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## PART 2

### TECHNICAL INFORMATION & REQUIREMENTS

#### **1.0 DESIGN-BUILDER'S SCOPE OF WORK**

##### **1.1 Project Description**

The Project is located along 11 miles of Interstate 64 (I-64) in the vicinity of Afton Mountain (mile markers 96 to 107) Afton, Virginia. The purpose of the Project is to apply an Active Traffic and Safety Management System (ATSMS) along I-64 to allow for better traffic management and improved safety. The specific treatments being applied are detailed in Section 2 of this document. The successful Design-Builder, herein referred to as Design-Builder, shall work cooperatively with the central system software providers to fully integrate the system to achieve full functionality. Any hardware modification and equipment set-up shall be provided by the Design-Builder, and approved VDOT's Engineer, to achieve this goal.

The elements detailed in the Request for Proposal (RFP) Conceptual Plans (located in the RFP Information Package) are considered to be the basic Project configuration. Modifications such as design exceptions/waivers and environmental impacts due to adjustments of this design may be required as described elsewhere in this document. VDOT is interested in creative and cost-effective solutions. However, Design-Builders should note that they are solely responsible for any schedule and cost impacts associated with the Design-Builder's deviation from the basic Project configuration. Also to note, the Design-Builder shall be responsible for delivering a fully functional system.

##### **1.2 Anticipated Scope of Work**

The anticipated scope of work to be undertaken by the Design-Builder under this Project will include, but not be limited to: (a) project management and coordination; (b) preliminary engineering; (c) ITS design; (d) sign structure and foundation design; (e) clearing and grubbing; (f) infrastructure construction; (g) ITS device installation and configuration; (h) utility additions, adjustments, and coordination; (i) static guide sign fabrication and installation; (j) minor temporary roadway improvements (staging/pull-out areas); (k) guardrail installation; (l) earthwork as required for foundation installation; (m) traffic maintenance and management; (n) system integration; (o) system testing and acceptance; (p) training; (q) system maintenance until final acceptance; and (r) system documentation including but not limited to as build drawings, and operational and maintenance manuals.

Descriptions and technical requirements of this anticipated work are included in Section 2 of this document. Design-Builders should note that all work performed on this Project shall be completed using English Units.

##### **1.3 Anticipated Design Services**

Design services shall address all items necessary for construction and operation of the completed AT&SM system. The anticipated design services to be undertaken by the Design-Builder for this Project will include, but not be limited to: (a) geotechnical investigation, borings, and analysis; (b) foundation design; (c) metal sign structure pole design; (d) device mounting design; (e) ITS component design; (f)

electrical load design; (g) communication system and fiber optic design; (h) maintenance of traffic; (i) guardrail design; (j) systems integration; (k) static sign design; (l) survey; and (m) utility designation.

#### **1.4 Anticipated Right-of-Way and Utilities**

The Design-Builder's proposed design should be wholly contained within existing right-of-way limits as shown on the RFP Conceptual Plans, with the exception of utility easements which have not yet been identified or shown on the RFP Conceptual Plans. Deviations from the proposed right-of-way limits shown on the RFP Conceptual Plans will be subject to VDOT approval. It will be the responsibility of the Design-Builder to coordinate directly with the affected property owners to acquire such right-of-way in accordance with State and Federal requirements. The Design-Builder shall be responsible for assuming all risks associated with exceeding such right-of-way limits, including any public hearings that may be required. No modifications to the Contract Price or Contract Time(s) will be granted or considered for deviating from the right-of-way limits as shown on the RFP Conceptual Plans.

The Design-Builder's services shall include all work necessary to perform utility coordination, relocations, and/or adjustments as required by the Project. All costs for utility relocations, excluding betterments, shall be included in the Design-Builder's Lump Sum Bid. Utility betterments shall not be included in the Design-Builder's Lump Sum Bid, but shall be reimbursed to the Design-Builder through agreement with the requesting utility owner. Betterments must be requested by and/or approved by the affected utility owner.

#### **1.5 Anticipated Construction Services**

The anticipated construction services to be undertaken by the Design-Builder under this Project will include, but not be limited to: (a) permitting; (b) coordination with stakeholder agencies and other Design-Builders; (c) pole and device mounting structures; (d) DMS/static sign removal, installation, and relocation; (e) ITS devices and component installation, modification and upgrade of device power communication systems; (f) infrastructure construction; (g) telecommunications and electrical cable installation; (h) utility relocation; (i) structure and foundation removal; (j) construction engineering, inspection, and management; (k) quality assurance and quality control; and (l) system maintenance.

### **2.0 PROJECT TECHNICAL INFORMATION AND REQUIREMENTS**

#### **2.1 References and Information**

The design and construction work for the Project shall be performed in accordance with the applicable federal and state laws and VDOT standards, specifications, and reference documents to include, but not be limited to, the documents listed herein. The Design-Builder must verify and use the latest applicable version of the documents listed herein. The Design-Builder must meet or exceed the minimum design standards and criteria.

If during the course of the design the Design-Builder determines that a specific standards, specifications, or reference document is required, but is not listed herein, it is the responsibility of the Design-Builder to identify the pertinent standards, specifications, or reference document and submit to VDOT for review and approval prior to inclusion in the contract documents.

Design-Builder shall understand that the *VDOT 2007 Road and Bridge Specifications*, and its associated *Special Provision Copied Notes*, contain pricing language under sections entitled “Measurement and Payment” that is not applicable in the Design-Build context of this RFP. Thus, in accordance with the hierarchy of documents, the Design-Builder will refer to Part 3, Articles 6 and 7; Part 4, Section 6; and applicable portions of the Division I Amendments (Part 5) to the Standard Specifications for more information regarding the pricing and payment to the Design-Builder. Similarly, other references below which contain pricing methodologies for the “Design-Builder” shall likewise not be used. The Design-Builder also understands that the requirements as described in the text of Part 2 herein take precedence over the referenced documents listed below, unless otherwise indicated.

The standards and references for the Project are listed below in the following order: (a) published references and standards; (b) reference manuals; (c) special provisions list including special provisions, special provision copied notes, and supplemental specifications. Items (a) and (b) are published references that are available publicly, for which copies are largely not provided to the Design-Builders in this RFP package; these items, however, are to be used as manuals for design and construction. Item (c) is included with the RFP Information Package for ease of the Design-Builder’s reference.

