DMS-G19**			**58.48**	0.57	**G-20 T1**	**58.57**	**0.26**				**008 & 09**	**58.65**	**0.12**				DMS-1
66	58.71	58.96					*PR/No #*	*58.95*	0.43	*58.95*	*0.9*						**C-2 T3**	**58.85**	**0.28**	**G-21 T1**	**58.75**	**0.69**	**010 & 11**	**58.86**	**0.11**				
67	58.96	59.21										*160/550*	*59.05*	*1.33*	*59.05*		**G-23 T1**	**59.21**	**0.36**				**012 & 13**	**59.12**	**0.13**				
68	59.12	59.47					*PR3	*59.34*	*0.39*								**G-24 T3A**	**59.34**	**0.13**	**G-25 T1**	**59.44**	**0.24**	**014, 15 &16**	**59.35**	**0.12**	**017&18**	**59.44**	**0.12**	FCCTV-1
69	59.40	59.72		*CCTV-150*	*59.68*	*1.08*														**C-3 T3**	**59.68**	**0.32**	**019& 20**	**59.54**	**0.09**	**021 & 22**	**59.67**	**0.12**	
70	59.72	59.97					*PR/*PR	*59.83*	*0.49*	*59.85*							**G-26 T1**	**59.90**	**0.56**				**023 & 24**	**59.78**	**0.12**	**025 & 26**	**59.91**	**0.05**	
71	59.97	60.23		*CCTV-160*	*60.11*	*0.43*	*PR*	*60.19*	0.36								**C-4 T3**	**60.23**	**0.33**	**G-27 T1**	**60.00**	**0.41**	**028 & 29**	**60.04**	**0.13**	**FCCTV027**	**60.00**	**0.18**	FCCTV-2
71	59.97	60.23																					**032 & 33**	**60.22**	**0.09**	**030 &31**	**60.18**	**0.12**	
72	60.23	60.48					*No numb.*	*60.33*	*0.14*											**C-5 T3**	**60.41**	**0.47**	**034 & 35**	**60.35**	**0.07**	**036 &37**	**60.42**	**0.10**	
73	60.48	60.73															**G-28 T1**	**60.60**	**0.37**				**038 & 39**	**60.61**	**0.13**	**040 & 41**	**60.62**	**0.13**	
74	60.73	60.99		*CCTV-170*	*60.88*	*0.77*	*No numb.*	*60.98*	*0.65*			*VMS-180*	*60.90*	***1.85***			**C-6 T3**	**60.96**	**0.36**	**G-29 T1**	**60.88**	**0.39**	**042 & 43**	**60.86**	**0.13**	**044 & 45**	**60.88**	**0.13**	
75	60.99	61.24															**G-31 T1**	**61.11**	**0.15**				**046 & 47**	**61.11**	**0.13**	**048 & 49**	**61.15**	**0.12**	
76	61.24	61.49		**CCTV-003**	**61.27**	**0.39**	*No numb.*	*61.38*	*0.4*								**C-7 T3**	**61.37**	**0.26**	**G-32 T1**	**61.27**	**0.44**	**050 & 51**	**61.36**	**0.13**	**052 & 53**	**61.38**	**0.10**	
77	61.49	61.74		*CCTV-180*	*61.58*	**0.31**											**G033T1**	**61.53**	**0.16**	**G-34 T1**	**61.71**	**0.19**	**054, 55 & 56**	**61.54**	**0.09**	**057 & 58**	**61.58**	**0.13**	FCCTV-3
77	61.49	61.74																			**61.90**		059 & 60	61.74	0.10				
																											(61.84)		
					Avg Spacing	0.57		***Avg Spacing***	0.40	See Note MVD1								***Avg Spacing***	**0.31**			**0.41**		***Avg Spacing***	**0.11**			**0.12**		
						0.66																							

Notes

Duplicate numbering of sheets 63, 71 and 77 is required because of multiple Fixed CCTV Locations.

MVD1 - It is not known if existing Eastbound MVD cover westbound lanes. Average WB Spacing is undetermined.

DMS-1 Sheet 65 - One line DMS

Aux Power 1 - Sheet 62 - Install Auxillary Power MM 57.93 EB

FCCTV-1 FCCTV016 provides coverage of the westbound shoulder at the Jermantown Road underpass

FCCTV-2 FCCTV027 provides coverage of the westbound shoulder under the westbound to southbound ramp at the Route 123 interchange

FCCTV-3 FCCTV-056 provides coverage of the eastbound shoulder lane under the Blake lane underpass

Based on the data on Sheet 2D (1), there will be 60 cameras in this segment, 39 eastbound and 21 westbound. Where two or more cameras are mounted on a pole we have decided to equip one of them with full pan, tilt, and zoom (PTZ) capability. Although each PTZ camera is slightly more expensive than an equivalent camera without this functionality, the cameras are being procured with PTZ to reduce the time needed for lane closures and the use of a bucket truck to perform the initial positioning and fine tuning of the view from each camera and the overlap of sequential cameras. The team knows that PTZ functionality is not required for the operation of the Shoulder Lane Monitoring System, and will convey the system to VDOT with these functions disabled, if desired. But because the PTZ cameras can save the shoulder lane monitoring PTZ positioning as a "preset," VDOT would receive six benefits:

- monitoring the entire roadway, when the highest operational priority is not the monitoring of the shoulder lane;
- close-up views of detected incidents, to identify the type of incident and the rapid mobilization of the required response units;
- temporary re-optimization of the PTZ shoulder lane camera views in the event of a failure of a fixed-position camera;
- verifying the display of proper information on the LCS, SDMS, DMS;
- verifying the data collected by the MVDs; and
- enabling collection of detailed data for future VDOT and FHWA research projects.

Cameras will be mounted on new 50' poles and existing poles as required to maximize the camera coverage. Cameras will be mounted at 50' unless a lower height is needed for a better view beneath the overpasses and pedestrian bridges.

Design constraints in this segment include the heavy tree growth and the segments of the sound walls that are often placed next to the shoulder lane. The tree growth and these wall sections occasionally obscure the view of any camera installed next to the shoulder lane in these areas. To optimize each camera's field of view, we will find ways to mount the affected cameras directly over the shoulder lane on new and existing structures where required.

Shoulder Lane Monitoring Detection Software We will provide the shoulder lane monitoring system with detection software that meets the functional requirements of the special provisions and do not require that the images from the cameras be transmitted back to the MPSTOC for analysis. Additional information on this software is provided in Proposal Section 4.3.1 (d).

Microwave Vehicle Detectors One more MVD to monitor both the eastbound and westbound roadways will be installed at the western end of the segment and added to the 12 MVDs already there, nine of which monitor the eastbound roadway. The average gap between the eastbound detectors is about 0.4 miles. The average gap between the westbound detectors appears to be much greater, if the existing eastbound detectors can't capture data for the westbound lanes.

Dynamic Message Signs Similar to the installation in Segment A, a one-line DMS, provided by Daktronics, will be installed on an existing westbound sign gantry at MM 58.48 to supplement the HOV information and Monument Drive exit ramp information.

Lane Control Signals and Gantry Assemblies A series of 14 new gantry structures support lane control signals and SDMS units. One is a Type 2 unit that spans the width of the eastbound and

westbound roadway at MM 58.31. Existing records/plans show that the shoulder is wider than normal in this area (17′ according to one set of plans), and we will fully investigate the possibility of putting a center column support in the median for this Type 2 Gantry. There are also 13 LCS and SDMS Gantries that span the eastbound or westbound roadway, and a series of eight LCS units for stand-alone mounting above the shoulder lane (seven on new structures and one on an existing structure). The average spacing for the lane control signals on the eastbound gantries is 0.31 miles; westbound it's 0.41 miles, and 0.35 miles where there's a shoulder lane. .

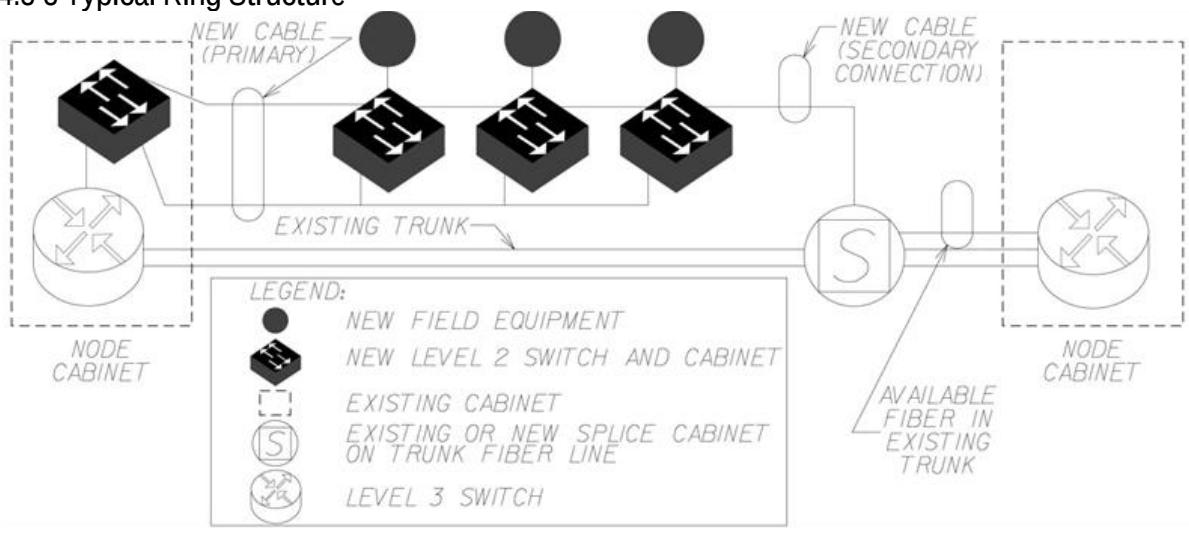
Communications and Power for ITS Field Equipment Because of the number of field elements in this segment, we anticipate installing new conduits and fiber-optic cables to support the new communication rings that will be established for devices along the eastbound and westbound roadways. These rings may make use of existing spare fibers, if available, from the western-most device to the Level 2 switch/ring masters that will interface with the Level 3 switch identified as Node 2 – I66/Rte 123 located at MM 57.5.

A figure illustrating how a typical ring would make use of new fibers and spare fibers is shown in **Figure 4.3-3 Typical Ring Structure.**

Power service will make use of service drops for existing field equipment, which is in close proximity to almost all new equipment in this segment. As previously indicated, wherever needed, existing VDOT owned services will be modified by adding service equipment to the existing racks. We will accomplish this by adding a wire trough to the metered side of the service, and installing new conduits and cables to the new and existing service equipment. Prior to any modifications being made, load tests will be performed to determine the available spare capacity of the existing service. Necessary improvements will be made to bring the service into compliance with VDOT and NEC standards.

Other Work in this Segment includes a new Auxiliary Power unit at MM 57.93 about 250′ west of the eastbound Route 50 overpass. There are also 12 new sign structures to be installed: 4 overhead spans, 1 cantilever, 7 for ground mounted signs; and 17 to be removed—1 overhead span, 1 ground-mount and 5 bridge-mounted sign structures, plus 10 lane control signals.

4.3-3 Typical Ring Structure



Segment C: Blake Lane to Westmoreland Exit Ramp MM 61.74 – 68.51 (Sheets 78 – 104)

The Midasco team chose the limits of Segment C to include all work that would require WMATA coordination and permits. The WMATA facilities in this segment include the rail lines in the median, the Vienna, Dunn Loring, and West Falls Church Stations, the WMATA Rail Yard, and the flyovers from the median to the new "Silver Line" in the Dulles Toll Road Connector median. (WMATA is also present in portions of Segment D, but the work in Segment D won't require their permits.) This segment also includes the I-66 Interchanges with I-495 and I-495 HOT Lanes, and the Dulles Toll Road Connector. Segment C includes the eastern portion of the shoulder lane monitoring area, and all of the equipment and systems in Segment B. Segment C also includes one ramp metering location. A summary of the locations, spacing, and other characteristics of the ATM field equipment that will be installed is summarized in **Table 4.3C** on the following page. We discuss below how these field elements relate to special features and considerations in this section.

CCTV Six new CCTV units are being installed in this segment. Although WMATA has tracks in the center, these cameras generally give a qualitative view of traffic movements in both directions. The access tunnels to the WMATA rail yard in the median near the West Falls Church Metro Station result in an extremely wide median, which reduces the ability of cameras mounted on one side of the roadway to see traffic on the other side. To compensate for this, the CCTV here will be mounted on an 80′ pole (with a lowering system) to facilitate its view of both eastbound and westbound traffic. We also recommend that CCTV-008 and CCTV-009 also be mounted on 80' poles with lowering systems to provide enhanced views of the westbound roadway.

ary of ITS Equipment SECTION C Sheets 78 THRU 104 *Existing*

Sheet #	Mile Marker		CCTV				Microwave Videow Detection					Full Size DMS					Lane Control Signals						FXCCTV						Notes
								East Bound		West Bound			East Bound		West Bound			East Bound			West Bound			East Bound			West Bound		
	Start	End	ID	Location	Dir	Spacing ↓	ID	Location	Spacing ↓	Location	Spacing ↑	ID	Location	Spacing ↓	Location	Spacing ↓	ID	Location	Spacing ↓		Location	Spacing ↑	ID	Location	Spacing ↓		Location	Spacing ↑	
77			*CCTV-180*	*61.58*								*VMS-180*	*60.90*	Miles		Miles	G-33 T1	61.53					FCCTV#			FCCTV#			
78	61.74	62.00						*61.78*		*61.84*	*0.25*						C-8 T3	**61.87**	**0.34**	C-9 T3	61.89	0.26	063 & 64	61.95		061 &62	61.85	0.09	
78D								*61.95*	*0.17*																				
79	62.00	62.25	*CCTV-360*	*62.08*	WB	0.50	*/*PR*	*62.02*	*0.07*	*62.09*	*0.51*						G-35 T2	62.15	0.28	G-35 T2	62.15	0.24	068 & 69	62.15	0.10	065 - 67	62.03	0.18	FCCTV-1
80	62.25	62.50	**CCTV-004**	**62.45**	EB	0.87											C-10 T3	**62.29**	**0.14**	C-11 T3	62.39	0.23	072 - 74	62.41	0.13	070 & 71	62.39	0.07	FCCTV-2
81	62.50	62.76					*PR	*62.59*	*0.57*	*62.6*	*0.58*						G-36 T2	62.62	0.33	G-36 T2	62.62	0.24	077 & 78	62.61	0.10	075 & 76	62.52	0.10	
																										079 & 80	62.73	0.12	
82	62.76	63.01	*CCTV-200*	*62.86*	EB	0.41		*63.15*	*0.56*	*63.18*	*0.5*						C-13 T3	**62.86**	**0.24**	C-12 T3	62.86	0.27	081 & 82	62.88	0.14	083 & 84	62.97	0.12	
83	63.01	63.26															G-37 T2	63.13	**0.27**	G-37 T2	63.13	0.28	085 & 86	63.13	0.13	087 & 88	63.21	0.13	FCCTV-3
84	63.26	63.54															G-38 T2B	63.41	**0.28**	G-38 T2B	63.41	0.42	089 & 90	63.4	0.13	091 & 92	63.46	0.11	
85	63.54	63.79	*CCTV-210*	*63.60*	EB	0.74		*63.68*	*0.53*	*63.68*	*0.54*						C-14 T3	**63.65**	**0.24**	MISSING Type 3 LCS			093 - 95	63.57	0.09	096 & 97	63.69	0.07	LCS-1
86	63.79	64.01															G-39 T2A	63.83	**0.18**	G-39 T2A	63.83	0.67	FCCTV10(	63.83	0.13	098 & 99	63.83	0.09	
86D																										FCCTV10	64.00		
87	64.01	64.29	*CCTV-220*	*64.18*	EB	0.58		*64.19*	*0.51*	*64.22*	*0.53*																		
88	64.29	64.55															G-40 T2	64.50	0.67	G-40 T2	64.5								
89	64.55	64.87								*64.75*	*1.34*																		
90	64.87	65.12	*CCTV-230*	*64.95*	EB	0.77																							
91	65.12	65.36																											
92	65.36	65.61																											
93	65.61	65.85	**CCTV-005**	**65.74**	EB	0.79																							
94	65.85	66.10	**CCTV-006**	**65.99**	WB	0.25				*66.09*	*0.70*																		
95	66.10	66.35										DMS-001			66.16	6.17													
96	66.35	66.60						*66.37*	*2.18*			DMS-002	*66.38*	*5.48*															DMS-1
97	66.60	66.84	*CCTV-350*	*66.80*	WB	0.81	**MVD-016**	**66.75**	*0.38*	*66.79*	*3.17*																		
							RMD-01&19																						
98	66.84	67.07					**RMD-02**	**66.910**																					
99	67.07	67.30	**CCTV-007**	**67.21**	Med	0.41	**RMD-03**	**67.100**																					CCTV-1
100	67.30	67.53					**MVD-017**	**67.39**	0.64																				
101	67.53	67.77					**MVD-018**	**67.74**	*0.35*																				
102	67.77	68.02	**CCTV-008**	**67.80**	EB	0.59						DMS-003	67.98	1.6															
103	68.02	68.26					**MVD-019**	**68.22**	0.48																				
104	68.26	68.51	**CCTV-009**	**68.33**	EB	0.53																							
										Prior 69.96				Prior 72.33															
				Avg Spacing		**0.60**		***Avg Spacing***	0.59		0.90							***Avg Spacing***	0.29			0.34		***Avg Spacing***	0.12			0.11		

NOTES

CCTV-1 Sheet 99 - CCTV-007 is mounted on 80' pole with lowering systm.

DMS-1 Sheet 96 - DMS would be better placed at MM 64.4

FCCTV-1 Sheet 79 - One FCCTV for westbound shoulder under Vaden Lane

FCCTV-2 Sheet 80 - One FCCTV for eastbound shoulder under Nutley Street

FCCTV-3 Sheet 85 - One FCCTV for eastbound shoulder under Cedar Lane

Shoulder Lane Monitoring System We will install a series of cameras and associated electronics to monitor the shoulder lanes. The camera positions will generally correspond to the locations shown on Sheet 2D (1) of the Plans in Addendum 2, although more cameras may be required to give complete coverage of the shoulder lanes under the overpasses and pedestrian bridges above I-66.

As stated in the narrative in Segment B two cameras will be mounted on poles that are approximately 1,500' apart on each side of the highway. Normally, two cameras will be mounted on each pole, and the view will be optimized with the cameras facing in the same direction in an "over-under shotgun" configuration. One camera will see incidents from 400′ to 1000′ away from the pole, and the second will see from 900′ to 2,000′. The area from the base of the pole to the 400′ mark will be covered from the camera immediately upstream of this camera pole.

Based on the data on Sheet 2D (1) in Addendum 2 there will be 41 Shoulder Lane cameras in this segment, 19 eastbound and 22 westbound. As stated earlier, we have decided to install one camera on each pole with full pan, tilt, and zoom (PTZ) to reduce the time required for lane closures during the initial positioning and fine tuning of the view from each camera and the overlap of sequential cameras. The team knows that PTZ functionality is not required for the operation of the Shoulder Lane Monitoring System, and will convey the system to VDOT with these functions disabled, if desired. But we believe that the Shoulder Lane Monitoring System gives significant benefits to VDOT when the software is complemented by PTZ cameras, as we noted in Segment B.

Cameras will be mounted on new 50′ poles and existing poles, as required to maximize the camera coverage. Cameras will be mounted at 50′ unless a lower height is needed for a better view beneath the overpasses and pedestrian bridges.

As in Segment B, the design constraints in this segment include the heavy tree growth and the sections of the sound walls that are often placed next to the shoulder lane. Where these features obscure the view of any camera installed next to the shoulder lane we will find ways to mount the cameras directly over the shoulder lane on new and existing structures.

Shoulder Lane Monitoring Detection Software We will provide the shoulder lane monitoring system with detection software that meets the functional requirements of the special provisions and do not require that the images from the cameras be transmitted back to the MPSTOC for analysis. Additional information on this software is provided in Proposal Section 4.3.1 (d).

Microwave Vehicle Detectors for Travel lanes and Ramp Metering Four new MVDs to monitor the eastbound roadway will be installed at the western end of the segment and added to the 17 existing MVDs. This segment also includes an upgrade of the Ramp Metering System at the eastbound entrance lanes from Route 7. Our approach to the ramp metering system is to install a whole new system comprising new Ramp Microwave Vehicle Detectors (RMVDs) with presence detection in the RMVD at the stop line, a new cabinet with a new 2070 L controller, and other new equipment. This approach will let the existing system keep operating without fear of disruption until the change-over to the new one. It's also worth noting that the new mainline MVDs immediately upstream and downstream of the ramp metering location will be linked into the communications system through the ramp metering cabinet, allowing either of these detectors to be used

for mainline monitoring and/or as the mainline detector in the ramp metering software.

All the new mainline MVDs are eastbound detectors east of Route 7, spaced on average just under 0.5 miles. We recommend installation of additional westbound MVDs to monitor westbound traffic flow in this area.

Dynamic Message Signs Of the three new Type 1 (Walk-in) DMS units in Segment C, one serves westbound travelers and two serve eastbound travelers. The DMS westbound is between Route 7 and the I-495 interchange. The eastbound DMSs are at the exit ramp to Route 7 eastbound[1] and upstream of the exit ramp to Westmoreland Street. (Both signs are replacements for existing DMS units). The westbound DMS will have a 35 mm Pixel Pitch as shown in the call-out for this sign.

Lane Control Signals and Gantry Assemblies There are 4 Type 2 LCS assemblies, 1 type 2A, 1 type 2B, and 7 type 3s. The Type 2, 2A, and 2B span the eastbound and westbound roadways.

The average spacing between the LCS in this segment (including the areas beyond the shoulder lanes) is about 1500′ eastbound and 1800′ westbound.

A Type 3 LCS for the shoulder lane near MM 63.62 appears to be missing from the plans.

We recommend that the Type 2 gantry at MM 62.15 be replaced with two Gantry assemblies because of the difficulty of securing the supporting column into the retaining wall next to the eastbound CD lanes. The gantry spanning the westbound lanes would stay near MM 62.15, while the gantry spanning the eastbound lanes would be moved to the west side of Vaden Drive at MM 62.03

Communications and Power for ITS Field Equipment Because of the number of field elements in this segment, new conduits and fiber-optic cables will be installed to support the new rings to be established for devices along the eastbound and westbound roadways west of the I-595 interchange. It is anticipated that these rings for the TMS elements west of the I-495 interchange will be an extension of the rings in Segment B and will interface with the existing system using Level 2 switch/ring masters at the Level 3 switch identified as Node 2 – I66/Rte 123 located at MM 57.5. The secondary connection for these rings will be the Level 3 switch at the I-495 interchange. East of the I-495 interchange, the equipment will use spare fibers to interface with the Level 3 switches at the I-495 interchange and the TOC in Arlington.

Power service will make use of service drops for existing field equipment, which is in close proximity to all new equipment in this segment. Wherever needed, existing VDOT owned services will be modified by adding service equipment to the existing racks, and installing new troughs, conduits and cables to the new and existing service equipment. Prior to any modifications being made, load tests will be performed to determine the available spare capacity of the existing service. Necessary improvements will be made to bring the service into compliance with VDOT and NEC standards

Other Work in this Segment includes two new staging areas in the segment between the I-495 and Route 7 interchanges: eastbound at MM 65.9 and westbound at MM 66.3. Shoulder lane type monitoring

[1] *It would be better if the DMS were moved slightly upstream of its current position at Barbour Rd. where there is guardrail on both sides. The guide sign could remain at the gore of the route 7 exit ramp as shown in the plans.*

cameras and detection electronics will be installed at these staging areas to detect stopped vehicles. A new Auxiliary Power unit will be installed at MM 64.90 about 1000′ east of the Gallows Road overpass. In addition, there are 10 new sign structures to be installed: 1 overhead span, 5 cantilevers, and 4 for ground mounted signs; and 15 to be removed:1 cantilever, 1 ground mount, and 7 bridge mounted sign structures; as well as 6 lane control signals and their support structures.

Segment D Westmoreland Ramp – DC Line MM 68.51 – 75.1(Sheets 105 – 131)
Segment D includes all work east of Westmoreland Street. Although WMATA trains run in the median from the western end to MM 71.2, no work in this segment should require WMATA review or permits. The major features of interest and concern here are the five ramp metering locations and complementary MVDs. Segment D also includes a few other TMS field elements, as discussed next. **Table 4.3D** on the following page summarizes the locations and spacing of the ITS field elements in Segment D and a few pertinent notes about the locations of this equipment.

CCTV Two new CCTV units are being installed in this segment. We recommend an 80′ pole (with lowering system) for CCTV-010 to improve visibility of the westbound lanes which at this location are separated from the eastbound lanes by the WMATA trains in the median.

Microwave Vehicle Detectors for Travel Lanes and Ramp Metering The ramp metering system will be upgraded at five ramps, two eastbound and three westbound. An additional 13 mainline MVDs will be installed, most collecting data for both the eastbound and westbound roadways. As previously indicated, our approach to the ramp metering system is to install a completely new system comprising new RMVDs and a new cabinet with a new 2070 L controller and other new equipment. This approach will let the existing system keep operating without fear of disruption until the change-over to the new one. It's also worth noting that the new mainline MVD immediately upstream and downstream of the ramp metering location will be linked into the communications system through the ramp metering cabinet, allowing either of these detectors to be used for mainline monitoring and/or as the mainline detector in the ramp metering software.[2]

Dynamic Message Signs There are three new Type 1 Front Access DMS units on butterfly mounting assemblies, two serving eastbound travelers and one serving westbound travelers.

Communications and Power for ITS Field Equipment Our communications plan for this Segment is based on the types of devices. For the Ramp Metering cabinets we'll use the same fibers being used for the existing Ramp Metering cabinets and will make the switch after the equipment has tested to be functioning. The three new DMS units are replacements for existing DMS ones, so we'll also be tying into the fibers that supported the old DMS units. The MVD units not directly connected with the ramp metering locations will be wired into a new ring formed by the spare fibers to be made available by VDOT. A decision on whether to connect the Ring Master for this ring to the Level 3 switch at Node 2 (I-495) or Note 5 at the Arlington TOC will depend on field conditions.

[2] *We're skeptical about the proper operation of the MVD under the parking deck at MM 72.13. We suggest relocating this MVD to a location at MM 72.03.*

Table 4.3D Conceptual Project Layout and Summary of ITS Equipment SECTION D Sheets 105 THRU 131 ***Existing***

	Mile Marker			CCTV				Microwave Video Detection					Direct Messaging/Variable Messaging Signs					
									East Bound		West Bound			East Bound		West Bound		
Sheet #	Start	End	Notes	ID	Location		Spacing ↓	ID	Location	Spacing ↓	Location	Spacing ↑	ID	Location	Spacing ↓	Location	Spacing ↑	NOTES
					67.21	E&W												
START OF SECTION D				**CCTV-009**	**68.33**	**EB**							**DMS-003**	**67.98**				
105	68.51	68.76		*CCTV-340*	*68.75*	E&W	**1.54**	**MVD-020**	**68.70**									**CCTV-1**
106	68.76	69.00	No ITS work															
107	69.00	69.25		**CCTV-010**	**69.05**	**EB**	**1.03**											**CCTV-2**
108	69.25	69.50		***CCTV-330***	*69.36*	WB	0.61	**MVD-021**	**69.33**	**0.63**								**MD-1 , RMP MTR-1**
109	69.50	69.75						**MVD-022**	**69.70**	**0.37**								**MD-2**
110	69.75	70.00	No ITS work					*No numb.*	*69.96*	*0.26*	*69.96*	*0.40*	*No numb.*			***69.93***	2.4	
111	70.00	70.26	No ITS work															
112	70.26	70.51						*SI#5/SI#4*	*70.36*	*0.4*	*70.36*	*0.40*						
113	70.51	70.76		***CCTV SI*4***	*70.6*	WB	1.24						**DMS004**	**70.55**	**2.6**			
113D	70.51	70.76		***CCTV SI*5***	*70.6*	EB	1.55	*SI#6*			*70.76*	*0.17*						
114	70.76	71.01						*SI#7/* **023**	*70.82*	***0.46***	***70.93***	0.34						**MD-3**
115	71.01	71.23																**RMP MTR-2**
116	71.23	71.48		***CCTV-240 (2)***	***71.29***	E&W	0.69	**MVD-024**	**71.27**	**0.45**	**(71.27)**	**(0.41)**						**MD-4, RMP, MTR-2**
117	71.48	71.73		***CCTV-320***	***71.67***	E&W	0.38	**MVD-025**	**71.68**	**0.41**	**(71.68)**	**(0.45)**						**MD-5, RMP MTR-3**
118	71.73	71.98																**RMP MTR-3**
119	71.98	72.24						**MVD-026**	**72.13**	**0.45**	**(72.13)**	**(0.55)**						**MD-6, MD-7**
120	72.24	72.50		**CCTV-11**	**72.49**	**E&W**	**0.82**						**005&006**	**72.46**	**1.9**	**72.33**	**2.5**	
121	72.50	72.73						**MVD-027**	**72.68**	**0.55**	**(72.68)**	**(0.47)**						
122	72.73	72.98		*CCTV-440*	*72.9*	E&W	**0.41**											**RMP MTR-4**
123	72.98	73.23						**MVD-028**	**73.15**	**0.47**	**(73.15)**	**(0.53)**						**MD9, MD-10**
124	73.23	73.47	No ITS Work															
125	73.47	73.71		*CCTV-300*	*73.6*	E&W	0.7	**MVD-029**	**73.68**	**0.53**	**(73.68)**	**(0.31)**						**MD-11**
126	73.71	73.96		*CCTV-290*	*73.86*	E&W	0.26											**RMP MTR-5**
127	73.96	74.20						**MVD-030**	**73.99**	**0.31**	**(73.99)**	**(0.25)**						**MD-12, RMP MTR-5**
128	74.20	74.44		*No numb. @ Tunnel*	*74.38*	EB	0.52	**MVD-031**	**74.24**	**0.25**	**(74.24)**	**(0.49)**						
129	74.44	74.69	No ITS Work	*No numb. @ Tunnel*	*74.54*	WB	0.68											**RWIS005**
130	74.69	74.92		*CCTV-260*	*74.69*	E&W	0.31	**MVD-032**	**74.73**	**0.49**	**(74.73)**		*VMS0400*			*74.81*		
131	74.92	75.10	No ITS Work	*CCTV-250 on ramp*	*75.04*	WB												
				Avg Spacing		EB	0.75	***Avg Spacing***		0.43		0.40						
				Avg Spacing		WB	0.69											

Notes

MVD-024 thru MVD-032 serve as eastbound and westbound detectors

MD-1 **MVD-021 will be connected to ramp metering cabinet for EB Sycamore Street entrance ramp.**

MD-2 **MVD-022 will be connected to ramp metering cabinet for EB Sycamore Street entrance ramp.**

MD-3 **MVD-023 will be connected to ramp metering cabinet for WB George Mason Drive entrance ramp.**

MD-4 **MVD-024 will be connected to ramp metering cabinet for WB George Mason Drive entrance ramp.**

MD-5 **MVD-025 will be connected to ramp metering cabinet for EB Glebe Road entrance ramp.**

MD-6 **MVD-026 will be connected to ramp metering cabinet for EB Glebe Road entrance ramp.**

MD-7 **MVD-026 should be moved from under the parking decck to MM 72.03**

MD-8 **MVD-027 will be connected to ramp metering cabinet for WB Lee Highway entrance ramp.**

MD-9 **MVD-028 will be connected to ramp metering cabinet for WB Lee Highway entrance ramp.**

MD-10 **MVD-028 should be moved from its position between the sound walls to MM 72.91**

MD-11 **MVD-029 will be connected to ramp metering cabinet for WB Lee Highway (East) entrance ramp.**

MD-12 **MVD-030 will be connected to ramp metering cabinet for WB Lee Highway (East) entrance ramp.**

CCTV-1 **CCTV-340 mouted on Cell tower proving coverage of easbound and westbound traffic**

CCTV-2 **CCTV-010 should be mounted on an 85' tall pole (with lowering system) to maximize coverage of westbound lanes.**

RMP MTR-1 **Ramp Meter at EB Sycamore Street - 3 Microwave Detectors, detector at stop line has presence detection**

RMP MTR-2 **Ramp Meter at WB George Mason Drive - 3 Microwave Detectors, detector at stop line has presence detection**

RMP MTR-3 **Ramp Meter at EB Glebe Road - 3 Microwave Detectors, detector at stop line has presence detection**

RMP MTR-4 **Ramp Meter at WB Lee Highway - 3 Microwave Detectors, detector at stop line has presence detection**

RMP MTR-5 **Ramp Meter at WB Lee Highway (EAST) - 3 Microwave Detectors, detector at stop line has presence detection**

RWIS005 is a Road Weather Information Station

ll

Once again, power service will make use of service drops for existing field equipment, which is in close proximity to the equipment that is being replaced and the new equipment in this segment. Wherever needed, existing VDOT owned services will be modified by adding service equipment to the existing racks, and installing new troughs, conduits and cables to the new and existing service equipment. Prior to any modifications being made, load tests will be performed to determine the available spare capacity of the existing service. Necessary improvements will be made to bring the service into compliance with VDOT and NEC standards

Other Work in this Segment includes 6 new sign structures to be installed: 5 cantilevers, and 1 for ground mounted signs; and the removal of 1 cantilever and 8 bridge-mounted sign structures.

4.3.1 (b): Conceptual Plan – Typical Mounting Detail:

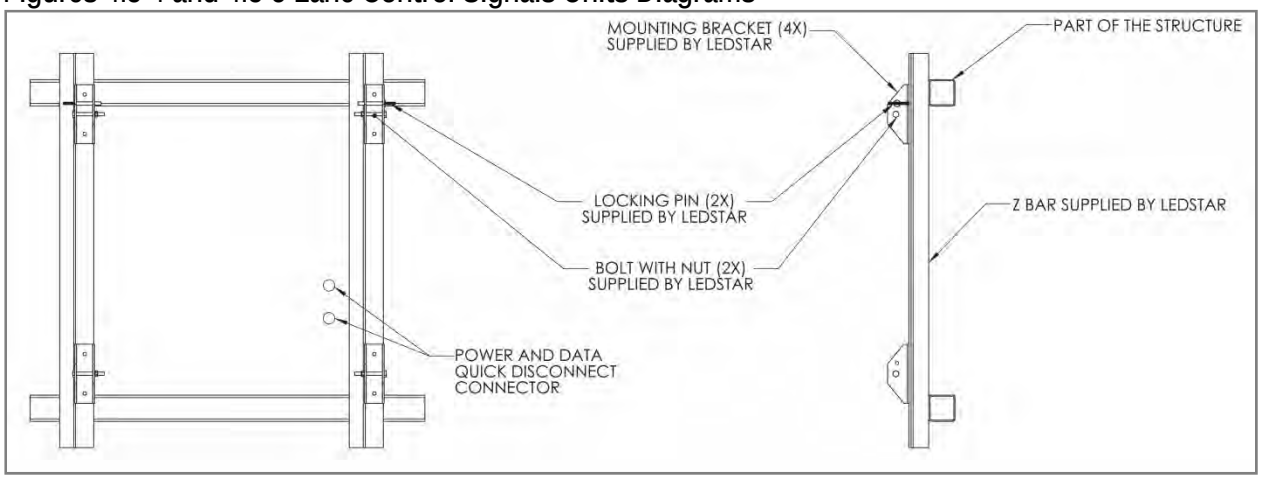
Our team's ability to deploy quick-release mounting systems for most required ITS devices gives our approach enormous value because future maintenance of the proposed system is of the utmost importance along this section of congested highway. Installing units that can easily be dismantled and maintained will lead to significant cost savings, not only in future maintenance costs, but also during construction installation. For this network of ITS devices along the tight corridor of I-66, our team has put high consideration on creating a system that VDOT maintenance crews would appreciate in the future with the ability to simply "plug and play" and essentially "unplug and maintain" these devices.

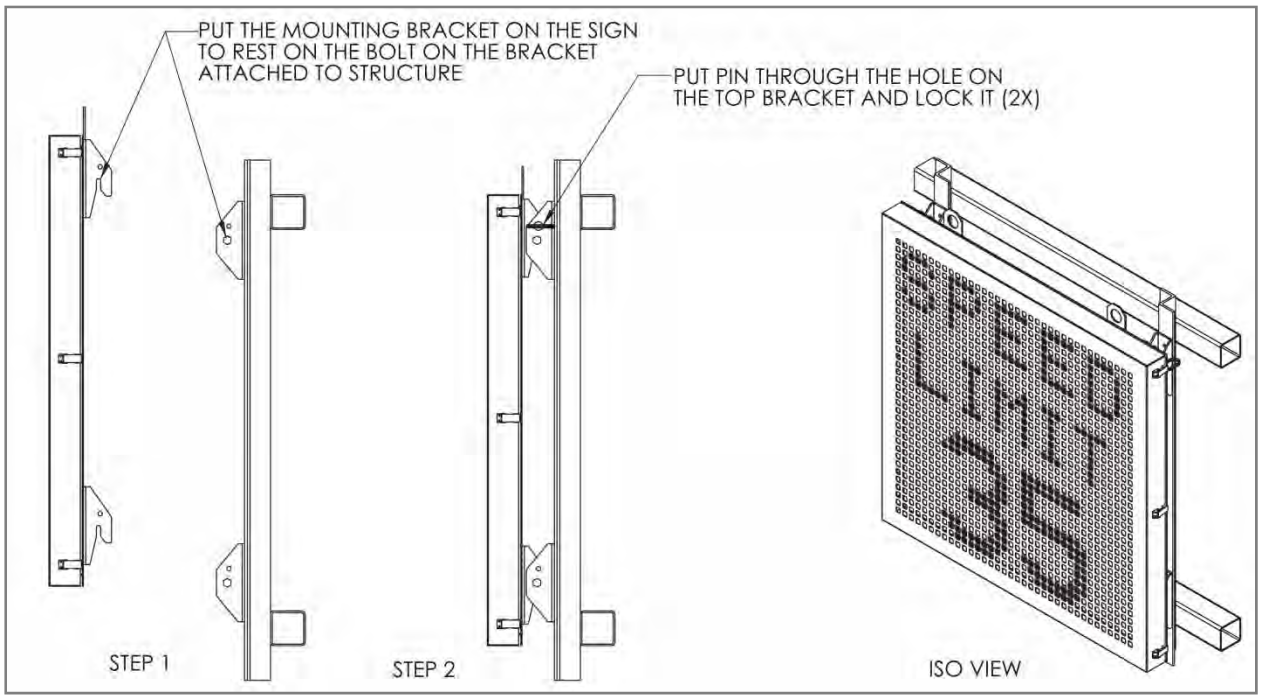
Below is a breakdown of the mounting techniques proposed for the critical ITS devices and their associated advantages. Though references to specific manufacturers may be made, it is still unclear which equipment will be used during construction, as price plays a vital role in the decision. However, the actual techniques and approaches to each mounting system will be implemented as we have established certain guidelines with all of our suppliers and vendors.

The biggest area of concern for mounting techniques, for both VDOT and our team, was the Lane Control Signals (LCSs). Outlined within the RFP, LCSs shall be composed of a single panel for quick removal and replacement for repair. The cabling shall have sufficient slack and mounting hardware shall be adjustable, such that moving the unit along the structure is possible. LCSs shall also be accessible and mounted in such a manner that a single unit can be removed and replaced in under 20 minutes by a qualified technician. By providing that information to our suppliers, we ensured that they could meet VDOT's requirements for quick mounting techniques and fast release for maintenance purposes.