**(a) Published References and Standards**

- VDOT Drainage Manual, (July 2012) (including current Errata Sheet)
- VDOT Hydraulic Design Advisories (all current)
- VDOT CADD Manual (2012) (including all revisions)
- VDOT Construction Manual (2005) (including July 2008 revisions)
- VDOT Post Construction Manual (May 2011)
- VDOT Construction Inspection Manual (April 2008)
- VDOT Traffic Engineering Design Manual (2011)
- VDOT Right-of-Way Manual of Instruction (January 2011) (including July 2011 revisions)
- VDOT Utilities Manual of Instruction (January 2011) (including February 2011 revisions)
- VDOT Appraisal Guidelines
- VDOT Policy Manual for Public Participation in Transportation Projects (updated November 2012)
- VDOT Instructional & Information Memoranda (“I&IM”), All Divisions
- VDOT Road and Bridge Standards, Vol. 1 and Vol. 2 (2008) including all revisions
- VDOT Road and Bridge Specifications (2007), (all except Section 100) including all revisions
- VDOT Guardrail Installation Training Manual (“GRIT”) (May 2012)
- VDOT Road Design Manual, Vol. I, including all revisions
- VDOT Guidelines for 1993 AASHTO Pavement Design, Revised May 2003
- VDOT Survey Manual (2013 Edition) (including all revisions)
- VDOT Manual of Instructions for Material Division (2011) (including all revisions)
- VDOT Manuals of Structure and Bridge Division, Vol. V
- VDOT 2011 Edition of the Virginia Work Area Protection Manual (WAPM)
- VDOT Traffic Engineering Division Numbered Memoranda (Traffic Engineering (TE) and Mobility Management (MM))

- VDOT Materials Division Approved List (October 212)
- VDOT’s Minimum Requirements for Quality Assurance & Quality Control on Design Build and Public-Private Transportation Act Projects (January 2012)
- VDOT Materials Division Memorandum Number MD299-07 for Materials Acceptance – October 4, 2007
- VDOT Asbestos Inspection Procedures, dated May 14, 2004
- VDOT Asbestos Monitoring Procedures, dated May 14, 2004
- AASHTO A Policy on Geometric Design of Highways and Streets, 6<sup>th</sup> Edition, 2011
- AASHTO A Policy on Design Standards Interstate System, 5<sup>th</sup> Edition, January 2005
- AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 2009 Edition, with 2010 and 2011 Interim Review.
- AASHTO Guide for Design of Pavement Structures (Rigid Pavement and Flexible Pavement) (1993 Edition)
- AASHTO Roadside Design Guide, 4<sup>th</sup> Edition (2011) (including errata)
- AASHTO Manual for Assessing Safety Hardware, First Edition, 2009
- NCHRP Report 350 Recommended Procedures for the Safety Performance Evaluation of Highway Features
- USDOT FHWA Standard Highway Signs and Markings (2004) and 2012 Supplement
- IEEE National Electric Safety Code
- IES RP-08-00, American National Standard for Roadway Lighting
- IES RP-19-01, Roadway Sign Lighting
- Corps of Engineers EM-1110-2-1906, Laboratory Soils Testing (1986)
- Engineering Properties of Clay Shales, Report 1 by W. Heley and B. N. McIver

**(b) Reference Manuals**

- National Electric Code (NEC)
- Manual on Uniform Traffic Control Devices (MUTCD) 2009 Edition and latest updates at time of Advertisement
- 2011 Edition of the Virginia Supplement to the 2009 MUTCD and the latest updates at the time of advertisement
- Telecommunications Industry Association (TIA) and Electronic Industries Alliance (EIA) Standards and Specifications
- Bellcore/Telcordia standards
- Institute of Electrical and Electronics Engineer (IEEE) Standards
- National Electrical manufacturers Association (NEMA) Standards
- National Electric Safety Code (NESC) Standards
- Underwriters Laboratories (UL) Standards
- National Transportation Communications for ITS Protocol (NTCIP)
- American National Standards Institute (ANSI)/Insulated Cable Engineers Association (ICEA) S-87-640-2006 requirements
- U.S. Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.900
- International Telecommunication Union (ITU) Requirements
- Virginia Uniform Statewide Building Code

- American Welding Society Standards
- Powder Coating Institute (PCI) Standards
- Society for Protective Coatings (SSPC) Standards
- International Mechanical Code
- DCR Virginia Stormwater Management Handbook, Vol. 1 and Vol. 2 (First Edition – 1999)
- DCR Virginia Erosion and Sediment Control Handbook (Third Edition – 1992)
- Virginia Test Methods Manual (June 2010)
- Virginia Calibration Methods (October 2008)
- gINT Manual
- Americans with Disabilities Act Accessibility Guidelines for State and Local Government Facilities
- Transportation Research Board Highway Capacity Manual, 2010 Current Edition
- DCR Virginia Stormwater Management Program Technical Bulletin 1  
(See [http://www.dcr.virginia.gov/stormwater\\_management/documents/tecbtln1.PDF](http://www.dcr.virginia.gov/stormwater_management/documents/tecbtln1.PDF))
- Duncan, J.M. (April 2000) Factors of Safety and Reliability in Geotechnical Engineering, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Discussions and Closure August 2001

**(c) Special Provisions List: Special Provisions, Special Provision Copied Notes and Supplemental Specifications**

- S107G01-0309 C-45 Stormwater Pollution Prevention Plan (SWPPP) General Permit for the Discharge of Stormwater from Construction Activities Contractor and Subcontractor Certification Statement, dated February 19, 2009
- SPCN c100ai03-0112 General Project Requirements, Supplemental Specifications (SSs), Special Provisions (SPs) and Special Provision Copied Notes (SPCNs), December 1, 2011
- SPCN c105hf1-0309 Subcontracting, December 19, 2008
- SPCN c512i00-0708 Police Patrols, July 2008
- S102CF1-0309 Use of Domestic Material, February 26, 2009
- S107HF1-0708 Section 107.15, December 10, 2010cc
- S302B00-0708 Restoring Existing Pavement, January 14, 2008c
- S100B00-0708 Project Communication and Decision Making, Reissued July 2008
- S522B00-1109 Informal Partnering, January 14, 2008
- S704E02-0309 Type B, Class VI Pavement Line Marking Tape, October 21, 2011
- SS20001-1212 Supplement Section 200, General, dated September 28, 2012
- SS21402-0908 Supplemental Section 214, Hydraulic Cement, dated January 28, 2008
- SS21501-0908 Supplemental Section 215, Hydraulic Cement Concrete Admixtures, dated January 28, 2008
- SS21705-0911 Supplemental Section 217, Hydraulic Cement Concrete, dated January 27, 2011
- SS22101 Supplement Section 221, Guardrail, Dated January 6, 2012
- SS22401-0908 Supplemental Section 224, Castings, dated November 15, 2007
- SS22601-0609 Supplemental Section 226, Structural Steel, dated December 16, 2008