- **Lane Control Signals (LCSs) Units**
  - The proposed LCSs attach to the sign structures by two Z-bar attachments, each containing two mounting brackets (top and bottom). The brackets for the sign would slide into place onto the Z-bar-attached mounting brackets. The top mounting brackets on the Z-bar attachments would contain a pin that locks the sign into place, enabling a quick disconnection of the LCS for replacement. A diagram (**Figures 4.3-4 and 4.3-5**, *following page*) for the proposed system is shown.

Figures 4.3-4 and 4.3-5 Lane Control Signals Units Diagrams





- Power and data cabling also contains quick disconnect connectors to let the cabling be quickly plugged and unplugged. This quick disconnect essentially allows maintenance crews to simply "twist and pull" the cable for disconnect (**Figure 4.3-6**, *right*).
- Each LCS will have an individual controller and circuit breaker to be installed on the ground in an equipment cabinet.

Figure 4.3-6 Quick Connect Illustration

By having the controls away from the LCS unit, we're allowing for maintenance of controls to be done along the side of the road in a safe, controlled area rather than up in the air.

- **Dynamic Message Sign (DMSs) Units**
  See **Figure 4.3-7** (*right*)
  - Walk in, large, small, and one line DMS units will all have parallel Z-bracket attachments. Z-bracket attachments will attach to aluminum sign hangers on overhead sign structures. Z-bracket attachments allow for a quicker installation and removal, if necessary. The adjacent detail shows the Z-bracket attachment.
  - Each one line DMS unit will be front-access surface mounted to allow for easy installation and removal, if necessary.
  - Power and data cabling would contain quick disconnect connections, similar to the LCS units.
- **CCTV Cameras**
  See **Figure 4.3-8** (*right*)
  - When required in tight corridors and where placement makes sense, a camera system lowering device will be implemented for ease of maintenance. The system lowering device is a pole-mount system with the raising and lowering cable and signal/power cable running inside. This system is the safest camera maintenance system to use on tall poles. All CCTV cameras mounted to 80-foot poles will include the lowering device system.
  - On poles ≤ 50' tall, CCTV cameras will include a quick power and data disconnect located at the mounting device. This shall allow for easy maintenance and cleaning of camera when required.

Figure 4.3-7 Dynamic Message Sign Units

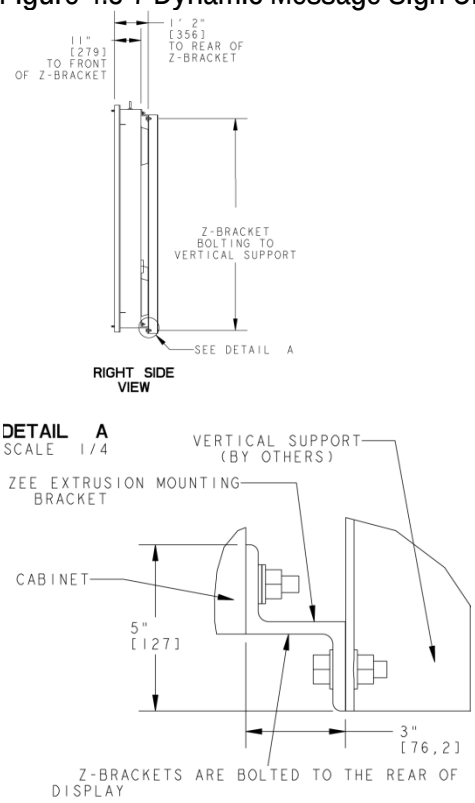
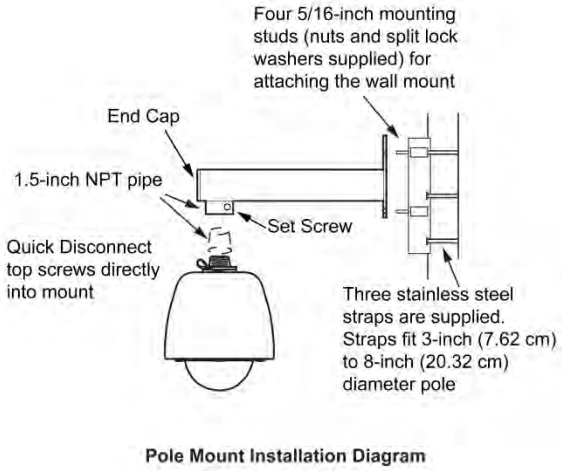


Figure 4.3-8 CCTV Camera Illustration



Pole Mount Installation Diagram

(For poles ≤ 50' tall)

- **Microwave Detectors**
  Our approach towards microwave detectors is ideal for both our team as well as VDOT. For starters, our proposed detectors are relatively small and lightweight units that can be easily installed and aimed by one person. In addition, our detectors contain an optional feature of an on board camera built into the units which can allow for offsite adjustment of the detection zones. This allows for any adjustments to the units to be done remotely, without the need for delays to traffic. These units will be mounted using the SideKick Mounting Bracket, which allows for easy installation and adjustments (**Figure 4.3-9**).

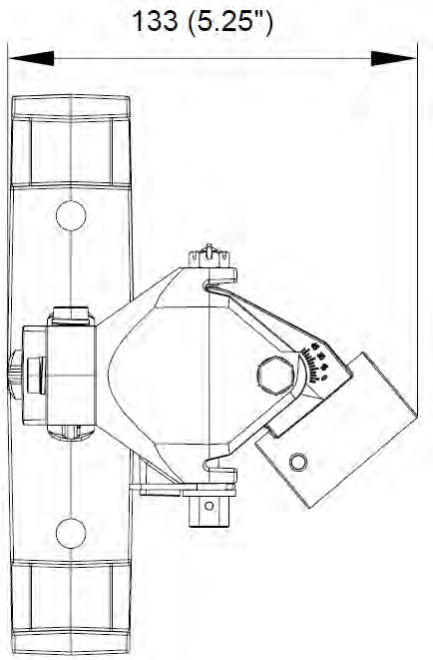


Figure 4.3-9 Microwave Detector Bracket Attachment

4.3.1 (c): Conceptual Plan – Power Distribution Plan

Throughout the entire project we intend to use existing services wherever possible. In areas where access to existing service locations is not available or is unpractical, new service drops will be provided.

New power drops will utilize standard VDOT SE-5, or SE-9 services as applicable. All locations will be coordinated with the appropriate utility company and VDOT representative.

Wherever possible, existing VDOT owned services will be modified by adding properly rated service equipment to the existing racks. We will accomplish this by adding a wire trough to the metered side of the service, and installing new appropriately sized conduits and cables to the new and existing service equipment. All taps will be made in the wire trough using NEC approved devices.

Prior to any modifications being made and load tests will be performed to determine the available spare capacity of the existing service. Ground resistance tests will be performed and if necessary ground rods will be added to bring the service into compliance with VDOT and NEC standards.

New conduit and feeder cables will be installed from the new or modified services per the requirements of VDOT and the NEC. Voltage drop calculations will be performed to assure cables are properly sized for the load being served and distance from the power source.

All service installations and modifications will be performed meeting the requirements of VDOT, the NEC, and the necessary utility companies, and under the direct supervision of a VA Licensed Master Electrician.

A summary of the power plan for all four construction segments is contained in **Table 4.3E** on the following pages. For each new ATM device this table provides an initial assessment of whether the nearby electrical service used for an existing device should be adequate, or whether new electrical service, or modifications to the existing service equipment are required.

Table 4.3E - Summary of Power Distribution Plan

Segment A Sheets 4 Thru 61			NEW DEVICES ONLY	Sheets without new field equipment have been omitted
Sheet	**Start MM**	**End MM**	**New Devices**	**Power Service Sources and New Service Equipment Requirements**
21	47.00	47.31	Staging Area -1	Staging Area CCTV power using spare capacity of existing service for CCTV-450 at MM 47.25
24	47.82	48.08	MVD-001	Use spare capacity of existing service for CCTV-020 at MM 47.88
29	49.12	49.39	CCTV-001	Use spare capacity of existing service for VMS-030 at MM 49.2
34	50.42	50.69	Aux Pwr -1	Power from new service on Compton Road at MM 50.6
37	51.21	51.47	Stgng Area -2	Staging Area CCTV power using spare capacity of existing service for VMS-660 at MM 51.5
38	51.47	51.73	CCTV-002	Use spare capacity of existing service for VMS-660 at MM 51.5
41	52.27	52.50	LCS G-001	Use spare capacity of existing service for VMS-650 at MM 52.6
42	52.50	52.77	LCS G-002 & MVD-002	Use spare capacity of existing service for VMS-650 at MM 52.6
43	52.77	53.01	LCS G-003	Add service equipment to existing service for CCTV-070 at MM 53
44	53.01	53.26	LCS G-004	Add service equipment to existing service for CCTV-070 at MM 53
45	53.26	53.52	MVD-004	Add service equipment to existing service at Route 28 MM 53.2
46	53.52	53.80	LCS G-005 & MVD-005	Add service equipment to existing service for CCTV-420 at MM 53.88
48	54.06	54.34	LCS G-006 & 007 & MVD-006	Use spare capacity of existing service for Removed VMS-070 at MM 54.25
50	54.64	54.90	LCS G-008	Add service equipment to existing service for CCTV-410 at MM 54.85
51	54.90	55.14	MVD-007	Use spare capacity of existing service for VMS-620 at MM 55.3
53	55.40	55.67	LCS G-009 & MVD-008	Add service equipment to existing service for VMS-620 at MM 55.3
54	55.67	55.92	MVD-009, Stgng Areas-3 & 4	Power for MVD and Staging Area CCTVs using spare capacity of existing service for VMS-610 at MM 55.82
55	55.92	56.15	LCS G-010	Add service equipment to existing service for CCTV-110 at MM 55.93
57	56.42	56.69	LCS G-011, MVD-010, VMS-120	Add service equipment to existing service for VMS-090 at MM 56.63
58	56.69	56.94	LCS G-012, MVD-011, VMS590	Use spare capacity of existing service for VMS-600 at MM 56.82
59	56.94	57.19	LCS G-013 & 014, MVD-013 & 014	Add service equipment to existing service for VMS-110 & 120 at MM 57.06
60	57.19	57.43	MVD-014	Add service equipment to existing service for VMS-580 at MM 57.52
61	57.43	57.66	LCS G-015	Add service equipment to existing service for VMS-580 at MM 57.52

Segment B Sheets 62 Thru 77 New Devices Only Sheets W/O new field equipment omitted

Sheet	Start MM	End MM	New Devices	Power Service Sources and New Service Equipment Requirements
62	57.66	57.95	LCS-G017, MVD 015, FCCTV-001, Aux Pwr-2	Add service equipment to existing service for Aux Power-2 at MM 57.93
63	57.95	58.20	LCS C-001, FCCTV-002 thru 005	Add service equipment to existing service for Aux Power-2 at MM 57.93
64	58.20	58.45	LCS G-018, FCCTV-006 & 007	Add service equipment to existing service for Aux Power-2 at MM 57.93
65	58.45	58.71	LCS G-020, FCCTV-008 & 009, DMS G-019	Add service equipment to existing service for VMS-560 at MM 58.48
66	58.71	58.96	LCS C-002 & G-021, FCCTV-010 & 011	Power from new service at Waples Mill Rd. at MM 58.6
67	58.96	59.21	LCS G-023, FCCTV-012 & 013	Power from new service at Waples Mill Rd. at MM 58.6
68	59.12	59.47	LCS G-024 & 025, FCCTV-014 thru 018	Power from new service for at Jermantown Rd. at MM 59.4
69	59.40	59.72	LCS C-003, FCCTV-019 thru 022	Power from new service for at Jermantown Rd. at MM 59.4
70	59.72	59.97	LCS G-026, FCCTV-023 thru 026	Add service equipment to existing service for CCTV-160 at Route 123 MM 60.1
71	59.97	60.23	LCS C-004 & G-027, FCCTV-027 thru 033	Add service equipment to existing upgraded service for CCTV-160 at Route 123 MM 60.1
72	60.23	60.48	LCS C-005, FCCTV-034 thru 037	Add service equipment to existing service for CCTV-160 at Route 123 MM 60.1
73	60.48	60.73	LCS G-028, FCCTV-038 thru 041	Add service equipment to existing service for VMS-180 at 60.9
74	60.73	60.99	LCS C-006 & G-029, FCCTV-042 thru 045	Add service equipment to existing service for VMS-180 at 60.9
75	60.99	61.24	LCS G-031, FCCTV-046 thru 049	Add service equipment to existing service for VMS-180 at 60.9
76	61.24	61.49	CCTV-003, LCS C-007 & G-032, FCCTV-050 thru 053	Add service equipment to existing service for CCTV-180 at Blake Lane MM 61.58
77	61.49	61.74	LCS G-033 & 034 , FCCTV-054 thru 060	Add service equipment to existing service for CCTV-180 at Blake Lane MM 61.58

Segment C Sheets 78 Thru 104 NEW DEVICES ONLY Sheets W/O new field equipment omitted				
Sheet	**Start MM**	**End MM**	**New Devices**	**Power Service Sources and New Service Equipment Requirements**
78	61.74	62.00	LCS C-008 & C-009, FCCTV-061 thru 064	Add service equipment to existing service for CCTV-360 at Vaden Dr. MM 62.07
79	62.00	62.25	LCS G-035 , FCCTV-065 thru 069	Add service equipment to existing service for CCTV-360 at Vaden Dr. MM 62.07
80	62.25	62.50	CCTV-004, LCS C-010 & 011, FCCTV-070 thru 074	Add service equipment to existing service for CCTV-no numb. at Nutley St. MM 62.47
81	62.50	62.76	LCS G-036, FCCTV-075 thru 080	Add service equipment to existing service for CCTV-no numb. at Nutley St. MM 62.47
82	62.76	63.01	LCS C-012 & 013, FCCTV-081 thru 084	Add service equipment to existing service for CCTV-200 at MM 62.86
83	63.01	63.26	LCS G-037 FCCTV-085 thru 088	Add service equipment to existing service for LCS-190 at MM 63.14
84	63.26	63.54	LCS G-038 FCCTV-089 thru 092	Use spare capacity of existing service for VMS-210 at MM 63.41
85	63.54	63.79	LCS C-014 & XX, FCCTV-093 thru 097	Add service equipment to existing service for CCTV-210 at Cedar Ln MM 63.6
86	63.79	64.01	LCS G-039 FCCTV-098 thru 101	Use spare capacity of existing service for VMS-500 at MM 63.83
88	64.29	64.55	LCS G-040	Power from new service at Gallows Rd. MM 64.7
93	65.61	65.85	CCTV-005	Power from new service at Virginia LnMM 65.8
94	65.85	66.10	CCTV-006	Power from new service at Virginia LnMM 65.8
95	66.10	66.35	DMS-001	Use spare capacity of existing service for VMS-280 at Barbour Rd. MM 66.4
96	66.35	66.60	DMS-002	Use spare capacity of existing service for VMS-280 at Barbour Rd. MM 66.4
97	66.60	66.84	MVD-016 & RMD001& 019	Use spare capacity of existing service for CCTV-035 at MM 66.8
98	66.84	67.07	RMD-02	Use spare capacity of existing service for CCTV-035 at MM 66.8
99	67.07	67.30	CCTV-007 & RMD-003	Use spare capacity of existing service for Ramp Mtrg at MM 67.1
100	67.30	67.53	MVD-017	Use spare capacity of existing service for Ramp Mtrg at MM 67.1
101	67.53	67.77	MVD-018	Add service equipment to existing service for DMS-290 at MM 68.1
102	67.77	68.02	CCTV-008, DMS-003	Add service equipment to existing service for DMS-290 at MM 68.1
103	68.02	68.26	MVD-019	Add service equipment to existing service for DMS-290 at MM 68.1
104	68.26	68.51	CCTV-009	Add service equipment to existing service for DMS-290 at MM 68.1

Segment D Sheets 105 Thru 130			NEW DEVICES ONLY	Sheets W/O new field equipment omitted
Sheet	**Start MM**	**End MM**	**New Devices**	**Power Service Sources and New Service Equipment Requirements**
105	68.51	68.76	MVD-020	Use spare capacity of existing service for CCTV-340 at MM 68.75
107	69.00	69.25	CCTV-010	Power from new service at Lee Hwy EB. at MM 68.05
108	69.25	69.50	MVD-021, RMD-004, 005 & 006	Use spare capacity of existing service for Ramp Mtrg at MM 69.4
109	69.50	69.75	MVD-022	Use spare capacity of existing service for Ramp Mtrg at MM 69.4
113	70.51	70.76	DMS-004	Add service equipment to existing service for CCTV at MM 70.6
114	70.76	71.01	MVD-023	Use spare capacity of existing service for Ramp Mtrg at MM 71.23
115	71.01	71.23	RMD-007	Use spare capacity of existing service for Ramp Mtrg at MM 71.23
116	71.23	71.48	MVD-024, RMD-008 & 009	Use spare capacity of existing service for Ramp Mtrg at MM 71.23
117	71.48	71.73	MVD-025, RMD-010 & 011	Use spare capacity of existing service for Ramp Mtrg at MM 71.73
118	71.73	71.98	RMD-012	Use spare capacity of existing service for Ramp Mtrg at MM 71.73
119	71.98	72.24	MVD-026	Use spare capacity of existing service for Ramp Mtrg at MM 71.73
120	72.24	72.50	CCTV-011, DMS-005 & 006	Use spare capacity of existing service for VMS-420 & 320 MM 72.4 +/-
121	72.50	72.73	MVD-027	Use spare capacity of existing service for Ramp Mtrg at MM 72.85
122	72.73	72.98	RMD-013, 014 & 015 (& MVD-033)	Use spare capacity of existing service for Ramp Mtrg at MM 72.85
123	72.98	73.23	MVD-028	Recommended relocation to MM 72.91
125	73.47	73.71	MVD-029	Use spare capacity of existing service for Ramp Mtrg at MM 73.86
126	73.71	73.96	RMD-016 & 017	Use spare capacity of existing service for Ramp Mtrg at MM 73.86
127	73.96	74.20	MVD-030 & RMD-018	Use spare capacity of existing service for Ramp Mtrg at MM 73.86
128	74.20	74.44	MVD-031	Use spare capacity of existing service for Ramp Mtrg at MM 73.86
130	74.69	74.92	MVD-032	Use spare capacity of existing service for CCTV-260 at MM 74.68

Auxiliary Power System A major RFP requirement is to furnish, install, and integrate an auxiliary power system consisting of a new generator set, liquefied petroleum gas tank, and UPS backup power system. By definition, installation includes modifying, providing, installing, and integrating electrical equipment described in the RFP Conceptual Plans. We propose to meet the RFP requirements through the use of a Kohler Power System Liquid Propane Generator.

In addition to meeting the auxiliary power requirements in the RFP, there are other reasons for proposing this particular generator, including:

- **Ease of Installation**. The entire system is shipped and installed as one part (Genset & Enclosure).
- **Quiet Operation.** Sound-Attenuated Cabinet is superbly quiet and built to the highest standards. Kohler generators are shipped with enclosures that reduce ambient noise to 74dBA at 7 meters.
- **Extended Warranty.** Kohler packages each generator with the Industry's finest 5-year basic warranty.
- **Included Testing.** Kohler load bank testing is included as part of initial generator commissioning.
- **Demonstrated Dependability.** Kohler is known throughout the industry as one of the premiere sources of stand-by power. It's also an industry leader with its DEC-3000 Digital Controller.

4.3.1 (d): Shoulder Lane Monitoring Software System

Summary of TrafficVision Incident Detection Capabilities and Benefits

TrafficVision Technology – Advanced Vehicle Tracking Video and image processing technology has improved greatly since its development in the 1970s, evolving from pixel change-based analysis of small zones to today's patent-pending TrafficVision technology, which minimizes the effects of spillover lights and vehicle occlusion with its use of a tracking algorithm.

- **TrafficVision** is enormously impressive because it eliminates false positives by automatically adapting to changing light and traffic patterns. In one 24-hour traffic counting test that included a variety of lighting conditions the system achieved over 98% accuracy using manual counting as ground truth. TrafficVision has received many prestigious accolades, including awards from the Transportation Research Board (TRB), the U.S. DOT, and South Carolina State University's Transportation Center.