- SS23802-0609 Supplemental Section 238, Electrical and Signal Components, dated March 4, 2008
- SS24701-0611 Supplemental Section 238, Reflective Sheeting, dated February 10, 2011
- SS41301-0609 Supplemental Section 413, Dismantling and Removing Existing Structures or Removing Portions of Existing Structures, dated August 5, 2008
- SS51202-0909 Supplemental Section 512, Maintaining Traffic, dated June 11, 2009
- SS51404-0609 Supplemental Section 514, Field Office, dated March 6, 2009
- C700i00-0313 Section 700, General, as dated February 2, 2013
- SS70003-0609 Supplemental Section 700, General (Traffic Control Devices), dated June 9, 2008
- SS70102-0410 Supplemental Section 701, Traffic Signs, dated January 22, 2009c
- SS70301-0609 Supplemental Section 703, Traffic Signals, dated January 6, 2009
- SF030AF-0708 Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246), July 2008
- SF010CF-0309 FHWA 1273, Memorandum and CFR Change, July 2, 2012
- Special Provision for Section 105.09 – Cooperation Among Contractors August 1, 2013
- Special Provision for Work Zone Traffic Control Management, dated November 1, 2009
- Special Provision for Project Communication and Decision Making for Design-Build Projects, dated August 2009
- Provision for Section 108 – Prosecution and Progress of Work (Roadway and Night Work Limitations), August 1, 2013
- Special Provision for Powder Coating, August 14, 2009
- Special Provision for Intelligent Transpiration Systems, Infrastructure, dated October 4, 2013
- Special Provision for Uninterruptible Power System for ITS Applications, dated August 1, 2013
- Special Provision for Intelligent Transportation System, Junction Boxes, dated August 1, 2013
- Special Provision for Intelligent Transportation Systems, Fiber Optic Cable and Interconnect, dated August 1, 2013
- Special Provision for Intelligent Transportation Systems, Managed Field Ethernet Switch, dated August 1, 2013
- Special Provision for Intelligent Transportation Systems, Primary Network Switch, dated August 1, 2013
- Special Provision for Intelligent Transportation Systems, Digital Video Encoder and Decoder, dated August 1, 2013
- Special Provision for CCTV Equipment and CCTV General Requirements, dated October 4, 2013
- Special Provision for Intelligent Transportation Systems, Dynamic Message Signs, dated August 1, 2013
- Special Provision for Intelligent Transportation Systems, Vehicle Detection and Data Collection, dated August 1, 2013
- Special Provision for Intelligent Transportation Systems, (ITS) Road Weather Information System (Environmental Sensor Stations), dated August 1, 2013

The above list of Special Provisions is not intended to be an all-inclusive list. The Design-Builder is responsible for achieving the Work in accordance with all current VDOT Standards as of the date of the RFP issuance, including any revisions thereof.

In the event of a discrepancy between VDOT and non-VDOT Standards and References listed herein, the VDOT 2007 Road and Bridge Specifications, design standards, and manuals shall take precedence; if there is a discrepancy among the VDOT specifications, standards, and manuals, VDOT will decide appropriate requirements. Special Provisions included in this contract document or other applicable Special Provisions approved by VDOT shall govern over the VDOT specifications, design standards and manuals. Special Provision Copy Notes approved by VDOT and requirements specified within the text of this RFP shall govern over both the Special Provisions and VDOT specifications, design standards and manuals.

### 2.1.1 Definitions

**Table 1: Acronyms**

AASHTO	American Association of State Highway and Transportation Officials
AGC	Associated General Design-Builders
AID	Automatic Incident Detection
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATSMS	Active Traffic and Safety Management System
ATS	Automatic Transfer Switch
AWG	American Wire Gauge
AWS	Advanced Warning System
BCE	Blanket Categorical Exclusion
CCTV	Closed Circuit Television
CFM	Car Fleet Management
CFR	Code of Federal Regulations
CHAP	Challenge-Handshake Authentication Protocol
CMS	Changeable Message Sign
CPU	Central Processing Unit
DAT	Digital Audio Tape
dB	Decibel
DE	Design Exception
DHCP	Dynamic Host Configuration Protocol
DiffServ/	
QoS	Differentiated Services/Quality of Services
DIN	Digital Input
DMS	Dynamic Message Signs
DTM	Digital Terrain Model
DVD	Digital Video Disc

DVE	Digital Video Encoder
DW	Design Waiver
EIA	Environmental Impact Assessment
EIA	Electronic Industries Association
EIS	Environmental Impact Statement
EMI	Electromagnetic Interference
ESC	Erosion and Sediment Control
ECSSC	Erosion and Sediment Control Design-Builder Certification
FAT	File Allocation Table
FCC	Federal Communications Commission
FHWA	Federal Highway Administration
FMCW	Frequency Modulated Continuous Wave
FSORS	Full Standardize Object Range Support
FTP	File Transfer Protocol
GDBMS	Geotechnical Database Management System
GMSS	General Motorists Services Signs
GPA	Gas Processors Association
HOV	High Occupancy Vehicle
IEEE	Institute of Electrical and Electronic Engineers
IETF	Internet Engineering Task Force
IGMP	Internet Group Management Protocol
IMSA	International Municipal Signal Association
IEC	International Electrotechnical Commission
IETF	Internet Engineering Task Force
IGMP	Internet Group Multicast Protocol
IP	Internet Protocol
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation Systems
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LCS	Lane Control Signals
LP	Liquefied Petroleum
LPGC	Liquefied Petroleum Gas Code
MAC	Media Access Control
MAN	Metropolitan Area Network
MFES	Managed Field Ethernet Switch
MIB	Management Information Base
MIG	Memory Interface Generator
MOI	VDOT Manual of Instructions
MOT	Maintenance of Traffic
MTBF	Mean Time Between Failures
MVD	Microwave Vehicle Detection
NEC	National Electric Code

NEMA	National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NOI	Notice of Intent
NRO	Northern Region Operations
NRZ	Non-return-to-zero
NTCIP	National Transportation Communications for ITS Protocol
NTP	Network Time Protocol
NTSC	National Television Systems Committee
OSD	On Screen Display
OSHA	Occupational Safety and Health Administration
PCE	Programmatic Categorical Exclusion
PCI	Powder Coating Institute
PMPP	Point-to-Multipoint Protocol
PPP	Point-to-Point Protocol
PRL	Profile Requirements List
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance and Quality Control
QC	Quality Control
QoS	Quality of Service
QPL	Qualified Products List
RFI	Radio Frequency Interference
RLD	Responsible Land Disturber
RMON	Remote Monitoring
RP	Rendezvous Point
RSTP	Real-Time Streaming Protocol
RUMS	Right-of-Way and Utilities Management System
RUS	Rural Utilities Service
RW	Right-of-Way
RWIS	Road Weather Information System
SAP	Systems, Applications and Products
SAP	Session Announcement Protocol
SGS	Supplemental Guide Signs
SMON	Switch Monitoring
SNMP	Simple Network Management Protocol
SNTP	Simple Network Time Protocol
SSPC	Society for Protective Coating
STC	Smart Traffic Center (Currently Referred to as TOC)
STP	Spanning Tree Protocol
SWM	Stormwater Management
SWPPP	Stormwater Pollution Prevention Plan
TCD	Traffic Control Devices

TEES	Transportation Electrical Equipment Specifications
TFTP	Trivial File Transfer Protocol
TGIC	Triglycidylisocyanurate
TIA	Telecommunications Industry Association
TIG	Tungsten Inert Glass
TM	Traffic Monitor
TMP	Transportation Management Plan
TOC	Traffic Operations Center
TODS	Tourist Oriented Directional Signs
TVSS	Transient Voltage Surge Suppressor
UDP	User Datagram Protocol
UL	Underwriters Laboratory
UPS	Uninterrupted Power Supply
VA SHPO	Virginia State Historic Preservation Officer
VAC	Volts of Alternating Current
VDC	Vehicle Detection and Classification
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VLAN	Virtual LAN
VMS	Variable Message Sign
VOSH	Virginia Occupational Safety and Health
VSL	Variable Speed Limit
VSP	Virginia State Police
WAPM	Virginia Work Area Protection Manual

### **2.1.2 RFP Information Package**

An RFP Information Package CD-ROM will be provided to the point of contact for each short listed firm. The RFP Information Package includes the following:

- Special Provisions List: Special Provisions, Special Provision Copied Notes and Supplemental Specifications, revised October 4, 2013
- RFP Conceptual Plans, including electronic reference files, revised October 4, 2013
- Final Concept of Operations, dated October 2012
- Final System Requirements Document, dated October 2012
- High Level Design, dated May 2013
- System Validation Plan, dated June 2013
- System Verification Plan, dated July 2013
- Environmental Certification/ Commitments Checklist, dated July 2, 2013
- Fish, Plant, and Wildlife Resources Clearance, dated July 2, 2013
- Permit Determination, dated June 25, 2013
- Document for PS&E Authorization, dated July 2, 2013
- Afton Mountain Assets
- Power House Layout
- Existing Construction Plans for 0064-002-105, 0064-007-102, and 0064-002-102

Requirements described in the Technical Information and Requirements (Part 2 of the RFP) shall supersede information included in the RFP Information Package including the information depicted on the RFP Conceptual Plans. In the event that there is a discrepancy between the RFP Conceptual Plans (or other information included in the RFP Information Package) and the Technical Information and Requirements (Part 2 of the RFP) herein, the Technical Information and Requirements (Part 2 of the RFP) shall take precedence.

Existing construction plans included in the RFP Information Package are not deemed a component of the RFP. These plans are solely for the information of the Offeror, which each Offeror may use at their own risk and as they deem appropriate. The Department does not represent or warrant that the information contained in the plans is suitable for designing the Project.

### **2.1.3 Design Exceptions and Waivers**

There are no anticipated substandard features reflected in the preliminary design. However if during further development of the design the Design-Builder identifies substandard features, the Design-Builder is required to either eliminate them through design improvements or apply for the appropriate design exceptions and/or waivers. The costs for preparation of design waivers or exceptions and any information needed to support these documents is the responsibility of the Design-Builder. Any schedule delays as a result of the approval process are the responsibility of the Design-Builder.

### **2.1.4 Coordination with Active Construction Projects**

The Design-Builder shall be responsible for coordinating with contractors of other active construction projects in the vicinity of the I-64 ATSMS Project in accordance with Section 3.6 of Part 4.

The Design-Builder shall be responsible for coordinating as required with adjacent local agencies and other contractors and builders performing projects within the I-64 ATSMS project limits at the time of advertisement.

## **2.2 Environmental**

### **2.2.1 Environmental Document**

The project qualified for a Blanket Categorical Exclusion (BCE) Category 7 on June 25, 2013. No acquisition of right-of-way is required for this project, so no document re-evaluation for Right of Way (RW) Authorization (EQ-201) is required. VDOT has completed preliminary document re-evaluations for Plans, Specifications and Estimates (PS&E) Authorization (EQ-200) dated July 2, 2013, and a preliminary Environmental Certification/Commitments Checklist (EQ-103) dated July 2, 2013, which are included in the RFP Information Package. VDOT shall complete a final document re-evaluation for PS&E Authorization (EQ-200) and final Environmental Certification/Commitments Checklist (EQ-103) prior to the VDOT Project Manager releasing the Project for construction.

The Design-Builder shall carry out environmental commitments during design, right-of-way acquisition, and construction, as applicable, as identified in the BCE, the PS&E Re-evaluation, and the Environmental Certification forms. All commitment compliance shall be supported by appropriate documentation, to be provided by the Design-Builder to VDOT.

Any changes in the scope or footprint of the established basic Project concept, proposed by the Design-Builder and acceptable to VDOT, may require additional environmental technical studies and analysis to be performed by the Design-Builder at their cost. The Design-Builder will be responsible for notifying VDOT of plan revisions, scope changes, and providing any necessary studies and other necessary information to support VDOT's completion and re-evaluation of the NEPA document. VDOT will be responsible for the coordination of any environmental documentation re-evaluation with FHWA. The Design-Builder shall then carry out any additional environmental commitments that result from such coordination at its sole expense and no additional cost and/or time delays to the Project.

The Design-Builder is solely responsible for any costs or schedule delays related to the permit acquisition, permit modifications, and NEPA document re-evaluations associated with Design-Builder's design changes and no time extensions will be granted. All costs associated with complying with these requirements shall be included in the Offeror's Price Proposal.