Installations of TrafficVision Technology Four departments of transportation have installed TrafficVision technology (South Carolina DOT; Louisiana DOT; and Kansas DOT and Missouri DOT for their jointly operated Kansas City SCOUT TMS) as have several municipalities, including the City of Virginia Beach. Negotiations are currently underway for additional installations for Delaware DOT and Ohio DOT.

Application of the Traffic Vision System for I-66 Shoulder Lane Monitoring TrafficVision's algorithm for detecting vehicles is ideal for I-66 because it works best when facing traffic and tracks headlights at night, a significant benefit in bad weather when taillights are hard to see. This traffic-facing design also minimizes the problem of sun glare on I-66 at sunrise and sunset because the cameras will face west in the morning and east in the

evening. During periods of particularly bad visibility the operators will be able to adjust sensitivity and set parameters that are appropriate for that condition. Although parameter values can be set by the operator in the control room, all of the processing performed by the algorithm is performed in the field on processors specially configured by TrafficVision. Transmission of the compressed video image to the operations center is not required.

- **Stopped Vehicles and Dropped Cargo** – TrafficVision not only detects stopped vehicles and other noteworthy falling objects in the field of view; it lets the operator choose how long to wait before getting the alert, eliminating alerts caused by drivers who are briefly stopped to check a map or make a phone call. At the specified zoom levels recommended for this project, TrafficVision staff are confident that the algorithm can identify a stopped vehicle up to 2,000 feet away from the base of the 50-foot structure on which the camera sits.
- **Pedestrians and Animals –** TrafficVision's new functionality can detect pedestrians and large animals in the roadway, easily distinguishing them from vehicles.
- **Wrong-Way Drivers** – After a note of the direction of normal travel is made during initial calibration the algorithm would be able to detect a wrong-way driver by tracking the vehicles' pixels.
- **Traffic Flow Data Collection and Alerts** – TrafficVision captures accurate data on highway traffic flow including v*ehicle classification, speeds* and *volumes*—then stores it in the user interface for easy export to data analysis programs to help improve and enhance roadways. With access to the user interface the operator will be able to set alert notifications when average occupancy or volume exceed threshold values, when average speed is below a threshold, or when there is a rapid decrease in average speed.

Other Benefits of TrafficVision **–** Along with real-time robust incident detection in the shoulder lane, operators would also be able to do much more with the shoulder lane monitoring cameras.

- **Masks/Ignore Zones** – TrafficVision lets operators specify road areas they don't (just then) care about so they only get alerts for their areas of interest, such as the shoulder lane or staging areas.
- **Custom Alert Thresholds** – Operators can set different alert thresholds for measured parameters at different times of the day and days of the week. (i.e.: Stopped vehicle alerts can be sent after a vehicle is stopped for several seconds during peak periods, several minutes between peaks, and longer durations on weekends and holidays.) The operator can select one set of parameter values for Monday and Friday and another set for Tuesday through Thursday.

- **Automatic Adaptation Between Presets and Camera Views** – If VDOT decides to use the PTZ camera features, operators will be able to define different presets for different PTZ settings, after which the system will automatically know which preset to use without any user interaction. Operators will be able to move between camera positions without losing incident detection and traffic data collection functions. The system will be able to "tour" the entire roadway for incidents when shoulder monitoring isn't the highest priority.
- **Flexibility and Scalability** – The ability to use a wide variety of video encoding standards and camera types allows for flexibility in the future should VDOT wish to extend the SLMS or the ATMS.

Snapshots of stopped cars, trucks and motorcycles, and pedestrian movement identified by TrafficVision on roadways where it is already being used are shown in **Figure 4.3-10**.

4.3.2 (a): Structural Design Concept:

When it comes to structural design for sign structures in the Northern Virginia region, our team believes we have the most experience of any other team, both in design and construction. Our abundant list of past successful sign structure projects throughout the region allows our team to understand the soil conditions and VDOT's preference for types and materials. Our vivid understanding of the requirements for sign structures is a value that cannot be overlooked when considering our team.

In an effort to match the surrounding structures in the region, we are proposing the use of steel angle box truss structures throughout the entire project for cantilever and overhead structures. These types of structures have multiple advantages, ranging from price, light-weight properties, allowable span lengths, and matching existing structures along Interstate 495. Below is a more detailed description of the advantages of utilizing angle box truss structures:

- **Lowest Possible Price.** Compared to every other structure type that could feasibly be used on the project, angle box truss structures offer the absolute lowest cost per structure. Our team considers this to be the most critical point when making our decision on structure types. These structures provide the most value.
- **Long Span Length.** In addition to these structures being the cheapest, they also allow for the longest possible span. Compared to mono-tubes and tubular structures, angle box truss structures allow us to span long lengths without impacting costs too greatly. The price-per-span lengths with our proposed structures are extremely cost-effective when structures exceed 200-foot in length.
- **Light Weight Structure.** These structures offer the lowest possible weight of any of the options. On average, angle box truss structures are roughly 30 percent lighter in weight when compared to mono-tube structures.
- **Ease of Installation.** These structures are the easiest of any of the options to construct. The light weight combined with easy bolting patterns allows these structures to be constructed on site quickly and affordably. As we have limited windows for lane closures, these structures are the perfect fit for this project.

Renderings and pictures of similar structures that Midasco has provided on the I-495 HOT Lanes Project are in **Figure 4.3-11**.

Figure 4.3-10: Typical images identified from TrafficVision's systems include: stopped cars, trucks, motorcycles, and pedestrian movement.

Pedestrian

Passenger Vehicles

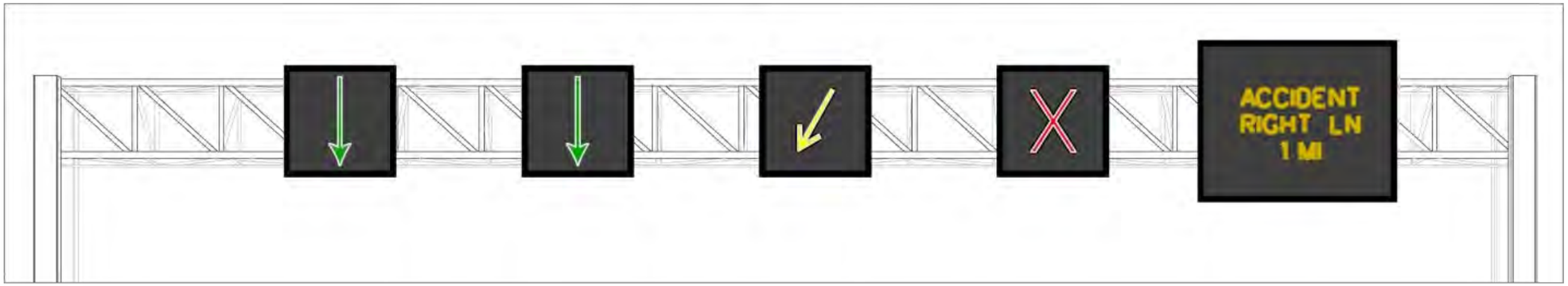
Tractor Trailer

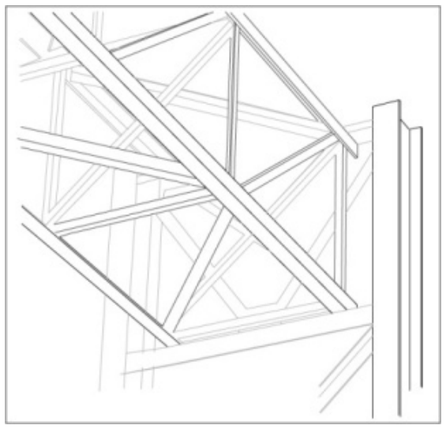
Motorcycle

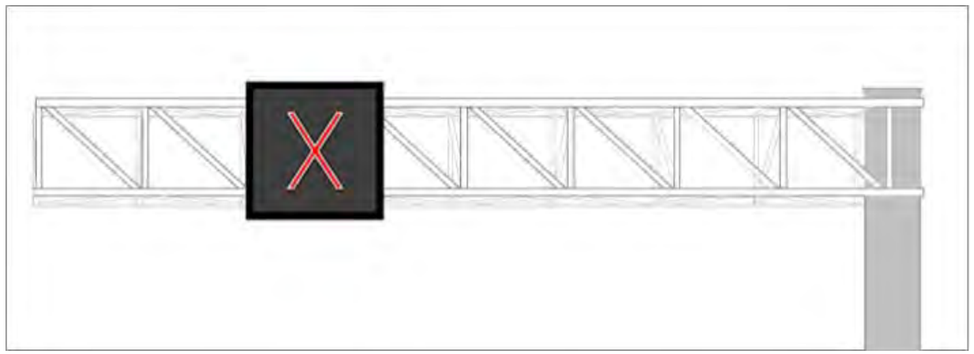
Passenger Vehicle – Night

Passenger Vehicle – Night, Precipitation

Figure 4.3-11: Renderings and pictures of similar structures Midasco constructed on the I-495 HOT Lanes Project







4.3.2 (b) & (c) Typical Offset from Edge of Pavement and Proposed Protection

The offset to each device from the edge of the travel lane and the appropriate protection for each device will be determined based on final design of the proposed improvements. One of our objectives in locating all new devices will be to locate their support poles and cabinets outside of the clear zone or behind existing guardrail or concrete barrier. Where additional guardrail is necessary, equipment will be located such that it is beyond the deflection area. The use of additional concrete barrier will be limited to locations where guardrail does not provide adequate protection, or where limited space does not allow for proper deflection of the guardrail in the event of an impact. All proposed guardrail and concrete barrier installations will comply with VDOT standards and specifications.

In recognition that wider shoulders ultimately provide for a safer facility, and in compliance with the RFP requirements, we do not intend to seek design waivers for the placement of support columns in the median shoulders adjacent to the WMATA rail lines and barrier walls. Where overhead spans are required, full spans will be designed such that further reduction of the existing shoulders is not required.

CCTV and Shoulder Lane Camera Support Poles – The Shoulder Lane Cameras must be located with a clear unobstructed view of the shoulder lane. The heavy tree growth along the edges of the roadway and the sound walls that occasional lie close to the edge of the shoulder lane prohibit the possibility of setting these cameras beyond the clear zone. Protection must be provided at these locations. Where possible we will mount these poles behind existing guardrail, or co-locate the support poles with structures for LCS and DMS where guardrail will also be required. An evaluation of the possibility of mounting these cameras on vertical extensions of the LCS and DMS support structures will also be made on a case by case basis as part of final design. The support poles will be mounted behind guardrails where alternative options are not viable.

DMS and LCS Structures – Based on inspection of the corridor and the anticipated DMS and LCS structure locations, it is unlikely that the support columns for these structures can be located outside of the clear zone, and adequate protection will be required either in the form of guardrail or concrete barrier.

MVD and RMVD – These are small lightweight devices that will be co-located on existing poles and sign support columns wherever possible, and will in most cases not require protection for each specific device. If co-location is not possible, these elements will be protected in a similar manner to the other proposed devices, either by guardrail or concrete barrier, depending on the location and site constraints.

4.3.2. (d) Typical Erection Sequence

In order to make construction operations for sign structures flow smoothly with minimal restrictions and delays, we have divided the project into four segments that will allow the erecting of the structures to be performed efficiently within the required work areas. Segmenting the project, as previously shown within the document, provides us with independent construction activities. This shall allow our crews to

work in multiple locations throughout each segment with minimal delays.

Our segmented approach will also allow our crews perform the most time-efficient work possible within their work zone and spread out our resources (labor, equipment, materials) to the best extent possible. Within each segment, crews will work using a typical erection sequence, as shown below:

1. **Define the Work Area**
   a. Separate work areas will be created throughout each segment based on the location of the proposed installation. They will be created at a minimal length, as needed, and will meet all VDOT and MUTCD requirements for maintenance of traffic and traffic control. Strong emphasis will be placed on historic traffic volume data and heavy congestion areas. Throughout most of Segment's C and D, these work areas will mainly occur at night and weekends, to minimize impacts to surrounding activities. All guidelines for work hours will addressed within the RFP will be strictly adhered to.
   b. Proper maintenance of traffic and traffic control approaches will be implemented to ensure that traffic volumes are considered and impacts are at a minimal.
   c. Work zones will be setup on both east and westbound traffic within each segment, if needed. Multiple crews will be working concurrently on multiple activities to ensure the project schedule stays on track.
   d. Work areas will be created under the requirements called within the RFP, Part 2, with a complete awareness of the penalties for failure to meet the standards. All requirements set in place by VDOT within the RFP and roadway specifications will be followed.
2. **Staging the Work Area**
   a. Utility locates will be called in prior to construction to allow for proper utility marking and locating.
   b. Erosion and sediment control measures will be installed as needed for the proposed underground construction prior to any ground disturbance.
   c. Area will be cleaned and grubbed and all necessary site work shall commence to ensure a safe and open work area for our crews.
   d. Work area will be properly marked and all safety concerns shall be addressed as needed. If barrier around work site is required, it shall be provided.
3. **Phase 1 - Initial Installation**
   a. Foundation work will come first for all ITS devices, cabinet foundations, and sign structures will be installed simultaneously throughout the work zones. Starting with this activity gives the concrete time to cure to the specified curing and strength requirements.
      i. The team's foundation protocol for implementing steel forms and templates for installation ensures that our foundations are straight, flat, and symmetric. This method guarantees that anchor bolts are straight and in the correct location.
      ii. We anticipate using drilled shaft foundations compared to using spread footing foundations. This allows for faster, more efficient construction along the corridor.
   b. Any underground work will be performed throughout Phase 1 concurrently with the foundation work. This includes the installation of any conduit, communication networks, and electrical systems. Through the use of multiple crews,

the strategy is to work as efficiently within each work zone as possible, without compromising safety and quality.

c. Once all underground work is completed, temporary erosion and sediment measures will again be implemented and areas will be cleaned up and treated, as required.
d. As work completes within a certain work area, crews will move to the next location along that section of roadway and start Phase 1 work again. All Phase 1 work will be completed within each segment before starting Phase 2.

4. Phase 2 – Structure and Equipment Installation

a. Once Phase 1 is complete with all foundations approved throughout an entire segment, crews will mobilize back to the work area and start working on structures, cabinets, and any other miscellaneous installation required.
    1. Sign structures, camera poles, hangers, and electrical cabinets will all be built using multiple crews. Four crews will be proposed per work area (structures, signing, electrical, and ITS crews)

    ii. It is foreseen that Phase 2 will most likely be performed during nighttime lane closures. Daytime lane closures will be performed only as needed. This schedule will allow our crews to work with minimal delays to traffic.
        1. This approach minimizes the need for material on site at all times.
        2. It also maximizes our construction window each day while working under the lane closure guidelines.

    iii. When feasible, structural systems will be partially assembled offsite and transported to their final location and installed within the requirements set forth within the RFP and VDOT roadway specifications.

b. Once everything is complete and approved, the site will be cleaned and erosion and sediment control measures will be removed. Once approved, crews will shift to the next adjacent site within that segment.

5. Testing and Inspection

a. Structures testing will be performed during installation of every structure to ensure all requirements are met
    i. VDOT will have a consultant at the vendor's fabrication facility (for steel approval and welding inspection) at the galvanization facility (for approval of the galvanizing process). Both are independent facilities. After approval, the structure is marked with an approval stamp when it is shipped.
    ii. Upon arrival the QC department physically views the structure and sees if there are any discrepancies.
    iii. When the structure is ready to install, a safety inspection will be performed. This is to ensure that the structure is safe to have the public drive under it. All nuts and bolts, sign panel attachments and lighting for compliance with plans and specifications. When the structure is set in place, the torque of all connection bolts will be checked. The last thing is verifying that the height is within spec.

iv. At the time of finalizing the project, we will go through the same inspection. There will be forms and documentation.

b. Concrete Testing will be performed throughout the installation of all foundation work.
   i. Before pouring the concrete we will check the rebar and anchor bolts. We will have a subconsultant testing concrete in the presence of a QC inspector. As standard procedures, we will make extra cylinders for early breaks in case we need to get breaks for concrete strength. All forms and documentation will be completed and saved.

c. As a project requirement, a QA/QC representative will be present at each of the following for their inspection and documentation:
   i. Structure fabrication facility
   ii. Structure galvanization facility
   iii. All concrete pours
   iv. Structure safety inspection
   v. Structure final inspection

4.3.2 (e) Features that Ease Maintenance

Features that ease maintenance and improve the safety of the maintenance staff include the shoulder lane monitoring cameras, our video detection units and the new DMS units. Many of the CCTVs for the shoulder lane monitoring system will be equipped with full pan/tilt/zoom capabilities. If VDOT staff determine that the viewing area on these cameras should be adjusted, this can be done remotely through the PTZ functions on the CCTV units – eliminating the need for lane closures and bucket truck access in the field.

Three of the new DMS units have front access to the internal components. These units can be serviced by a bucket truck without the need for closure of a traffic lane. We will complement this design by widening the shoulder at these points so that the outriggers of the bucket truck can be safely deployed without extending into the adjacent travel lane.

Similarly, we will look for opportunities to provide minor shoulder widening in the vicinity of the CCTVs, Shoulder Lane Monitoring Cameras, Type 3 Lane Control Signals and DMS units, so that vehicles that are stopped for maintenance activities at these units will be further away from the adjacent travel lane. These widened shoulders at ITS cameras and DMS units were incorporated into Segment C of the ICC which was designed by the Midasco team.

4.4: PROJECT APPROACH

For ease of design and construction, we've divided the 34-mile Active Traffic Management project into four segments, allowing us to effectively account for existing conditions, project constraints, right-of-way availability, traffic volumes, review requirements and agency involvement, and specific project components, each of which differ between the individual segments.

As shown on the preliminary project schedule provided in Section 4.6, design will be completed reflecting separation of the project into four segments, with the exception of the ITS Plan which will be completed as a separate but complete package, in recognition of the need to develop a system wide concept for the entire length of the project. Plans for the four segments will each contain all roadway, grading, and drainage improvements, staging areas in Segments A and C, as well as all details for structure improvements.

Design of Segments A, C and the ITS Plan will begin immediately upon notice to proceed. Initiating design in Segment A immediately is based on the desire to start work as early as possible and in advance of construction work associated with the widening of I-66 from the west end of the project to Route 15. Initiating design of Segment C immediately is required in recognition of the additional involvement required from WMATA, and the constraints of this section of roadway, which include higher traffic volumes and the most restrictive work areas on the entire project. Design of the ITS Plan, including development of the overall preliminary concept for the entire corridor and additional reviews from multiple agencies, will also be initiated as early as possible. Design of Segments B and D will be initiated after Segments A and C are underway, and will be coordinated with the advanced stage of design of Segments A and C. Regardless of the staging of design, each of the four segments will be coordinated, along with the overall ITS design, so that the entire system functions seamlessly and is integrated from end-to-end upon completion. Provided below is a description of how our team plans to implement and complete each element of the project, providing an efficient and reliable traffic management system for the entire length of the project while minimizing impacts to the travelling public during construction.

4.4.1: ITS Deployment Management:

Our segmented approach is the best way to minimize traffic disruptions. Starting at the westernmost point of the project limit and moving east, we have the following divisions *(right)*:

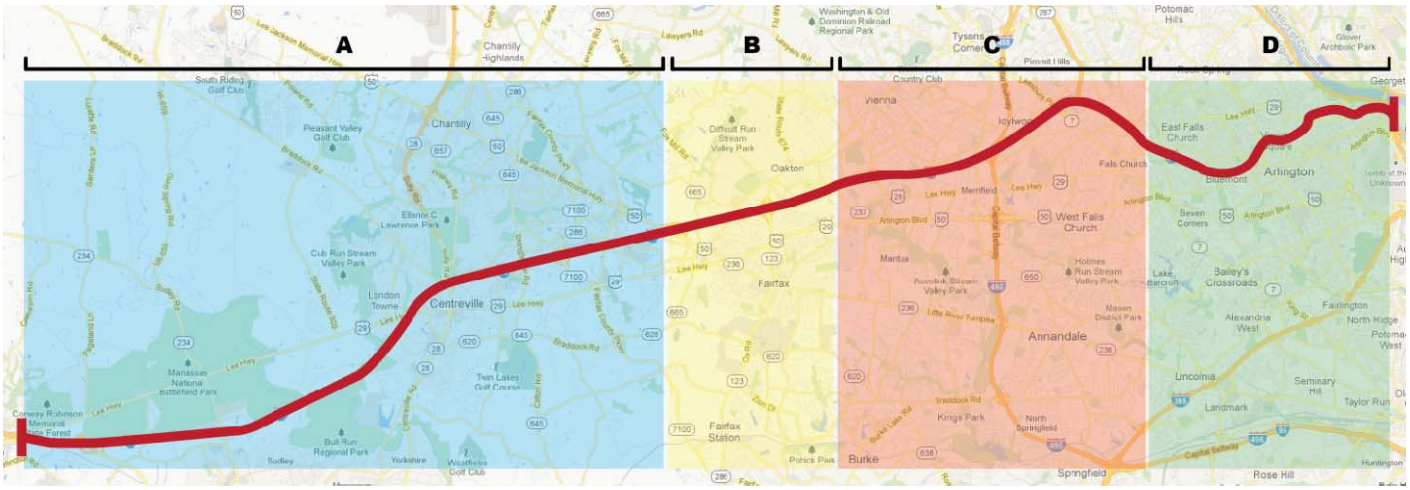
SEGMENT	DESCRIPTION	MILES
A	Route 15 to Route 50	16.6
B	Route 50 to VA 655, Blake Lane	3.5
C	VA 655, Blake Lane to Westmoreland Street	6.9
D	Westmoreland Street - DC Line / Potomac River	7.0

Segmenting allows for independent reviews along with early openings of portions of the project and minimize potential review durations with WMATA and VDOT. This is best illustrated in Segment C, which incorporates the entire WMATA section required to submit for review. We anticipate that this section will have the longest overall review duration, and that it will still be in review when the Ready for Construction (RFC) plans have been released for the other sections. By establishing this area as a separate segment we will be able to proceed with construction in the remaining areas. Beginning work on Section C last will also reduce the time period for potential conflicts with the final work activities of the I-495 HOT Lanes project.

In addition to mitigating the impacts of extended reviews by WMATA and VDOT, the segments also let our crews work in certain areas at the right time of year, minimally affecting the daily traffic. Segments A and B being within moderately less congested areas along the I-66 corridor lets us work these areas during the winter, when traffic issues typically arise. From an ease of constructability standpoint, Segment A presents the fewest challenges, based on historic traffic volume, workable area, and ITS equipment installed. On the eastern side, Segment D is a difficult segment because of the tight project corridor, and historically high traffic volumes.

We briefly summarize below each segment of the projected ITS deployment, along with our construction practices and management strategies for each. For more detail on our construction strategies, see **Section 4.5.1 Sequence of Construction**.

Figure 4.4-1: Map of the Project



Segment A – ITS Deployment Management

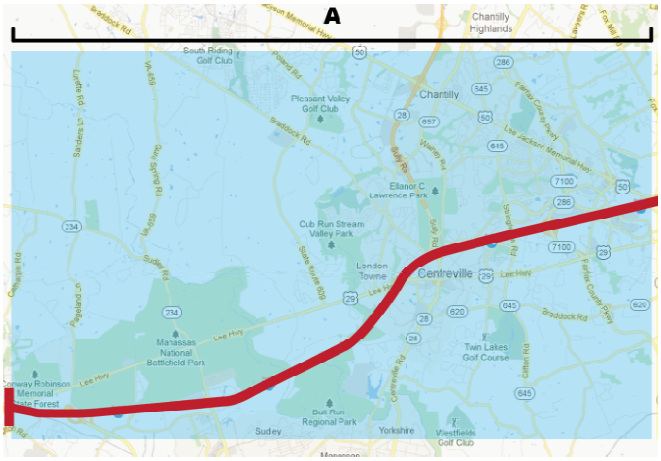
Segment A should be the least challenging for both design and construction. Its lower traffic volumes, the large work areas, and minimal ITS equipment to be installed, Segment A should allow for efficient construction with minimal negative impacts to the traveling public. Because it incorporates only a modest amount of new equipment, this Segment also allows for a quick design and review process: we can "hit the ground running" soon. Any unanticipated challenges presented during design or construction will be readily resolved with minimal impacts to both the schedule and the traveling public. Our intent is to use Segment A as a launching pad for our team – to find a steady, sustainable project tempo that will set the tone for the rest of the project.

One aspect to note within this Segment (**Figure 4.4-2**, *right*) is the required coordination between our crews and crews from the concurrent I-66 Widening Project. Since certain work areas on these two projects overlap, communication between our team and the contractor selected for the Widening Project will be key. Although mitigating any possible overlapping will be one of our main management strategies, we don't foresee this being an issue due to our segmented approach, as we will be able to properly coordinate. If an event occurred where crews are planned to overlap, our approach and design allows for crews to work effectively elsewhere.

The following table highlights the characteristics of Segment A's ITS construction deployment, broken down by individual ITS devices and subsystems. Some of the proposed ITS components are not included the table below.

SEGMENT A – ITS DEPLOYMENT MANAGEMENT APPROACH	
ITS DEVICES	**CONSTRUCTION CHARACTERISTICS**
Shoulder Lane Monitoring	No new equipment will be constructed within this segment.
Lane Control Signals	No new equipment will be constructed within this segment.
Video Detection / CCTV	Open corridors, limited barriers, and ample right-of-way allow for ease of video detection and CCTV installation.
Communication Network	Open corridors, limited barriers, and ample right-of-way allow for ease of communication network installation.
Emergency Pull-off / Staging	Ample right-of-way and work space allow for easy construction.
Auxiliary Power	Open corridors, limited barriers, and ample right-of-way allow for ease of auxiliary power installation.
Dynamic Message Signs (DMS)	Shoulder installation and minimal need for lane closures make installations of DMS in this segment simple and efficient.

Figure 4.4-2: Map of Segment A



Segment B – ITS Deployment Management

As we move east into Segment B, traffic volumes increase resulting in the need for a construction approach more sensitive to time-of-day to limit possible traffic delays. Segment B also includes installation of the Shoulder Lane Monitoring Cameras (SLMC), as well as Lane Control Signals (LCS). By ending this segment at Blake Lane, we avoid challenging and extended WMATA reviews from the critical path of the schedule, as the WMATA railway section begins just to the east of Blake Lane. We address our strategy to work with WMATA's review process as effectively as possible within Segment C.

The installation of SLMS and LCS beginning along this Segment (**Figure 4.4-3**, *right*) combined with tighter work spaced and increased traffic, drastically increases the need for experienced project management. Properly managing the installation of every device while focusing on traffic delays and safety is vital here. However, our crews' familiarity with working in tight corridors in the Northern Virginia area makes us confident of our proficient construction procedures.

The adjacent table (*right*) shows the characteristics of Segment B's ITS construction deployment broken down by individual devices and subsystems. Some proposed components are not included within this segment, as stated below.

SEGMENT B – ITS DEPLOYMENT MANAGEMENT APPROACH	
ITS DEVICES	**CONSTRUCTION CHARACTERISTICS**
Shoulder Lane Monitoring	Camera placement designed to allow for sufficient work space. Use of PTZ cameras will reduce required time to adjust cameras during installation.
Lane Control Signals	Absence of reviews by WMATA should speed up the installation throughout this segment.
Video Detection / CCTV	Limited number of installations required (estimated 1 video detection / 1 CCTV unit).
Communication Network	New conduit and fiber is being proposed in open areas with no WMATA or other major constraints.
Emergency Pull-off / Staging	No staging areas provided in Segment. Any equipment or material will be stored and assembled (when possible) at Midasco's Manassas office.
Auxiliary Power	Estimated 1 new auxiliary power unit being proposed in an open area near an off ramp. Foresee no construction constraints.
Dynamic Message Signs (DMS)	Smaller overhead structure span lengths and sufficient median space allow for straightforward installation. No reviews by WMATA required within this Segment.

Figure 4.4-3: Map of Segment B

Segment C – ITS Deployment Management

Though Segment C is adjacent to Segment B, we expect to begin it last. Based on prior construction work in this area, we anticipate upcoming challenges associated with sections of severely restricted right-of-way as well as with WMATA and their permitting process, which can pose threats to the critical path. There is little doubt that Segment C is the most challenging from both design and construction standpoints To our advantage, both Midasco and Dewberry have in the past successfully worked with both WMATA and VDOT in resolving schedule threats. Having a good understanding of WMATA's procedures and requirements adds value to our proposal.

As we foresee this section taking the longest to process through reviews, our approach is to mitigate possible delays by containing the entire WMATA area into one segment. By segregating the area required to be reviewed by WMATA due to proposed construction within and adjacent to their right-of-way, we are reducing the WMATA impact to the entire project, thus allowing us to work within the largest areas without their review. Construction crews will implement work through Segments A, B, and D while Segment C is under design and review.

The adjacent table (*right*) shows the characteristics of Segment C's ITS construction deployment broken down by individual devices and subsystems.

SEGMENT C – ITS DEPLOYMENT MANAGEMENT APPROACH	
ITS DEVICES	**CONSTRUCTION CHARACTERISTICS**
Shoulder Lane Monitoring	Camera placement has been properly designed to allow for sufficient work space. The use of Pan-Tilt-Zoom (PTZ) cameras in certain areas will reduce the time required for adjusting cameras during installation.
Lane Control Signals	Combine entire WMATA section into one package for review and permitting, reducing possible setbacks for construction.
Video Detection / CCTV	80' CCTV poles within Segment C will contain camera lowering device for ease of maintenance. Point/Tilt/Zoom cameras are also being considered for this Segment.
Communication Network	Proposed using all new equipment and controllers to allow for existing system to stay running while proposed system is being installed. Proposing running new conduit along retaining wall to match existing layout.
Emergency Pull-off / Staging	Proposed 2 staging areas to allow for proper storage of materials; however, Midasco's facility in Manassas will house most, if not all, of the needed materials.
Auxiliary Power	Proposed 1 auxiliary power unit in open location behind existing barrier. No foreseeable construction issues.
Dynamic Message Signs (DMS)	Combine entire WMATA section into one package for review and permitting, reducing possible setbacks for construction.

Figure 4.4-4: Map of Segment C

Segment D – ITS Deployment Management

Originally considered one of the most technically challenging sections, as it is "Inside the Beltway," we actually don't foresee construction along Segment D presenting serious challenges, even given the constraints of limited work space, heavy congestion, and heavy utilities. Since no structures or new work approaches the WMATA right-of-way, Midasco doesn't foresee significant delays with reviews or permitting. However, due to the heavy congestion, we intend to do most of this segment at night and/or on weekends to minimize lane closures and possible negative traffic impacts. By planning for this segment's implementation later in the schedule, we are attempting to allow for the completion of the current I-495 Express Lanes project when all of their work zones are closed out.

One of the biggest challenges with this Segment (**Figure 4.4-5**, *right*) is the installation of the new communication network. With existing conduit, barrier, and other utilities heavily saturating the area, the availability of space for new conduit is extremely sparse. However, by implementing techniques that are currently in place within the area for current systems (i.e. running conduit along retaining walls); we intend to install the new communications network with little impact to the surroundings.

The next table (*right*) shows the characteristics of Segment D's ITS construction deployment broken down by individual devices and subsystems. Some of the proposed components are not included within this segment, as stated below.

SEGMENT D – ITS DEPLOYMENT MANAGEMENT APPROACH	
ITS DEVICES	**CONSTRUCTION CHARACTERISTICS**
Shoulder Lane Monitoring	No new equipment will be constructed within this segment.
Lane Control Signals	No new equipment will be constructed within this segment.
Video Detection / CCTV	Video detection cameras will be installed outside the shoulder only – no median installation will be required. Camera lowering devices may be installed on certain poles for ease of maintenance.
Communication Network	Though challenges are presented, the use of unique construction methods – such as installing conduct behind concrete barrier and possibly within the barrier – will be implemented.
Emergency Pull-off / Staging	No emergency pull-off/staging areas included within this segment.
Auxiliary Power	No auxiliary power sites are included within this segment.
Dynamic Message Signs (DMS)	DMS's will be installed outside the shoulder only – no median installation will be required. Will be installed on butterfly mount leaving small area required for construction.

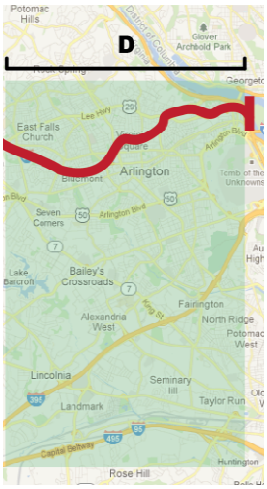


Figure 4.4-5: Map of Segment D

Techniques for Expediting Construction – Methods for expediting construction can revolutionize a project by minimizing the negative impacts associated with working along a major highway like I-66. With all of the complexities by which we are constrained, reducing impacts and expediting construction will be integral to a successful project.

Working along one of the most congested highways in the nation is a challenge not faced by most contractors. Through our past work experience, we've worked along many major roadways in the Mid-Atlantic region. We know how to do this work and do it well. We understand that the faster we're finished, the quicker the traveling public has an improved road to enjoy. One of our chief tools is a well thought-out Type B Transportation Management Plan (TMP) with Temporary Traffic Control (TTC) plans to maximize the safety of the traveling public and construction personnel. Many of Midasco's current and past projects involved working along major Northern Virginia highways, such as I-95, I-495, and I-66. This wealth of relevant project experience in the region gives us insights only gained through direct experience, including the understanding of how successful TTC should be set up and how congested traffic will respond. Our team is primed for responding to the shifting changes in the traveling public's response to the project's implementation.

In parallel with implementing proper TTC procedures, we realize the importance of maximizing the window of opportunity any lane and ramp closures offer to the fullest extent possible. For instance, if and when a lane or ramp closure is required, we intend to perform as much work within that small zone as possible. We intend to have crews from multiple disciplines (electrical, conduit, foundation, ITS, etc.) working in sync, to maximize our construction work space. One aspect of Midasco that we believe stands out above our competitors is our experience in working in such closely coordinated spaces to get the job done in a safe and professional manner.

As is the case on many other mega-highway projects, the construction windows of area and time when we're permitted to work without delays and fines are very small. By fielding an experienced TTC crew capable of mobilizing and demobilizing when necessary, we anticipate negligible impacts on the traveling public. Through proper implementation of a well-planned TTC, we intend to minimize any risks that may present themselves during construction.

Another way we'll expedite construction of the ITS devices, as previously mentioned, is by using Pan/Tilt/Zoom (PTZ) cameras in certain areas for the Shoulder Lane Monitoring System (SLMS). PTZ cameras can be adjusted remotely, rather than in the field, resulting in faster installation and less time required for possible lane and shoulder closures. PTZ cameras also allow remote maintenance, eliminating traffic impacts. The great benefit of such devices, at such minimal cost, is something that we carefully considered and strongly recommend.

Steps for Managing Equipment Procurement – Equipment management is a tightly integrated component of Midasco's project management duties. From our experience, we know well that proficient and timely equipment and materials management is critical to a project of this complexity and schedule.

The key to timely project completion is appropriately staged and readily available equipment and materials. After thoroughly studying the project's schedule, we understand how compressed the actual construction window is. We'll have to closely manage the staging of materials and equipment, and mitigate any foreseeable issues, as expediently as possible. Any long lead-times for materials need to be formally discussed and resolved during the design phase so as to prevent construction delays.

Below are steps our crews will take for managing equipment procurement and material handling.

- **Material Testing Offsite.** When feasible, material tests, including equipment bench tests, will be done at our office and staging area in the Manassas area. Testing can be performed in a climate controlled area as well as outdoors, depending on the equipment.
- **Equipment Installation and Storage Offsite.** When feasible, it is our intent to build any devices offsite at our Manassas facility. By keeping these offsite, we not only reduce the space required to construct, but also can ensure everything is constructed properly and under a safe and secure environment. Also, by sending material to our facility, we can ensure all materials are undamaged and meet requirements. Once approved, materials can quickly be transported to the nearby site.
- **Close Relations with Suppliers.** Through many projects in the region over the past decade, we've gained a close and open relationship with many regional suppliers and vendors, including DBE suppliers. Having such a network allows for efficient communication on both ends, which often results in timely delivery of materials and equipment.
- **Daily Updating of Material Logs.** Project teams are proficient in keeping a running log of material submittals, updates, and schedules as part of their projects. These logs are shared to ensure that every member of the project team understands the material schedules, which are updated daily by the project administrator and the construction supervisor. These logs are implemented from the design phase, through the submittal phase, up until completion.
- **Quality Control of Materials.** Midasco's material management is integrated into our quality control program. By ensuring that materials are ordered and shipped correctly, we reduce the possibility of delays. Also, by ensuring quality control on all submittals through checklists and reviews, our teams work to get everything approved on the first submittal.

Managing Material Process – Midasco's material management is a two-step process. The first occurs during the design phase, when materials are selected based on specific guidelines, their costs estimated and brought to the table, and availability determined. Managing materials in the design phase is of the utmost importance, since it not only affects project costs but also the logistics of how the materials will be ordered.

The second step occurs during construction, when the plans put in place during the first step of design become actions. Implementing the original plans and managing materials through construction is required for this project to stay on task with the tight construction schedule.

Successful materials management relies on the skills of many professionals from the designers to the construction supervisors. The table below identifies the key people associated with our material management plan and the roles they play in effective management, from pre-construction through construction.

Design Involvement of Materials Management During Design	
Team Member	**Roles in Material Management**
Design Manager	Ensures appropriate component dimensions, quality and spacing for use of standard fasteners and materials for multiple applications, and all ITS equipment and mounting procedures to be used. Specifies materials with short lead times and availability.
Project Estimator	Uses latest materials takeoff technologies and exercises accuracy in estimates. Uses local suppliers to obtain costs and price the project.
Material Purchaser	Plans purchases & deliveries to reduce surplus & to balance materials maintenance (on-site storage versus transportation energy consumption).

The next table specifies the people who actually use the materials. Even though they're directly associated with construction management, they all participate in the planning process as well, since they know first-hand the actual site and working conditions.

Construction Involvement of Material Management during Construction	
Team Member	**Roles in Material Management**
Construction Manager	Applies the materials management plan to the site and oversees its implementation. Takes into consideration physical space available and ensures subcontractors are familiar with and committed to the plan.
Material Purchaser	Keeps track of new materials, cuts, and used materials; organizes and stores them for availability by the various trades throughout the project in accordance with the materials management plan.
Subcontract Management	Communicates with site management and Construction Manager about the types of materials they may be able to use for various purposes, even if temporarily. Ensures trades follow the plan's practices.
Construction Supervisors	Use materials properly, store new materials properly, handle and cut them carefully for maximum use and minimum waste. Consider using cuts before new pieces.

One of the strongest points of our materials management plan is the location and logistics of our Manassas-area office. This office, conveniently near the I-66 corridor, not only houses the project teams for all of Northern Virginia, but also encompasses roughly five acres of available storage area for project materials and equipment. Having such an ideal storage area within the project limits adds great value to the Midasco team, which in turn creates project savings for VDOT.

Part of our materials management plan involves storing all equipment at our office in Manassas and transporting it to the project on an as-needed basis. By so doing, we can

- Reduce possible material delays by ensuring materials are always available by pre-ordering and storing at Midasco's secure storage area;
- Reduce the need for storage and staging areas along I-66, allowing for more room for equipment, machines, and crews;
- Reduce impacts to the traveling public;
- Ensure the materials meet the requirements of the project before transporting, thus reducing the possibility and costly removal of faulty products;
- Inspect all materials before installation to get a better understanding of how they'll be installed; and
- Secure the materials within their protected office and staging area to prevent theft.