### **2.2.2 Cultural Resources**

VDOT, in consultation with the VA SHPO, has determined that there are no historic properties present or affected by the project as proposed in the Conceptual Plans. Please note that any changes to the design, alignment, right-of-way limits, or easements shown on the Conceptual Plans may require review by VDOT and could require additional cultural resources studies and/or coordination with the VA SHPO. The Design-Builder is responsible for conducting all cultural resources studies necessitated by the proposed changes, while the VDOT is responsible for coordinating both the studies and the proposed changes with the VA SHPO. The Design-Builder shall then carry out any additional cultural resources commitments that result from such coordination at its sole expense and at no additional cost to the Project.

### **2.2.3 Section 4(f) Resources**

No Section 4(f) resources are associated with this project and no further work is needed.

### **2.2.4 Water Quality Permits and Compensatory Mitigation**

The Design-Builder will obtain all necessary environmental clearances, permits, and approvals required to accomplish the work as noted in Part 4 (General Conditions of Contract), Article 2.6. The Design-Builder will be responsible for performing necessary design and fieldwork to support the acquisition of necessary water quality permits independently and directly from the regulatory agencies. The Design-Builder will be the Permittee.

VDOT completed a preliminary Permit Determination, dated June 25, 2013, concluding that no water quality permits are required for this Project based on the Conceptual Plans. A copy of the preliminary Permit Determination is included in the RFP Information Package. The Offeror should note that the preliminary Permit Determination and wetland delineations are provided for informational purposes only. The Design-Builder will be responsible for verifying permit requirements prior to construction. Regulatory agencies will make the final determination as to which state/federal water quality permits will be required during coordination with the Design-Builder.

The Design-Builder shall determine the applicability of water quality permits for the Project (to include utilities to be relocated by the Design-Builder for the Project). Should it be determined that Water Quality Permits are required, the Design-Builder shall conduct the preliminary field assessment including, but not limited to, wetland delineation, stream assessment, and permit impact sketches. The Design-Builder shall also determine the required sequencing methodology to limit Project impacts to wetland systems. The Design-Builder shall utilize this information to obtain required permits.

If the Design-Builder determines water quality permits are not required based on information generated, the Design-Builder shall notify the VDOT Project Manager in writing, so that VDOT can authorize the Design-Builder to execute the work. Any deviations that the Design-Builder makes to the Project footprint and/or scope may render the permit determination invalid and will require additional consideration.

If the Design-Builder determines that wetlands and/or stream mitigation is required to secure the permit authorization, the Design-Builder will provide the required compensatory mitigation. The Offeror shall account for all costs associated with water quality permit acquisition, as well as compensatory mitigation, in its Price Proposal.

The Design-Builder shall note that avoidance, minimization, and mitigation measures associated with permit acquisition will require close coordination between the Design-Builder and VDOT. If permit issuance is delayed or permits are denied, the Design-Builder will be responsible for any schedule delays and/or associated costs.

Should the Design-Builder propose design changes acceptable to VDOT, permitting requirements may also change; the Design-Builder remains responsible for obtaining all necessary water quality permits and permit modifications required by the regulatory agencies to accommodate the design changes.

The Design-Builder shall ensure that Project schedules accommodate any Special Provisions, Time of Year Restrictions (TOYR), and the duration of permit acquisition from the regulatory agencies. The Design-Builder shall be responsible for adhering to permit conditions and Special Provisions, as identified in the permit authorizations including but not limited to TOYR, avoidance and minimization recommendations, restoration of temporary impact areas, and countersinking culverts.

The Design-Builder shall be responsible for compliance with pre-construction, construction-related permit conditions, as well as post-construction monitoring if required by regulatory agencies. This shall include costs associated with acquiring water quality permits and additional compensatory mitigation for the Project if needed.

The Design-Builder shall provide to the VDOT Project Manager copies of all permits, documentation, and correspondence with regulatory agencies. Construction activities shall not impact regulated areas within the Project limits until all applicable water quality permits have been issued to the Design-Builder. The Design-Builder shall not proceed with work covered by the water quality permits until the VDOT Project Manager releases the work in writing. The VDOT Project Manager may release a portion or all of such work not in jurisdictional areas, but may order a suspension of the same work after its release. The Design-Builder shall not be allowed to begin work that pre-determines the work required in the jurisdictional areas until the permits are secured.

After receiving the VDOT Project Manager's release of the work, the Design-Builder shall notify the VDOT Project Manager and the regulatory permitting agencies in writing 14 days prior to beginning work in the jurisdictional areas covered by the water quality permits.

The Design-Builder shall allow environmental compliance inspections by VDOT, and/or regulatory agencies as required by permits and/or to facilitate any interim compliance reviews/assessments.

At the conclusion of the Project, the Design-Builder shall notify the VDOT Project Manager and the regulatory permitting agencies in writing of the completion of the work in the jurisdictional areas covered by the water quality permits. At the completion of the Project, the Design-Builder is required to transfer any Virginia Marine Resources Commission (VMRC) permit back to VDOT.

The Design-Builder shall carry out any additional permit conditions/commitments that result from change in footprint and/or scope (assuming it is approved by VDOT) at its sole expense and no additional cost to the Project; additionally the Design-Builder will be responsible for any schedule delays and associated costs.

All permitted construction activities shall be identified as hold points in the Design-Builder's CPM Schedule.

### **2.2.5 Threatened and Endangered Species**

VDOT has performed preliminary database reviews to determine the Project's potential effects on threatened and endangered (T&E) species, indicating that the Project will have no adverse effect on T&E species and no further work is needed. A copy of VDOT's preliminary Fish, Plant, and Wildlife Resources Form dated July 2, 2013 is included in the RFP Information Package.

The Offeror shall be advised that new and updated T&E information is continually added to agency databases. The Design-Builder will be responsible for any subsequent coordination to obtain updated information, requirements, and clearances from environmental regulatory agencies that provide threatened and endangered species oversight. This additional T&E species coordination is also a standard component of the water quality permit acquisition process and may result in permit conditions for which the Design-Builder will be responsible. The Design-Builder is responsible for ensuring that all T&E species are correctly identified and impacts assessed, noting that more or less resources may be present than initially identified. Avoidance and minimization shall be implemented to the greatest extent possible. The Design-Builder shall provide to the VDOT Project Manager copies of all documentation and correspondence with regulatory agencies.