Tests for Compatibility and Functionality – A large part of our team's Quality Assurance program involves testing for compatibility and functionality. Our requirements address the methodology, controls, processes, and responsibilities the quality control people will implement throughout the project. Project procedures for inspection and testing include receiving inspection and testing, in-process inspection and testing, and final inspection and testing. Detailed project procedures will establish responsibilities, authorities, and controls needed for each inspection and test function. The criteria for each inspection and test method will be referenced to the appropriate manual, test method, contract requirement, or product specification. Documentation

produced from inspection and testing is reported, approved, collected, and distributed in a consistent and controlled way.

We have worked with VDOT on other mega-projects over the past few years and understands how VDOT expects their equipment and materials testing to be done. The inspection, measuring, and test equipment we use will show our conformance to specified project test requirements. This equipment will be used in a way that ensures that the measurement is consistent with its capability. Project procedures will outline the method of calibration and its frequency, approval, and record keeping. We will control the testing system to ensure that VDOT is up-to-date on key testing and inspection results, but not bogged down with small details.

Coordination of Concurrent Activities – Our project team will carefully plan and manage its work so as not to run afoul of concurrent construction activities along I-66. A crucial aspect of this will include constant communication with VDOT officials to determine where other work is going on in the area. By keeping a running log on concurrent work along I-66, we will try to minimize any possible overlaps in a certain area to reduce the number of work zones. We intend to properly coordinate all concurrent activities by

- Incorporating any prior knowledge of concurrent projects into the design and construction schedule. (For example, not working along the Beltway section until the I-495 Express Lanes project is completed);
- Coordinating daily, or as needed, with VDOT on a schedule that works best for VDOT and our project management with the least amount of interruptions;
- Posting any information, including nearby work zones, on trailer work board, project website, and VDOT information sites; and
- Creating daily, three-week, and overall critical path method schedules for all construction activities and locations, and sharing them with all necessary parties.

We understand that concurrent activities along the corridor are expected, especially with the I-66 Widening Project from Gainesville to Haymarket. We also understand that their working areas will most likely be within ours. Our plan to mitigate this issue isn't to wait until they're finished and then move in, but rather to work alongside them when feasible to keep both projects on schedule.

Unique Resource – VDOT experience which our team brings to the table, more than any other team, is our immense experience on similar VDOT design-build projects. Having worked with VDOT on both design and construction projects continuously throughout the past decade, our team has the people who understand how VDOT operates and the techniques and approach they expect from their customers. Having that understanding and experience is something you can't put a price tag on; it's a unique resource of our team.

Our certified and trained technicians bring extensive field experience successfully installing and integrating ITS devices into the existing VDOT network. Through previous widespread work, our technicians have gained a strong knowledge of the existing VDOT network, being mindful of legacy equipment while implementing new solutions. In addition to our in-house capabilities, our vast network of suppliers who have experience with VDOT procurement will furnish the needed equipment and also look to cutting-edge equipment when that's what VDOT asks for.

Having these knowledgeable people on staff – not needing to engage their services through the use of subcontractors and consultants – reduces any communication issues that may occur between the integration of the electrical components and the infrastructure equipment. With communication being the number one requirement throughout the life of the project, integrating these capabilities efficiently within our own crews can lead to huge cost savings and ease of scheduling.

GPS Location of Devices – Another unique resource we bring is the ability, through the use of GPS surveying, to locate and document every new piece of equipment and infrastructure we install, including conduit systems, foundations, and other ITS devices, and to collect these coordinates for future red-line plans. Since exact locations of existing infrastructure within the corridor is a huge question, we believe that locating all new equipment adds tremendous value to VDOT for future projects. Having the exact coordinates of new equipment, VDOT will know where equipment has been installed to the nearest inch. VDOT can then easily put these redline plans into any CADD program.

Contingency Plans for Proposed Deployment – A large part of this project, during both design and construction, involves always having a backup contingency plan that can be implemented quickly and safely. These practices are preached to our teams daily to mitigate any possible project risks.

In addition to having Midasco's supervisors continuously monitor the proposed systems and maintain contingencies, the project's Quality Assurance Manager (QAM), a third party consultant, will be responsible for ensuring the inspection, integration, and testing plan is properly executed and reported. By having a system of essential checks and balances installed within the in-service maintenance plan, our team will be able to ensure that all risks are properly mitigated and a back-up plan is in place.

In-Service Maintenance Plans – We will develop in service maintenance plans for all equipment based on the best available information from the manufactures, vendors and our own experience with these units on other projects. We will also seek to identify ways that preventive maintenance can be performed on clusters of equipment in the same area during a closure of the roadway shoulder, and ways in which the capabilities of the equipment can be used to cross-check the operation of other equipment. For example: using the shoulder lane cameras to cross check the operation of the Lane Control signals, DMS and SDMS units and using the Shoulder Lane Monitoring Software to verify the operation of the MVDS.

4.4.2: ITS Operation Continuity

Because a construction project with such extensive ITS operations involves risk from both the design and implementation perspectives, it's critical to identify, manage, and mitigate risks at each segment of the project. This section identifies high-level risks associated with the project's successful ITS operations execution and a description of the risk-mitigation and management approach we intend to apply.

In addition, this section discusses general ITS risk-mitigation and allocation strategies and the management plan to mitigate those risks. In summary, this section provides the following:

- **Identification of key risks.** This section discusses key identified ITS operation risks, consolidated into categories for ease of presentation. The purpose of identifying risks is to assess and

understand them so that mitigation plans, risk allocation strategies, and risk management processes can be appropriately applied.

- **Risk mitigation and allocation strategies**. This section discusses initial risk mitigation strategies for the key risks. In determining and implementing the most appropriate risk mitigation strategies, we've drawn heavily on previous projects and their lessons learned. These general approaches include issues involving traffic control, shoulder lanes, existing equipment, and general construction activities.
- **Risk management plan and processes**. This section discusses processes to manage and monitor risk throughout the project's life cycle.

4.4.2 (a) Construction the Project with Minimum Disturbance to Critical Operations

We also believe our segmented design and construction approach mitigates the high-level risk associated with travel times on I-66. By dividing the project into four separate segments, we are essentially making our approach toward the project as efficient as possible. As a result to our proposed efficient approach, we foresee interruptions to the traveling public along I-66 to be minimal, especially during peak hours. Through the use of maximizing any required ramp and lane closures with multiple crews, we intend to keep disruptions to traffic flow at a minimal.

Targeting historic bottleneck areas along the project will be an integral part of our construction schedule. Noting these highly congested areas and their heavy traffic times will be done by our team and incorporated into our construction schedule. Work hours will be determined around these congested hours to mitigate any possible delays in travel times to the traveling public.

Our team is also aware of the possible risks to HOV gates along I-66. These gates and gate groups are used to reverse HOV lanes to accommodate the traffic flow heading east in the morning and west in the afternoon. Our construction approach will not have any impacts on these gates and their established schedules. We understand the dire importance of proper utilization of these HOV lanes and the impact any construction limitations would put on the current traffic model. By keeping that concept in the forefront of our approach, we intend to not impact these gates by any means; keeping them on schedule for the entire duration of the project.

4.4.2 (b) Beneficial Use of ATMS Equipment

As previously explained construction of Segment C will be last to begin and is expected to have the most potential impact on traffic. One benefit of this construction sequence is that work in the other Segments will be well underway and we may be able to make beneficial use of the DMS and SDMS units that are installed in these segments by placing useful messages that will inform motorists of upcoming construction activities and current traffic conditions. In addition the cameras and TrafficVision software in Section B may be activated early enough so that they may also be useful. It is anticipated that these systems would be controlled and monitored at a project trailer set-up in the I-66 corridor.

4.4.2(c) Mitigating Disruptions to Critical Operations and Avoiding/Reducing Conflicts with Legacy Equipment

Part of our strategy is to minimize conflicts with existing legacy equipment. We strongly believe that to mitigate our risks to the greatest extent possible, we must integrate with existing equipment in as few locations as possible, and then only at communications hubs and equipment cabinets. Our integration plans include being as efficient as possible, tying in only at the necessary equipment cabinets to reduce the number of cabinets that must be brought up to new VDOT standards. Once we tie into the necessary equipment cabinets, we'll install new conduit, fiber and cabinets for the new field equipment which will limit our exposure to existing equipment. For example: in the areas between Route 50 and the I-495 interchange we will be installing entirely new communications rings of conduits, fiber, cabinets, switches, and field components, and will be integrating these new ITS elements with the existing components at the node cabinets with the Level 3 switches. At the Ramp Metering locations, we will install and test new conduit, fiber, RMVDs, and a new equipment cabinet, again minimizing the integration of old and new equipment.

By reducing our impacts with legacy equipment, we foresee essential cost and time savings that can be multiplied throughout the project. By giving VDOT this lowest-cost solution to this issue, we can assure efficient performance, which is of the utmost importance to our team.

In addition to tying into existing cabinets, we must also to tie into VDOT's fiber backbone Level 3 switches, which we must test, accept, and maintain for the entire duration of the project. We also intend to place all new fiber optic drop cables in new conduit, rather than use existing available conduit adjacent to I-66. This will reduce any accountability issues and also ensure a working system for the new network. We'll also install the new fiber optic cable system in accordance with the VDOT Special Provisions specified in the RFP.

Another major area of concern with this project from day one has been the use of the existing conduit system. As a means of mitigation, we have decided not to utilize the existing conduit between Route 50 and the I-495 interchange as there appear to be too many unknowns and concerns with its use. Since the existing conduit system will not be used, we intend to install new conduit along the project, where required.

For underground conduit, we intend to utilize available space along the I-66 corridor. By adhering to VDOT specifications, we foresee there to be ample right-of-way and available space to install this new conduit without any problems. In areas where installing underground conduit doesn't seem feasible, we have come up with certain means to alleviate any problems. For example, within the WMATA section (contained within Segments C and D) along I-66 where underground conduit doesn't seem feasible, our approach is to run the proposed wiring system along the overhead structures to get from one side of the highway to the other. This will avoid the need for direction drilling under the WMATA railway section.

When conduit cannot be installed underground, we have created a plan to install the conduit above ground to match certain systems currently in place. The proposed conduit system will be installed running conduit along the retaining walls. This proposed approach matches what is currently in place along I-66 and provides our crews with a suitable approach to the proposed system.

4.4.3: Utilities

Establishing internal administrative procedures for utility coordination is vital in promoting timely communication and cooperation between us and affected utility owners during project design and construction. It also helps promote successful scheduling of utility relocation to avoid delays and added costs of construction conflicts. By establishing early communications with the utility owners, we anticipate mitigating any possible utility conflicts, which often result in possible delays in construction. Instituting these early communications and having a meticulous awareness of the utility systems currently in place is something that our team will incorporate into the design and construction of this project.

We are dedicated to completing any required utility relocations without any utility-related disputes or delays. We'll do this by establishing partnerships with the utility owners and engaging them in our planning efforts. We'll also continually share ideas and communicate with them to keep all utilities within the corridor informed.

In essence, our coordination with the utility owners will include

- Indentifying potential utility conflicts throughout the project;
- Effectively communicating with utility owners to plan any required adjustments and/or relocations; and
- Coordinating utility adjustments and/or relocations during design as well as construction.

Through proper mitigation strategies, it is our team's plan to work closely with these utility owners during construction to reach proper resolutions and protect their facilities.

The first step in mitigation of utility conflicts is understanding the existing system. To understand what's currently in place, we need first to establish who the involved utility owners are throughout the project. The table below shows the franchised utility companies that may be affected by the project:

Instituting open communications early in the design phase is vital. Working in this general area over the past decade, both Midasco and Dewberry have become familiar with and established relationships all these companies. Working with our contacts allows us to maximize on opportunities to use readily available tie-in points for utility expansions.

To our advantage, many of the members of our team have worked on projects along the I-66 corridor, including various widening and improvement projects, and know what actually exists in the field. Having this strong awareness in place gives a strong backbone to our approach.

Utility Owners Affected by Project						
Location (County)	**Water**	**Sewer**	**Gas**	**Electric**	**CATV**	**Telephone**
Arlington	Utility and Streets Bureau	Utility and Streets Bureau	Washington Gas	Dominion Power	Comcast Cox Verizon	Verizon
Fairfax	Fairfax Water Public Utility Depart.	Fairfax County WM	Washington Gas Columbia Gas	Dominion Power NOVEC	Comcast Cox Verizon	Verizon AT&T
Prince William	Service Authority	Service Authority	Washington Gas Columbia Gas	Dominion Power NOVEC	Comcast Cox Verizon	GTE Verizon AT&T

4.4.4: Quality Assurance/Quality Control (QA/QC)

The Midasco team recognizes the significance of a design-build project compared to typical projects, as additional mitigations of risks are often required. This section describes our team's approach to mitigation and to ensuring a successful quality program throughout the life of the project. This approach includes

- Understanding VDOT's expectations and our team's responsibilities in managing Quality Assurance and Quality Control (QA/QC);
- Highlighting the measures necessary to establish the independence of the QA/QC role from other project functions;
- Describing our approach to QA/QC during both design and construction; and
- Recognizing our personal accountability for our team through proper management and communication.

The following sections describe our approach in further detail, by highlighting our quality program, the roles and responsibilities of the Quality Managers (QM), and the quality plans they will use to control work. Our commitment to quality starts with the management team and extends to everyone on the project through continual communication.

One important issue to note in our quality plan is that safety is the foundation of everything. Without safety, the effectiveness of our management has no legs to stand on. Quality affects not only aesthetics, appearance, and durability, but also performance. Failures due to poor quality always cost dollars and time, but can also even result in serious injury. Implementing safety as the backbone of our QA/QC plan is what we've done in the past and will do now and always.

A high-quality project doesn't happen automatically. It must be intentional, and resources must be properly used to ensure that quality happens on purpose. Our quality plan is based on systematic approach that looks at every detail, from design through construction.

Quality Assurance – Design – Our team starts but doesn't end with implementation of VDOT's Minimum Quality Control & Quality Assurance Requirements for Design Build & Public-Private Transportation Act Projects, which we've successfully implemented on numerous significant and complex projects. To ensure the QA/QC requirements are met, each of our team's primary members, including designers and contractors, as well as subconsultants, subcontractors, and suppliers, will be required to follow the same QA/QC guidelines and requirements. Our proper implementation of the QA/QC program and close coordination between project staff and VDOT staff will ensure that the required standards and specifications are adhered to, and that VDOT will have to perform only minimal QA oversight for completion of a successful project avoiding the need or likelihood of VDOT to expand their contract administration efforts.

Design QA/QC Procedures – As shown on our team's organizational structure, the design manager, Steve Kuntz, will be responsible for oversight of all design disciplines and will ensure that each design discipline properly coordinates with others. He'll also be responsible for ensuring proper implementation of the design QA/QC plan for all design elements. Steve will be responsible for final certifications and for signing and sealing of the plan submission packages. As required by the VDOT QA/QC

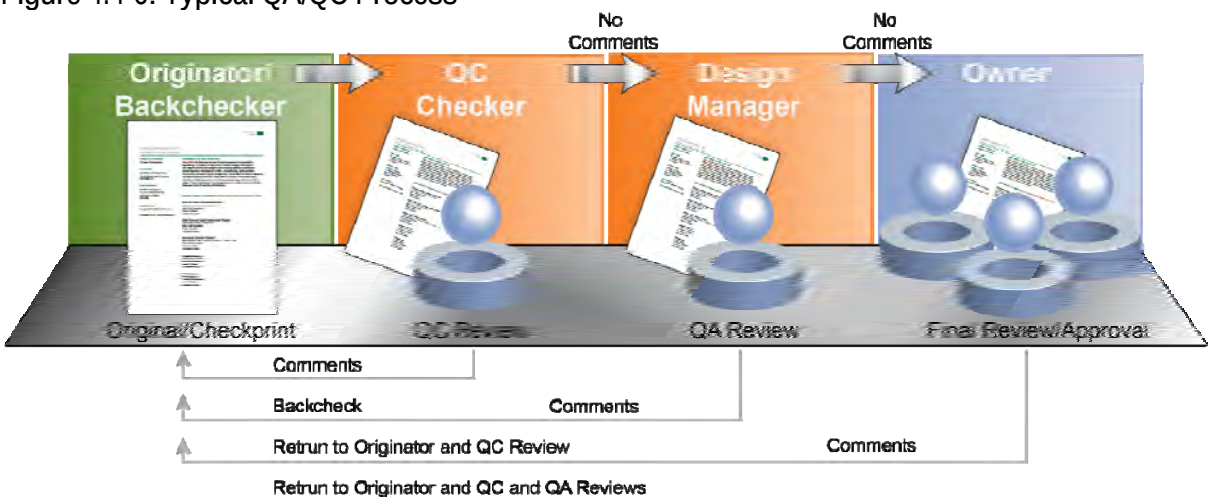
requirements, our design team will use separate QA and QC reviewers to ensure designs and submittals conform with contract requirements and meet the needs of the project design. Our design QA will be led by a professional engineer with more than 15 years of experience, much of it on VDOT projects, who will be responsible for ensuring that all QC checks and reviews are completed before completing a final QA review of the plans. QC checks will be completed throughout the design process by competent, senior-level staff not involved in the day-to-day design of the project elements they review. The general flow of the QA/QC process is illustrated in **Figure 4.4-6** *(below)***.**

At the outset of design, regular meetings will be held between all design discipline leads to ensure proper communication and coordination. This process will be formalized through weekly or bi-weekly meetings among the disciplines and will include construction staff at bi-weekly and monthly meetings. Informal coordination among design disciplines will occur daily via conferences and impromptu meetings between design staff and lead engineers to ensure early coordination of critical elements to prevent and avoid conflicts and rework.

Throughout the design phase, formal QC reviews will be completed before all milestone submissions and as design elements are completed. QC reviews will not only be completed on plan elements, but also on all computations, computer input data, and any studies or reports necessary as part of design, and QC reviewers will also ensure that the intended function of the design meets contract requirements and that all project-specific and VDOT standards and specifications are met. All QC reviews will be done by senior staff with no involvement in the day-to-day design but with knowledge of contract requirements and experience in the areas reviewed. Working with VDOT Administration Team and keeping them up-to-date on major decisions and design efforts will reduce VDOT's administration efforts.

All QC reviews will be documented on forms that identify the original comment, the response from the lead element designer, and final closure or acceptance of final modifications to the plans. Forms such as the VDOT LD-436 will also be used in completing the appropriate QC reviews. Following the QC review, the element designer and reviewer will meet to discuss all comments and determine the appropriate correction or modification required to address each comment. The designer will then incorporate any changes to the plans

Figure 4.4-6: Typical QA/QC Process



and respond in writing to all comments after they've been addressed and changes incorporated. Once all changes are made, the designer and QC reviewer will meet again to review the plans and ensure changes made satisfy the QC reviewer and properly address the original comment. Once all comments have been adequately addressed and changes made to the plans or appropriate document, the QC reviewer will sign-off on the final QC form, indicating that the QC is complete and ready for QA review. All QC review forms will be kept on file at Dewberry's Fairfax office.

This back-and-forth process will occur for each design discipline, but will not be limited to designer-only involvement. Our team, based on previous experience and successful design-build project execution, is keenly aware that involvement from construction staff, including suppliers for critical elements, is critical to achieving a complete and accurate design. For this reason, construction QC reviews will also be completed on all design documents and plans before submission to VDOT. Before each milestone submission, formal construction QC will start with submission of two hard copies of plans to construction staff, who will then formally review the plans, comment on the design or product documents, and return the comments to the designers for consideration, correction, and modifications. Comments from the construction review will be discussed at one of the formal coordination meetings between design and construction staff, who will reach resolution before submission of the plans to VDOT for review and approval.

Once the QC reviews by both design and construction staff are complete, all QC comments, forms, and final certifications will be submitted to the QA reviewer. As noted above, the design QA review will be completed by Mr. Jeremy Beck, PE. The intent of this formal QA review will be to

- Ensure accurate and proper review by the QC staff;
- Ensure complete and thorough review has been completed by QC staff;
- Ensure proper and complete inter-discipline reviews and coordination have been completed;
- Ensure the final design solutions and details are appropriate and cost effective;
- Compare final design details and the requirements of the contract documents to ensure the design falls within the scope of work, meets project criteria, and client expectations; and
- Verify proper application of PE seals on appropriate plan sheets and documents by the appropriate Virginia Professional Engineer.

After of the formal QA process, which will certify and verify completion of the appropriate and required QC process, and assurance that the plans and documents meet the intended requirements of the contract, the QA reviewer will report to the Design Manager that the plans are complete and ready for signature and submission to VDOT for review and approval. As verification of the QC and QA processes being completed before submission, all formal submissions to VDOT will be accompanied by the final QA sign-off sheet showing the project title and appropriate contract information, the specific elements reviewed, the level of plan completeness, and signatures by the QA reviewer and Design Manager. Copies of the VDOT LD-436 document, completed to the appropriate level based on submission stage, will accompany all formal submissions. This is a process that our team has performed on other large multi-discipline design-build

projects with proven success to in meeting project deadlines.

QA/QC Approach to Unique Design Element / Work Activity – This project has many unique and atypical elements. The element of work our team sees as the most unusual is the communications plan. The major steps in the development of this communications plan are as follows:

- Develop an overview plan of the locations of the devices identifying their longitudinal placement and also whether the cabinets will be located along the eastbound or westbound roadways. The overview plan will also be used to document db losses between cabinets/nodes.
- In Segments A, C (east of the I-495 interchange) and D, the new field equipment will be (for the most part) replacements for the existing field equipment. The existing cabinets supporting this field equipment will be replaced by new cabinets, and these new cabinets will be spliced into the existing fibers supporting the old cabinets, after the new equipment has been installed, powered and tested. New splices will be minimized to reduce fiber degradation. Where required, new communications rings will be established using spare fibers on VDOT's existing fiber-optic cables. The design plan will include testing the existing fiber to determine the existing losses and identify fiber that is compromised. (Both OTDR and power measurement tests will be included in the plan.) The new communications rings will tie into the existing MOXA Level 3 switches at the node cabinets through a new MOXA level 2 switch/ring masters. As part of the existing system validation check, we will document the existing Level 3 switch port connections to determine the existing capacity.
- Between Route 50 and the I-495 interchange new distribution cables will be used to link the new field equipment with the Level 3 switches. The number of rings that will be used will be based on the bandwidth requirements of the devices assigned to a ring and the capacity of the level 2 MOXA switch.
- Fiber-optic loss budgets will also be calculated for each ring to ensure that the signal strength losses do not exceed industry norms and VDOT requirements. Fiber optic splice diagrams will also be provided as part of the design deliverables.
- Special operational protocols for each vendors system (i.e. vehicle detection system) will be examined to identify cases where unusual network loading may arise and subsequently include those requirements into the network.
- A standardized methodology for fiber assignments will be incorporated into the design and switch port assignments will be documented.

Dewberry will address the QC need for detailed development of this communication plan by having this review performed by Paul Menichelli. Paul has a Degree in Electrical Engineering and Networks, has taken numerous training courses in communications, and has more than 25 years of experience performing ITS and communications projects. He recently completed the design for a NJDOT fiber optic communication by-pass to Verizon leased services as a strategy to eliminate

potential fiber optic cable failures resulting from the reconstruction of the I-295 / Route 42 / I-76 interchange in southern New Jersey. That project also included conversion of existing DMS and CCTV devices to IP based communications, new wireless IP radios, Travel Time systems, traffic signal systems and device integration into existing software. The design for the communications by-pass nodes included Cisco routers for NJDOT IT management and security. Remote devices communicating over leased facilities were also designed with routers for security using Network Address Translation. Our design will also be discussed with the various vendors of the equipment used to ensure that the field equipment will be compatible with the implementation of the ring configuration.

Construction Quality Assurance – Quality Assurance (QA) during construction takes a long-range view towards developing systems that produce high-quality work consistently over time. As with every good QA plan, part of Midasco's QA plan influences every aspect of the Company, from management down to the field operations. Our concept implies that if proper procedures, policies, and systems are institutionalized throughout the Company up front, the outcome at project level will be much more reliable. There are numerous practices in which this is preached within Midasco. A few of them are as follows:

- **Training Programs.** A commitment to quality requires a commitment to training. Midasco employees are consistently trained in the technical areas required to perform this type of work, including but not limited to OSHA safety training (various), IMSA Fiber Optic and Work Zone training, and Erosion and Sediment Control, Material Testing. By building training into our QA program, we're essentially creating an environment for consistent high performance.
- **Safety.** As previously mentioned, safety is the foundation of Midasco's QA plan for this and any project. These rules and regulations apply to all aspects of our work, including equipment use, material handling and storage, accident prevention, and personal protective equipment requirements. This single aspect is the biggest part of our QA plan, which can't and won't be compromised.
  - **Subcontractor Practices.** Our QA Plan for subcontractors starts before construction, when a project is estimated. The old adage "you get what you pay for" seems to be the case in today's construction world. To avoid issues that might compromise quality, we typically only work with subcontractors who we know can perform the work to our quality level, even if their price is a little higher than their competitors. This practice helps ensure quality throughout the job.
  - **Procurement Methods.** Many companies overlook the need for high-quality vendors. Within Midasco's procurement policy, the selection of quality vendors – typically those with whom we've worked in the past – is highly desirable. As part of our QA plan, we realize that poor performance by our vendors can sabotage our projects and our commitment to quality.
  - **Employee Incentives.** Midasco's management understands how to tell their employees about their commitment to quality. Recognizing and rewarding our employees for their commitment to safety and quality is a large part of our QA plan. By offering rewards to our

safest employees (based on yearly safety records), we are essentially putting money where our mouth is and rewarding the good work and high quality of our employees. Past rewards have included giveaways of a Ford pickup truck, weekend cruise, Harley Davidson, tool sets, and cash prizes funded through our administrative budget prices.

The team understands that construction is not a perfect science and that it would be impossible to produce a project without some sort of defect, complaints, or imperfections. There are too many variables to account for to achieve perfection. However, as part of our overall QA plan, we realize we must focus on a few primary objectives to ensure that quality and safety go hand in hand. By striving towards doing things right the first time, preventing things from going wrong, and continually improving, we point ourselves in the direction of success.

Quality Control Management – Construction – The team's Quality Control Plan (QCP) communicates the importance of a quality management system that fulfills customer expectations and meets contract requirements. The QCP identifies procedures for control of the design and construction processes necessary to achieve a final product fulfilling these criteria as well as communicating the results to responsible parties. The QCP also defines a uniform process approach to quality throughout the project, describes the reporting and documentation processes of the quality management system, and establishes appropriate responsibilities of the organization's staff. Within the system, subcontractors and suppliers are held accountable for the quality of their products.

The commitment to this QCP starts at the top. The objective of Midasco's management staff is to facilitate the overall progress of the project and to promote the effectiveness of the QCP. The Design-Build Project Manager, Gerry Grier, will oversee the implementation and improvement of this QCP. Management has given Gerry the responsibility and authority to implement, maintain, and improve the quality system. The quality control can at any time stop the work to reduce the likelihood of rework, replacement of work elements, or injury. Given Midasco's goal to "do it right the first time" and avoid rework or replacement, this ability to stop the work is an essential element in achieving the objectives of the QCP.

As noted earlier, the team foresees the most critical project element from a construction perspective to be the communication that will be required for this project. Even though communication is vital on every construction project, we believe that it is unique for this one because of the vast correspondence that will be required at all times throughout the life of the project. The communication flow chart for a project like this is extremely critical given so many and such highly inter-related variables.

For starters, regular progress meetings are essential. Preparatory meetings are also a key factor in communicating expectations and requirements before any work starts. Preparatory meetings will be held weekly or as needed with the customer and/or its representatives to clarify outstanding issues. These meetings let the principals advise Midasco of their former project experiences to avoid repeating old mistakes and offering lessons learned to the group.

Midasco will also conduct daily preparatory meetings with the field staff to ensure that directives related to project development and implementation are translated effectively. Decisions made in the field are communicated through these meetings, which also function to identify other issues

and the most appropriate means to resolve them. The resolution of issues will be identified in meeting minutes that will be recorded by an agreed-upon transcriber.

As with many strategies, proper QC planning is only as good as its implementation. Even the most detailed and precise QC plan can be defective and useless if it isn't implemented correctly. Midasco understands that implementation is of the utmost importance for quality control. With our strong experience with dealing with quality control under VDOT regulations, Midasco has assembled a responsibilities breakdown for their team personnel. The project team is aware of these duties and will carry them directly into this project. A summary of these responsibilities follows:

- **Design-Build Project Manager**
  - Serves as the main quality control point of contact throughout project duration;
  - Reviews all submittal data, confirms its compliance with contract documents, and takes appropriate actions accordingly, both pre- and post-submittal;
  - Responsible for all correspondence with VDOT, including requests for technical information;
  - Helps draft technical requests for information; and
  - Will be the governing authority on scheduling of work and implementing phases of control.

- **Construction Manager**
  - Field contact for this project for all phases of control including all on-site work;
  - Responsible for communicating daily with construction supervisors/foreman and confirming quality workmanship by inspection of contract work;
  - Ensures that the supervisors/foremen have a sound understanding of the contract documents and the installation procedures for each item of work;
  - Examines products as they are delivered to the Midasco facility and inspects for deficiencies and compliance towards the contract documents;
  - Maintains a proper quality control program to ensure quality workmanship; and
  - Will be responsible for logging and tracking of submittals and their status.

- **Construction Supervisor(s) / Foreman**
  - In charge of all production and ensures that quality control practices are implemented during construction;
  - Primary in command for ensuring all work is performed and in compliance with contract documents; and
  - Ensures all workmanship conforms to all applicable standards and is of the highest caliber and meets or exceeds satisfactory levels of compliance.

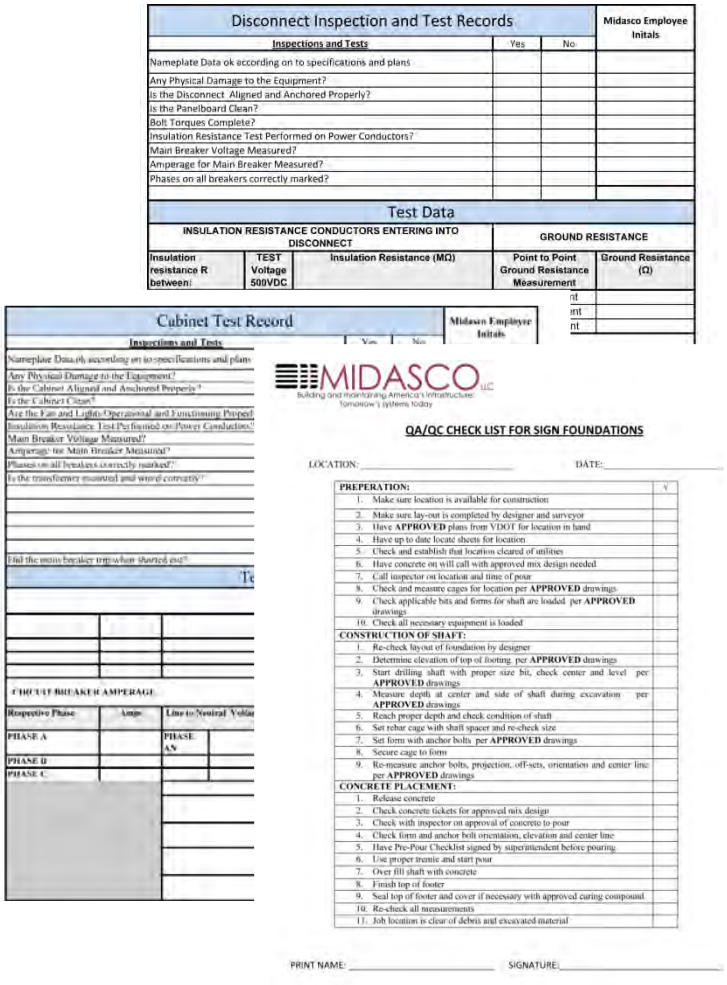
Quality Control Forms – To serve VDOT with excellence, we carry out extensive training and draw up very detailed operational procedures and quality controls, including forms implemented daily throughout the project. In addition to having our own teams operate under these forms, we also make certain that our subcontractors follow them as well. Everyone involved must maintain the necessary industry certification and compliance measures so we can keep our promise of delivering the best and highest quality product to all our

customers. VDOT can be certain that we place great value on integrity, not only from ourselves, but from our business partners as well.

Below is a description of a few quality control forms that our teams implement during the construction process. The purpose of these forms, along with the many others we implement during construction, is to make certain that we are conforming to VDOT's plans and specifications. These forms are also a way to ensure that quality control is implemented on the job site and that every aspect of the project meets VDOT's expectations.

- **Foreman's Daily Report:** This report is our primary tracking method for production units in the field. This record of the day's events details the crew's activities, any problems they may have encountered, and quantities installed. It's a carbon-copy style sheet.
- **Daily Cost Sheet:** This sheet, for in-house tracking of labor and equipment, is completed with the foreman's report; it tracks our internal project costs and also subcontractor costs.
- **Daily Task Analysis Document:** This form is a required daily document completed by the foreman, who identifies the weather, work site conditions, and defines the scope of work for that task, or series of tasks. It is used to inform the crew of any potential challenges that may be faced during the day. This tool is an integral part of the company's dedication to preventing accidents.
- **Tool Box Talks:** Tool Box Talks are provided weekly by the Safety Director. The weekly subject is presented by the foremen to their crews in an informal meeting at the beginning of the day; crew interaction about the subject matter is encouraged. The material is also given in Spanish.
- **3-Week Production Schedule:** The team uses a 3-week look-ahead production schedule to help our foremen and crews plan. This schedule lists the foreman, projected activities, and projects for that duration. This schedule is updated weekly and will be submitted to VDOT if requested.

In addition to these forms, our crews also use many other quality control forms for separate construction activities. For instance, we have forms, checklists, and testing requirements for sign foundation installation, concrete installation, structure assembly, light testing, and various other activities that our construction crews perform on a weekly basis. Sample QA/QC forms in standard use follow.



Disconnect Inspection and Test Records

Inspections and Tests	Yes	No	Midasco Employee Initals
Nameplate Data ok according on to specifications and plans			
Any Physical Damage to the Equipment?			
Is the Disconnect Aligned and Anchored Properly?			
Is the Panelboard Clean?			
Bolt Torques Complete?			
Insulation Resistance Test Performed on Power Conductors?			
Main Breaker Voltage Measured?			
Amperage for Main Breaker Measured?			
Phases on all breakers correctly marked?			

Test Data

INSULATION RESISTANCE CONDUCTORS ENTERING INTO DISCONNECT			GROUND RESISTANCE	
Insulation resistance R between:	TEST Voltage 500VDC	Insulation Resistance (MΩ)	Point to Point Ground Resistance Measurement	Ground Resistance (Ω)

Cubinet Test Record

Midasco Employee Initals

Inspections and Tests

Nameplate Data ok according on to specifications and plans

Any Physical Damage to the Equipment?

Is the Cabinet Aligned and Anchored Properly?

Is the Cabinet Clean?

Are the Fan and Light Operational and Functioning Proper

Insulation Resistance Test Performed on Power Conductors?

Main Breaker Voltage Measured?

Amperage for Main Breaker Measured?

Phases on all breakers correctly marked?

Is the transformer mounted and wired correctly?

Did the main breaker trip when tested out?

CIRCUIT BREAKER AMPERAGE

Respective Phase	Amps	Line to Neutral Volta
PHASE A		PHASE AN
PHASE B		
PHASE C		

MIDASCO LLC

Building and Maintaining America's Infrastructure, Tomorrow's Systems Today

QA/QC CHECK LIST FOR SIGN FOUNDATIONS

LOCATION: _____ DATE: _____

PREPERATION:	√
1. Make sure location is available for construction	
2. Make sure lay-out is completed by designer and surveyor	
3. Have APPROVED plans from VDOT for location in hand	
4. Have up to date locate sheets for location	
5. Check and establish that location cleared of utilities	
6. Have concrete on will call with approved mix design needed	
7. Call inspector on location and time of pour	
8. Check and measure cages for location per APPROVED drawings	
9. Check applicable bits and forms for shaft are loaded per APPROVED drawings	
10. Check all necessary equipment is loaded	
CONSTRUCTION OF SHAFT:	
1. Re-check layout of foundation by designer	
2. Determine elevation of top of footing per APPROVED drawings	
3. Start drilling shaft with proper size bit, check center and level per APPROVED drawings	
4. Measure depth at center and side of shaft during excavation per APPROVED drawings	
5. Reach proper depth and check condition of shaft	
6. Set rebar cage with shaft spacer and re-check size	
7. Set form with anchor bolts per APPROVED drawings	
8. Secure cage to form	
9. Re-measure anchor bolts, projection, off-sets, orientation and center line per APPROVED drawings	
CONCRETE PLACEMENT:	
1. Release concrete	
2. Check concrete tickets for approved mix design	
3. Check with inspector on approval of concrete to pour	
4. Check form and anchor bolt orientation, elevation and center line	
5. Have Pre-Pour Checklist signed by superintendent before pouring	
6. Use proper tremie and start pour	
7. Over fill shaft with concrete	
8. Finish top of footer	
9. Seal top of footer and cover if necessary with approved curing compound	
10. Re-check all measurements	
11. Job location is clear of debris and excavated material	

PRINT NAME: _____ SIGNATURE: _____

4.5.: CONSTRUCTION OF THE PROJECT:

By dividing the project into segments, the Midasco Team has prepared what we believe is an optimal schedule for the overall project. Part of our approach is to show the sequence and interdependence of each seperate activity. Using this interdependence approach towards construction, it is our intent to try to isolate certain tasks to which they don't depend on additional activities. This approach prevents delays to the project, and also allows our crews to work continuously on any given task. Using our knowledge from similar projects, we have assembled critical means and methods to present the finest end product to VDOT.

4.5.1: Sequence of Construction:

As mentioned in Section 4.4.1, we have decided to segment the project into four separate segments. This segmented approach allows design and construction to proceed efficiently, with minimal delays. Within our construction sequence, we have minimized the criticality of certain tasks and reduced any lag times that may be created, be it from a review process, material procurement, or permitting issues.

In addition to the four segments, we have added a section to include any project planning and mobilizatiion issues that we considered separate from each work segment. Below is a breakdown of the separate categories:

- **General Tasks** – Incorporation of any prior planning and processes that will be required activities to be performed on a corridor-wide basis. This category can be further broken down :
  - **Contract Negotiations.** Any negotiations and/or contract issues that may need to be discussed prior to beginning any work;
  - **Project Permitting.** Any permitting that can be done early on will be coordinated and properly handled; and
  - **Project-Wide Activities.** This includes any general design and construction issues than can be applied to the entire project, such as installing a project trailer, obtaining long-lead time materials, and arranging public information meetings.
- **Segment A** – Designed and constructed first, this section is considered the easiest of the project segments. We expect this segment's progress to move quickly with minimal traffic impacts. While it is the longest of the segments, the proposed components aren't as complicated as they are in subsequent segments, which should result in a fast-paced installation.
- **Segment B** – The section directly adjacent to Section A, B has both more ITS components and greater daily traffic volumes, resulting in more detailed design and construction phases. This segment ends right before the WMATA section in Segment C, which will require additional permitting and review time.
- **Segment C** – The most complex and detailed of the sections, C involves the major WMATA component, which will require permitting and extensive correspondence. The area is extremely congested and hosts the merge points with the I-495 Capitol Beltway. We anticipate the design and permitting phase lasting the longest, and this segment's being constructed during the final few months of the project.

- **Segment D** – While routinely heavily congested, and "inside the Beltway," this segment's complexity level is actually less than Segment C's. The lack of large structures and median work present a more desirable option than Segment C. This section will be highly contained to night and weekend work due to the limited work areas and a preference to avoid lane and ramp closures.