### **2.2.6 Hazardous Materials**

VDOT performed studies to determine the potential for hazardous materials and/or contamination within the Project area. No hazardous materials issues were identified on this project, and no further work is anticipated

The Design-Builder shall manage solid waste, hazardous waste, and hazardous materials in accordance with all applicable federal, state, and local environmental regulations and shall implement good housekeeping, waste minimization and pollution prevention practices.

Unless a structure has been otherwise classified, the Design-Builder shall assume all coated structures are Type B.

The Design-Builder shall perform asbestos inspections on all structures (including bridge structures) and, as applicable, perform asbestos abatement, abatement monitoring, notifications and demolition in accordance with VDOT procedures and specifications. Prior to demolition, asbestos abatement shall be performed for all structures found to contain regulated asbestos materials (RACM) and non-RACM that is expected to become friable (i.e. RACM) during the course of demolition. The Design-Builder shall make all appropriate abatement and demolition notifications as required by Federal and State regulations.

Asbestos inspection, abatement and project monitoring shall be performed by individuals and firms licensed by the Virginia Department of Professional and Occupational Regulation. Asbestos abatements shall not be performed by an asbestos contractor who has an employee/employer relationship with, or financial interest in, the laboratory utilized for asbestos sample analysis nor shall the asbestos contractor have an employee/employer relationship with, or financial interest in, the asbestos inspector and project designer working on the Project. Copies of all asbestos inspection, monitoring and disposal records shall be provided to the VDOT Project Manager.

For any asbestos waste and other non-hazardous waste, the Design-Builder shall have the signatory responsibility for the waste shipping manifest(s) and/or bill(s) of lading. For hazardous waste the Design-Builder shall be considered the co-generator and shall be responsible for preparing the hazardous waste shipping manifest(s) for the VDOT representative's signature and as otherwise consistent with the signatory requirement under Section 411 of the VDOT Road and Bridge Specifications.

The Design-Builder shall be responsible for the development of a Spill Prevention, Control, and Countermeasure Plan as required by regulation and for submission of any required plan to the VDOT Project Manager prior to start of construction. In the event of spills or releases of petroleum products and other hazardous liquids or solid materials, the Design-Builder shall take immediate action to contain and eliminate the spill release, including the deployment of environmental protection measures to prevent the migration of the spill into the waters of the United States and of worker exposure protection measures. The Design-Builder shall notify the VDOT Project Manager immediately of all instances involving the spill, discharge, dumping or any other releases or discovery of hazardous materials into the environment and shall provide all required notifications and response actions.

The Offeror shall include in the Price Proposal all costs associated with complying with the above listed requirements except that asbestos abatement and abatement monitoring will be paid for, if and when necessary, under a Work Order in accordance with Article 9 of Part 4 (General Conditions of Contract).

The Design-Builder shall not acquire property until any required Phase I Environmental Site Assessment is complete and approved. This shall represent a hold point in the Design-Builder's CPM Schedule.

### **2.2.7 Air Quality**

The Project has been assessed for potential air quality impacts and conformity with all applicable Federal and state air quality regulations and requirements. Due to its scope of work, this Project is considered exempt and no further air quality analysis is required.

This project is located in an area that is currently in Attainment with the National Ambient Air Quality Standards (NAAQS). Projects that lie within 6.2 miles (10 km) of Shenandoah National Park or James River Face Wilderness Area, Class 1 Prevention of Significant Deterioration Areas, should proactively employ strict dust prevention measures to protect air quality. In addition, the following VDEQ air pollution regulations must be adhered to during the construction of this project: 9 VAC 5-50-60 et seq., Fugitive Dust precautions.

Construction activities will be performed in accordance with VDOT's current "Road and Bridge Specifications." The specifications conform to the State Implementation Plan and require compliance with all applicable local, state, and federal regulations.

### **2.3 Survey**

Survey and utility data shown on the RFP plans has been obtained through GIS, 'as-built' roadway plans and other base mapping techniques. The Design-Builder shall be advised that such survey is not represented to be complete for purposes of designing the Project, and that Design-Builder's scope of work includes performing all additional surveying that is necessary to supplement the above-referenced survey as required for design purposes.

The Design-Builder shall be responsible for obtaining any additional survey data, including all right of entry and land use permits, locating and/or designating underground utilities, digital terrain model ("DTM"), utility test holes and obtaining other related data necessary for the design, right of way acquisition, limited access revisions and construction of the project. Additionally, the Design-Builder will be responsible for any update (property owner changes, subdivisions, etc.) that may occur and needs to be

reflected on the plans and plats in order to acquire right-of-way and complete the final design. Any additional Survey changes will be verified and certified and submitted in final documentation.

Where required the Design-Builder shall provide “Notice of Intent” (“NOI”) letters to all property owners where access to private property is necessary. This is a requirement of the Code of Virginia title § 33.1-94, right of entry. Copies of the letters and address labels shall be provided to the VDOT Project Manager for forwarding to the District Survey Manager as soon as they become available.

## **2.4 Geotechnical Work**

The Design-Builder is required to perform a design level geotechnical investigation that shall meet or exceed both Chapter 3 of the VDOT Manual of Instructions (MOI) for Material and Section 700.04(c) of the VDOT 2007 Road and Bridge Specifications. The Design-Builder shall collect appropriate data for geotechnical evaluation of pavements, embankments, soil and rock cuts, minor structures, including drainage pipe and any other earth-supported or earth-retaining structures or elements of highway design and construction required for this Project. The Design-Builder will be responsible for obtaining all necessary permits and utility clearances as required by VDOT, the Commonwealth of Virginia, or any other jurisdictional body or owner prior to accessing public or private property for the purpose of conducting geotechnical field work. The Design-Builder shall complete laboratory tests in accordance with pertinent ASTM or AASHTO standards and analyze the data to provide design and construction requirements. Soils, rock, aggregate, concrete, asphalt, and other materials tests shall be performed by a laboratory accredited through the AASHTO Accreditation Program (AMRL and CCRL) for each test it conducts for the Project, unless otherwise approved by VDOT.

The Design-Builder shall provide VDOT with all records of subsurface explorations and describe the soils and rock encountered with their depth limits in accordance with the requirements outlined in Chapter 3 of the VDOT Materials Division MOI. The Design-Builder shall provide to VDOT electronic copies of all subsurface explorations in accordance with the boring log template available on the website included in Chapter 3 of the VDOT Materials Division MOI. The electronic files shall be provided by a certified professional geologist or a suitably qualified registered professional engineer in the Commonwealth of Virginia, in gINT<sup>®</sup> software.