One of the biggest aspects that any sequence of construction needs to incorporate is safety. While providing the highest of quality product for VDOT, we have set internal goals to maintain a safe work environment that is free of accidents. Our construction teams dedicate themselves to providing an accident free workplace for all employees and subcontractors. Each team member takes responsibility for eliminating or managing all workplace hazards and for seeking out identification and treatment of all employee injuries regardless of whether or not they are work related, while at the same time, holding employees accountable to acceptable performance standards.

Our employees understand that the insightful management skills, project commitment, and optimistic teamwork are required to achieve a zero injury workplace and are required to build an organizationally strong and financially secure company. By striving for zero accidents and a completely safe work environment, they will be contributing to our success.

Throughout the project, we will assign sufficient crews to guarantee a timely installation. During construction, our installation crews will be under direct supervision by with management, which will help in determining the time needed for each state of installation and mitigating concerns before they occur. Our sequence also consists of pursuing work in such a manner that all underground, overhead, and electrical work at a jobsite will be completed at the same timeframe whenever possible. A strong suit of the Midasco Team is our large skilled workforce which will be able to provide multiple crews to multiple sites throughout a region simultaneously. Our Manassas office location, along with our large experienced workforce and profound equipment list will allow us to work as effectively as possible to keep the project on time and under budget.

Our construction sequence will incorporate a number of methods to foster communication internally among project functions and personnel and with VDOT, and externally with stakeholders. Our Team's Design-Build Project Manager will be the primary individual responsible for facilitating design development and constructability reviews, quality checks, and the resolution of issues.

Regularly scheduled coordination meetings will support communication of project activities and provide coordination and control during design and construction. Other means for communicating internally within the team will include electronic messaging through project e-mail and video conferencing. A variety of tools are available for disseminating external communications. Our team's approach to communicating and coordinating with communities, agencies, and other stakeholders is a vital part of this project due to the proximity of the project.

With our recent expansion into the Manassas area, we have the assets required near the project for a superb maintenance and testing yard. Our Manassas office, with its adjacent property, provides our Team with an advantage that no other team can provide. Our office, on five-plus acres, has many advantages and uses directly applicable to this project:

- **Houses our Construction Team**. Having the ability for the entire

construction team to literally be on site within minutes is a tremendous benefit to our team on a project whose work windows are very minimal. Being able to mobilize quickly will make or break a team on this project; not having our crews sit in traffic on one of the most congested highways in the County. The cost savings are remarkable. Our experienced crews for our entire Northern Virginia region all call this office their home.

- **Material and Equipment Storage**. All project materials will be sent and stored at the Manassas office. The site will be an essential storage facility for the entire project. This allows for proper material tracking, ensuring quality control on materials, as well as making sure required materials are only on site when they are needed. (The tight working corridors along the project doesn't allow for extra material to be stored on site.) Not only will this allow more usable work space for our crews, but it will also create a safer environment for our crews as well as the traveling public.
- **Erecting Structures and Equipment**. Equipment and systems that can be assembled offsite will be done so at our Manassas facility. Typically this will involve all equipment with exception to camera poles and sign structures, due to their large size. By assembling these assembled systems offsite, we allow ourselves ample room for workable space on site. This also introduces a built in quality control procedure within our sequence.
- **Testing of Equipment**. All equipment assembled at our facility will be tested to ensure quality standards have been met. Testing at our facility will allow mitigation policies to be implanted away from the project site. Not only will this work as a means of safety enhancement but also provides checks and balances before a system goes live.

Asbestos Mitigation Plan - One major construction concern that our Team is aware of and has started a mitigation plan for, deal with asbestos along the I-66 corridor. Naturally occurring asbestos has been mapped in approximately 11 square miles of Fairfax County, which includes a part of Fairfax City along I-66. Asbestos bearing rock is interspersed in the Green Stone Rock Formations that underlie the surface soils in the Orange Soils Group. These orange soils have been found during multiple construction activities in the past along I-66. With the anticipation of unearthing these orange soils during construction, our Team will put together a mitigation plan that will maintain safe working conditions on the construction site and prevent asbestos laden dust off the site.

Before beginning any activities on site, our Team will submit an asbestos mitigation plan to Fairfax County Health Department Air Monitoring and Trends Analysis. In addition, any subcontractors working on site shall be notified of the possible asbestos hazard and will be notified and educated on the approved mitigation plan. All parties will also be informed in writing of the control measures and guidelines that will be enforced on-site to limit the generation of dust, and the spread of contaminated soil and rock.

Any employees that may have potential for exposure to asbestos will review the mitigation plan and agree that the provisions and protocols of the plan are understood and will be implemented routinely. In addition, all personnel involved in operations where exposure to asbestos dust may occur will also participate in asbestos awareness training in accordance with the 'Right to Know' law. Our Team will also maintain records of attendance in which key topics

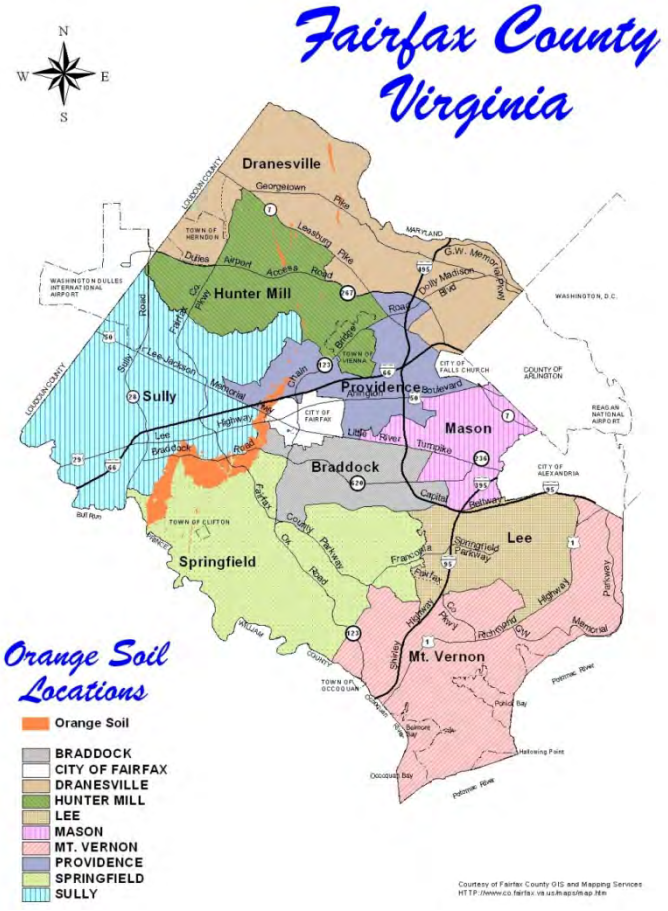
will be addressed to include recognition and uses of asbestos, health effects and medical surveillance, applicable regulatory requirements, and personal protection equipment.

As part of the scheduled training, all personnel operating rock drills, rock saws, or performing any other operation which could reasonably come into contact with asbestos will be instructed in personal protection. Training information will come from 29 Code of Federal Regulations, Section 1910.134.

As part of our mitigation plan, all tools, equipment, trucks, or machinery will be cleaned of visible soil as they exit the areas where asbestos containing soil is exposed. For wheeled vehicles, this cleaning will take place prior to entering paved roads or parking areas to ensure that asbestos contaminated soils are not tracked onto road surfaces. All asbestos contaminated spoils maintained on-site will be covered with a minimum of 6" of clean (non-asbestos containing) compatible material or other suitable sealing material such as plastic. Run off from water or air erosion will be totally controlled.

Our asbestos mitigation plan will be in accordance with Fairfax Counties Compliance Plan. A few major elements of this compliance plan include:

- **Minimizing Generation of Asbestos Laden Dusts.** When excavating soils or rock below the depth of where the existing topsoil, or there is rock that requires the use of drilling, blasting or hoe rams, the surfaces likely to generate dust will be kept wet to minimize the potential generation of asbestos dust. Excavated soils suspected to contain asbestos that are held on site will be kept wet or covered until properly disposed. Adequate vehicle and equipment cleaning will be performed to avoid the spread of asbestos to places such as parking lots and roads.
- **Personal Protection.** Workers in areas of potential dust generating operations, where OSHA Permissible Exposure Limit (PEL) may be reached, will be equipped with disposable Tyvek Page 2 Compliance Plan Elements coveralls, rubber boots and respirators to protect them and their families from asbestos. All employees will be provided asbestos awareness training to familiarize affected workers with the nature of asbestos, including the types of health problems it can cause, the appropriate protective gear that is recommended to minimize the exposure to asbestos dust, and the proper use of that equipment. Additional training will be provided for the individuals directly working within regulated areas, which require the utilization of personal protection



equipment. Regulated areas will be clearly delineated with barrier tape imprinted with appropriate asbestos warning labels. Strict decontamination procedures will be followed to help ensure that asbestos dust stays where it belongs.

- **Personal and Perimeter Ambient Air Monitoring.** Certain representative workers will be equipped with devices to monitor asbestos levels to which they could be exposed. Personal results will be compared to the OSHA permissible exposure limits (PEL). Ambient air will be monitored along the perimeter of the site to ensure that dust control measures are keeping airborne fibers concentrations from migrating from the site. Personal and ambient air monitoring results will be compared to the Fairfax County Air Pollution Control Directives and standards on a daily basis.

4.5.2: Transportation Management Plan:

To minimize construction-related traffic congestion along an already challenged I-66 commuter corridor, our team will create a detailed Type B Transportation management Plan (TMP) with Temporary Traffic Control Plans (TCPs) per VDOT IIM 11M-LD-241.5 to maximize safety for the traveling public and construction personnel. This detailed TMP will allow our project team's crews to work within the public right-of-way safely, efficiently, and effectively, while maintaining an orderly, uniform flow of traffic.

The construction work and the public traveling through the work zones will both be thoroughly considered within the TMP. Our TMP and TCPs will clearly depict the sequence of the construction operations, the construction to be performed, and the temporary traffic control for all movements during each phase of construction. With our proposed segmented approach, a separate TCP will be prepared for each different construction phase or operation. This approach will minimize impacts to the traveling public along I-66, as work zones will be limited only to the areas where construction activities are occurring in that phase. The intent of our project segmentation also allows different phases to be constructed concurrently, provided they do not interfere with existing traffic flow.

By using the new 2011 VDOT Work Area Protection Manual, our approach will be developed to minimize traffic restrictions as much as possible. While much of the construction will take place behind barrier, we understand that temporary off-peak lane closures will be necessary at certain times. Taking into account the RFP requirements regarding lane restrictions and allowable work hours, our TMP will incorporate a safe and efficient operation schedule at all times.

Our Team shall utilize the Virginia State Police (VSP) during rolling lane closures on I-66 for operations associated with events such as demolition, setting gantries, and/or installing signing over travel lanes. We shall also be responsible for coordinating VSP usage as needed for other lane closures and traffic shifts.

In accordance with the guidelines presented within the RFP, any location where our proposed construction impacts the ramp intersections with local roads, any pedestrian and bicycle traffic will be safely accommodated within our TCPs. Our construction vehicles shall not park on, store materials on, or block sidewalks or paths without prior approval by VDOT. Where

existing pedestrian routes are blocked or detoured, information will be provided about alternative routes and detours will be clearly signed. Access to temporary bus stops, safe crossings and other routing issues (such as accessibility and ADA compliance) will be thoroughly considered. As previously mentioned, the largest aspect of our TMP involves maximization of construction access while keeping safety and traveler mobility in the forefront of our plan. By maximizing our efforts within a given work area, we not only can be efficient with our work but shall also minimize any possible delays. Key components of our TMP are described below:

- **Traffic Management System:** Traffic conditions and incidents will be monitored through VDOT's existing Traffic Management System. . Using existing cameras, variable message signing (VMS), 511 Information System, and VDOT's live traffic website travelers will be informed of accidents and other incidents that affect traffic flow. In addition our Team's on-site crews will report-in any accidents or incidents that they see. Reports of accidents and incidents that come into the MPSTOC will be further investigated by the VDOT Operators there and appropriate information will be relayed to the State Police and other emergency response agencies, or service patrols or towing companies active in that area.
- **Enhanced Impact Management Strategies:** In order to maximize both traveler safety and mobility throughout construction, our team is committed to utilizing site- specific enhanced impact management strategies that meet, or exceed the minimum requirements of the Work Area Protection Manual and the MUTCD. These include: the use of temporary raised pavement markers to supplement lane line markings for increased visibility, especially during night and during wet pavement conditions; maintaining the availability of paved shoulders wherever possible during construction for vehicle refuge and enforcement; and the use of tighter than required channelized device spacing for increased work zone delineation and construction personnel safety.
- **Adjacent Projects:** Each segment's field implementation will be closely coordinated with work on adjacent roadways, such as I-495, Route 50, and Route 29. Every effort will be made to ensure that construction on these arterials will not conflict with on-going work along I-66.
- **Maintain Lane Configurations:** We will manage ramp and lane closures throughout construction to minimize effects on traffic flow in accordance with the project requirements. We will plan no ramp or lane closures for peak hours or holidays. When required, lane closures will be confined to evening hours. Should a daytime closure be unavoidable, we will post advance notices to the traveling public through various media outlets.
- **Sequencing of Construction:** We've begun sequencing the construction by segmenting the project for ease of construction, as well as limiting negative effects on the traveling public.
- **Diversionary Routes:** Area-wide diversionary routes are established through VDOT's operations center. In the event of a serious incident, messages will be broadcast over DMS, and local and state personnel will be properly notified to assist in the diversion.
- **Public Awareness:** We will work to establish an in-place media campaign to inform the traveling public of construction activities prior to beginning field activities that would affect traffic flow. Information about ramp and lane

closures, detours, construction planning and alternate travel options will be made available through VDOT's website and project brochures.

- **Ongoing Evaluation:** The impact of construction on traffic conditions will be monitored continually so that the TCP will be modified as needed. Any safety concerns will be immediately evaluated and incorporated into our plan. Delays in traffic caused by construction will also be mitigated as needed.

Maintain Lane Widening and Operating Speeds **--** We will maintain all existing lane widths for long-term operations, and do not anticipate the need for work zone speed limit reductions as the temporary traffic control plans will be designed to safely accommodate the existing posted speed limit in an effort to maximize driver mobility throughout construction.

A critical part of our TCP also includes holding informal meetings with affected stakeholders when necessary or as directed by VDOT. These stakeholders will include, but are not limited to:

- Local institutions (hospitals, schools, parks, etc.)
- Counties of Arlington, Fairfax, and Prince William
- Cities/Towns of Falls Church, Vienna, Fairfax, and Haymarket
- Service providers (Police, Fire and EMS Departments, Utilities, Parks and Recreation, etc.)
- Washington Metropolitan Area Transit Authority (WMATA) and County/City transit groups
- Traveling Public along the I-66 Corridor

All stakeholders will be informed of meetings by our Team. Any meetings held will be in accordance with the VDOT Policy Manual for Public Participation in Transportation Projects.

We will also provide on a weekly basis to VDOT's Northern Virginia District Office of Public Affairs written information suitable for posting by VDOT on its website. Such information will include a project overview, plan of work, overall project schedule, potential impacts to traffic, and potential impacts to I-66. Our team will also provide an emergency contact list of project personnel and response plan to respond to any onsite emergency, including any work zone incidents in accordance.

We will also operate as a liaison between VDOT, the Counties of Arlington, Fairfax, and Prince William, and the Cities/Towns of Falls Church, Vienna, Fairfax and Haymarket to provide appropriate notification to affected property owners and stakeholders. We don't foresee any major impacts to the stakeholders mentioned above. However, as a means of implementing a proactive, rather than retroactive, approach, we will take all necessary steps to ensure that these stakeholders as always well informed of any event that could possibly cause delays in their systems.

4.6.: PROPOSAL SCHEDULE

Our Team of professionals is known in the construction industry for getting critical projects done on time. The same project control methods and techniques that helped us build this reputation will be in place throughout the I-66 project. We'll use the latest CPM-based software to develop a resource-loaded schedule featuring summary-level analysis for effective management and reporting.

A principal aspect of our process is weekly CPM schedule updating, which is based on daily data collection from our field operations people and weekly utilization reports. The Design-Build Project Manager and Construction Manager will take a critical role in the schedule review process. They'll also do internal job reviews so as to track project costs, operation efficiencies, and equipment utilization. These systems will let the project team monitor and report progress to VDOT, with whose people we'll hold regular project status meetings as required and requested.

Our proposed schedule (attached) for the overall project and for each segment shows the sequence and interdependence of activities needed to finish the job and includes project milestones and key start and end dates. The schedule includes

- Preliminary Design and Permitting,
- Submittal and Review Process,
- Surveying and Utility Work/Relocations
- Testing and Erosion and Sediment Control,
- Construction, and
- Completion and Other Milestones.

We break down our proposed schedule into five categories:

- **General Tasks**. Activities relating to contract execution and any overall project activities that span the corridor. It also incorporates beginning our Pubic Outreach Program for the project.
- **Segment A**. From Route 15 to Route 50. Will be one of the first segments in design as well as construction.
- **Segment B**. From Route 50 to Blake Lane. Will begin after we have started Segment A in both design and construction.
- **Segment C**. "The WMATA Section," from Blake Lane to Westmoreland Street. Design will begin concurrently with Segment A, since it is anticipated this Segment will take the longest time to design and go through the review process. This will be the last Segment to construct.
- **Segment D**. From Westmoreland Street to the end of the Project at the DC Line / Potomac River. Design will begin concurrently with Segment B, but will take longer to design due to the criteria involved. Construction will begin after Segment B.

It is our intention to begin construction as soon as possible to prevent delays in the schedule. Because of that, we intend to be begin test boring of soils after 90% Plan Submittal and ITS Definitive Design has been approved. This will allow for construction to begin as soon as possible, utilizing our time to the fullest extent. We have also allowed ourselves for a significant testing period at the end of the project to ensure the entire system meets all requirements. Based on the proposed schedule, the project is proposed being finished on or before November 28, 2014.

4.7: DISADVANTAGED BUSINESS ENTERPRISES (DBE):

Both Midasco and Dewberry have long histories of contracting with small, minority-owned, and disadvantaged business enterprises. Our consultants are integral and essential members of the Team; their skills and experience make them essential to successfully executing a project. We believe that minority sub-consulting is everyone's opportunity to develop stronger engineering knowledge and future partners. This belief has fostered our excellent relationships and track records with DBE firms on projects throughout the Mid-Atlantic.

Our Team has never failed to meet a DBE participation goal. Now we're committed to achieving a 15% Disadvantaged Business Enterprises (DBE) participation for the entire value of this proposed project. We'll reach this goal through subcontracting certain tasks to local DBE subcontractors, suppliers, and by acquiring the services of geotechnical and quality assurance engineers. Our perfect record of compliance in meeting federal, State and local DBE goals on all projects is an accomplishment we can be proud of.

Plan to Meet DBE Subcontracting Goal
The precise breakdown for DBE participation will be outlined in **Section 4.8.8** of the Price Proposal, which is due to VDOT on August 22, 2012. As we continue to get pricing from our sub-consultants, subcontractors, and material suppliers, we can ensure that we will give VDOT the most value-added price proposal possible by reaching out to our long list of DBEs. Having worked alongside so many DBEs, we're confident we can make an effective selection.

At this time, we can declare our intent to use the services of two locally based DBE sub-consultants:

- GeoConcepts Engineering, Inc. for quality control testing, and
- Quinn Consulting Services, Inc. for quality assurance.

We've also targeted areas for further DBE participation through local subcontractors and suppliers. We have a strong history of working with a variety of Virginia DBEs; these existing relationships will help our team in choose the best-qualified DBE sub-contractors and sub-consultants to move this project forward. We plan to use DBEs for

- Directional drilling and boring operations,
- Underground conduit installation,
- Rebar assembly and material supply,
- Temporary traffic control (TTC),
- Temporary paving and striping operations, and
- Electrical material supply.

As part of our Price Proposal, we'll solicit firm pricing from potential DBE subcontractors and vendors in the above areas, and we'll detail our plan to achieve the 15% DBE requirement.

We've already let the DBE firms in our database know of this potential opportunity and have appointed a DBE Coordinator for any interested firms to contact for project information.