Unless already addressed by AASHTO LRFD, the Design-Builder shall incorporate reliability assessments in conjunction with standard analysis methods in accordance with Chapter 3 of the VDOT Materials Division MOI. . An acceptable method for evaluation of reliability is given by Duncan, J.M. (April 2000) Factors of Safety and Reliability in Geotechnical Engineering, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Discussions and Closure, August 2001. The Design-Builder may propose to identify specific, non-critical features, and alternative methods for evaluating variability of subsurface conditions, reliability and minimum factors of safety, prior to submission of its design calculations and drawings. VDOT may, in its sole discretion, accept or reject such proposed methods.

The Design-Builder shall submit to VDOT for its review all geotechnical design and construction memoranda and/or reports that summarize pertinent subsurface investigations, tests, and geotechnical engineering evaluations and recommendations utilized in support of their design/construction documents. This submittal shall be made at least 90 days in advance of the submittal of any final design/construction

documents that are dependent upon the geotechnical evaluations and recommendations with VDOT having a 45-day review period for all geotechnical engineering evaluation and recommendation submittals. Technical specifications for construction methods that are not adequately addressed in the standard specifications shall be provided by the Design-Builder as part of the final design/construction documentation. Prior to submittal of any final design/construction documentation, the Design-Builder shall review the final design/construction document to assure that it has appropriately incorporated the geotechnical components and shall submit evidence of this review to accompany the final design/construction documentation. The Design-Builder shall reference the drawings that incorporate the pertinent results. The Design-Builder's Quality Assurance and Quality Control (QA/QC) Plan shall document how each specific geotechnical recommendation or requirement will be addressed in the final design/construction documentation. The results of the geotechnical investigation and laboratory results shall support design and construction efforts to meet the requirements outlined in this Section.

#### **2.4.1 Geotechnical Requirements**

The Design-Builder shall analyze methods to provide construction recommendations to address soil-structure interaction to accommodate the construction methods applied to this Project. All geotechnical work shall be completed to satisfy baseline and post-construction contract performance requirements.

Embankments and certain aspects of retaining wall design are not addressed by LRFD. Embankments and cut slopes should be designed in accordance with Section 305 of the VDOT Materials MOI. All retaining walls shall be designed in accordance with applicable VDOT and AASHTO requirements.

#### **2.4.2 Trenchless Pipeline Installation**

Installation of any utility pipe by use of trenchless pipe method of installation shall be installed by either conventional tunneling methods, Jack and Bore and/or by Micro-tunneling in accordance with Section 302.03 of VDOT's 2007 Road and Bridge Specifications and the applicable Special Provisions. Trenchless technology other than these methods of installation is not permitted unless otherwise approved by the Department. The Design-Builder's Design Engineer shall choose which of the methods of installation is best suited for the ground and site conditions where the work is to be performed and that will meet the design requirements of the proposed culverts or utility pipes. The Design Engineer shall be responsible to establish both the vertical and horizontal tolerances in support of the design. Such tolerances shall be noted on the construction plans. The design tolerance may be more stringent than what is called for in the both the Jack and Bore and Micro-Tunneling Special Provisions; however, under no circumstances shall the performance requirements and design tolerances used in design of either culverts or utility pipes exceed those specified in the VDOT 2007 Road and Bridge Specifications and the applicable Special Provisions unless first approved by the Department. Performance requirements and tolerance stipulated in the Special Provision for Micro-Tunneling shall also apply to conventional tunneling methods.

### **2.5 Public Involvement/Relations**

The Design-Builder shall be responsible for providing a point of contact, email address, and phone number for the public to use in calling to request information or express concerns throughout the

duration of the project. All information to be released to the public shall be approved and controlled by VDOT. The Design-Builder shall also be responsible for coordinating preparation and release of information to the public with VDOT's Staunton District Office of Public Affairs.

During the Design and Construction Phases, the Design-Builder shall:

- Hold informal meetings with affected stakeholders when necessary and/or as directed by VDOT. These stakeholders will include but not be limited to local institutions (hospitals, schools, etc.), Counties of Albemarle, Augusta, Nelson and the City of Waynesboro. All local stakeholders shall be informed of meetings. Any meetings held will be in accordance with the VDOT Policy Manual for Public Participation in Transportation Projects.
- Provide to VDOT's Staunton District Office of Public Affairs on a weekly basis 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, potential impacts to I-64 and surrounding corridors (i.e., temporary lane closure, shoulder closures, etc.), up-to-date project photos, and contact information.

During the Construction Phase, the Design-Builder shall:

- Provide an emergency contact list of project personnel and have sufficient manpower and resources available to respond to any onsite emergency, including any work zone incidents.
- Operate as a liaison between VDOT, the Counties of Albemarle, Augusta, Nelson and the City of Waynesboro to provide appropriate notification to affected property owners and stakeholders.

## **2.6 Right-of-Way**

Any existing fencing impacted by the Design-Builder's design and construction activities shall be restored or replaced to the same location and alignment when relocation is not required. Where existing fencing needs to be relocated due to proposed improvements, the fencing shall be constructed in the same configuration relative to improvements as the existing condition.

There are no anticipated right-of-way impacts proposed by this Project as shown on the RFP Conceptual Plans included in the RFP Information Package, with the exception of utility easements that may extend beyond the shown right-of-way limits and have not yet been identified or shown on the RFP Conceptual Plans. Should right-of-way (whether fee or easements) be required to accommodate Design Builder's unique solution and/or Design-Builder's means, methods, and resources used during construction above and beyond the right-of-way limits depicted on the preliminary drawings included in the RFP Information Package, then all right-of-way acquisition costs for such additional fee or easements shall be paid by the Design-Builder. These costs would include (but not be limited to) the costs of any public hearings that may be required, actual payments to property owners and all expenses related to the additional acquisitions and associated legal costs, as well as any additional monies paid the landowners to reach a settlement or pay for court award. In the event additional right-of-way is needed as a result of an approved scope change request by the Design-Builder, the Design-Builder shall follow the procedures indicated in the "Right-of-Way Acquisition Guidelines" (Chapter 5 of VDOT's Right of Way Manual of

Instructions; <http://www.virginia.gov/business/row-default.asp>). Additionally, the Design-Builder is solely responsible for any schedule delays due to addition right-of-way acquisition associated with the Design-Builder's design changes; no time extensions shall be granted.

## 2.7 Utilities

The Design-Builder shall be responsible for coordination of the Project construction with all utilities that may be affected. The resolution of any conflicts between utilities and the construction of the Project shall be the responsibility of the Design-Builder. No additional compensation or time will be granted for any delays, inconveniences, or damage sustained by the Design-Builder or its subcontractors due to interference from utilities or the operation of relocating utilities.

The Design-Builder shall be responsible for utility designations, utility location (test holes), conflict evaluations, cost responsibility determinations, utility relocation designs, utility relocations and adjustments, utility reimbursement, replacement land rights acquisition and utility coordination required for the Project. Design-Builder shall be responsible for all necessary utility relocations and adjustments to occur in accordance with the accepted Baseline Schedule. All efforts and cost necessary for utility designations, utility location (test holes), conflict evaluations, cost responsibility determination, utility relocation designs, utility relocations and adjustments, utility reimbursements, replacement land rights acquisition and utility coordination shall be included in the Offeror's Price Proposal if any; provided, however, that the compensation paid to landowners for replacement land rights will be paid by VDOT and shall **NOT** be included in the Offeror's Price Proposal.

The Design-Builder shall make all reasonable efforts to design the Project to avoid conflicts with utilities, and minimize impacts where conflicts cannot be avoided.

The Design-Builder shall initiate early coordination with all utilities located within the Project limits. The Design-Builder shall identify and acquire any replacement utility easements needed for all utilities necessary for relocation due to conflicts with the Project.

The Design-Builder shall provide all utilities with roadway design plans as soon as the plans have reached a level of completeness adequate to allow them to fully understand the Project impacts. The utility will use the Design-Builder's design plan for preparing relocation plans and estimates. If a party other than the utility prepares relocation plans, there shall be a concurrence box on the plans where the utility signs and accepts the relocation plans as shown.

The Design-Builder shall coordinate and conduct a preliminary review meeting with all affected utilities to assess and explain the impact of the Project. VDOT's Project Manager and District Utilities Engineer (or designee) shall be included in this meeting.

The Design-Builder shall verify the prior rights of each utility's facilities if claimed by a Utility owner. If there is a dispute over prior rights with a utility, the Design-Builder shall be responsible for resolving the dispute. The Design-Builder shall prepare and submit to VDOT a Preliminary Utility Status Report within 120 days of the Date of Commencement that includes a listing of all utilities located within the Project limits and a conflict evaluation and cost responsibility determination for each Utility. This report shall include copies of easements, plans, or other supporting documentation that substantiates any compensable rights of the utilities. The Design-Builder shall obtain the following from each utility that is

located within the Project limits: relocation plans including letter of "no cost" where the utility does not have a compensable right; utility agreements including cost estimate and relocation plans where the utility has a compensable right; letters of "no conflict" where the utility's facilities will not be impacted by the Project.

The Design-Builder shall review all relocation plans to ensure that relocations comply with the VDOT Right of Way Manual of Instructions, the VDOT Utilities Manual of Instructions, Utility Relocation Policies and Procedures and VDOT's Land Use Permit Manual. The Design-Builder shall also ensure that there are no conflicts with the proposed roadway improvements, and ensure that there are no conflicts between each of the utility's relocation plans. The Design-Builder shall prepare and submit to VDOT all relocation plans. The Design-Builder shall assemble the information included in the relocation plans in a final and complete form and in such a manner that VDOT may approve the submittals with minimal review. The Design-Builder shall meet with VDOT's District Utilities Office within 45 days of the Date of Commencement to gain a full understanding of what is required with each submittal. The Design-Builder shall receive written approvals from VDOT prior to authorizing utilities to commence relocation construction. The utilities shall not begin their relocation work until authorized by the Design-Builder. Each relocation plan submitted shall be accompanied by a certification from the Design-Builder stating that the proposed relocation will not conflict with the proposed roadway improvements and will not conflict with another utility's relocation plan.

At the time that the Design-Builder notifies VDOT that the Design-Builder deems the Project to have reached Final Completion, the Design-Builder shall certify to VDOT that all utilities have been identified and conflicts have been resolved and that those utilities with compensable rights or other claims related to relocation or coordination with the Project have been relocated and their claims and compensable rights satisfied or shall be satisfied by the Design-Builder.

The Design-Builder shall accurately show the final location of all utilities on the as-built drawings for the Project. The Design-Builder will ensure the utility companies submit as-built drawings upon completion of their relocation and/or adjustments. VDOT shall issue an as-built permit to the utility companies after receipt of permit application and as-built drawings.

It is the Design-Builder's responsibility to verify whether other utility owners exist within the project limits and coordinate with them. Known utility owners are identified below for reference only and may not be limited to the following:

1. Dominion Virginia Power
2. Norfolk Southern Railroad

New service requests for power will be handled at our local utility offices and additional contact information will be provided at the Pre-Proposal Utility Coordination meeting on the date and time set forth in Part 1, Section 2.4.1.

## **2.7.1 Utility Coordination with Traffic Control Device Plan**

### **Design**

The Design-Builder shall develop Intelligent Transportation System (ITS) and Traffic Control Device (TCD) designs that are not in conflict with existing and proposed utilities (both overhead and underground). All traffic control device structures shall be a minimum of ten (10) feet both horizontal and vertical from all overhead electrical lines. If any areas are located near electrical high voltage power, water, gas and petroleum transmission lines, the Design-Builder shall coordinate with appropriate utility company for specific clearances that must be maintained during and post construction.

### **Designation**

The Design-Builder shall be responsible for locating and marking all underground utilities prior to any ITS and TCD installation work. At least seventy-two (72) hours prior to beginning ITS and TCD installation work, the Design-Builder shall contact:

1. Miss Utility of Virginia at 1-800-552-7001 or 811 in order to determine the extent and location of underground utilities within the project limits, and
2. VDOT NWRO Maintenance to determine the extent and location of all VDOT-owned underground communication and electric equipment.

### **Electrical Service Requirements**

The Design-Builder shall be responsible for all work, materials, and costs associated with obtaining power and maintaining power throughout construction for all ITS and TCD's (including the existing fog light system). It is the Design-Builder's responsibility to coordinate with appropriate maintaining agency to schedule all utility connections so as not to adversely impact the project schedule.

### **Testing of Electrical Service Grounding System**

The Design-Builder shall test the electrical service grounding system for each electrical service in accordance with Section 700.04 of the VDOT 2007 Road and Bridge Specifications.

## **2.8 Quality Assurance / Quality Control (“QA/QC”)**

The Design-Builder shall submit its Quality Assurance/Quality Control (QA/QC) for both design and construction to VDOT for review and approval at the meeting held after the Date of Commencement as set forth in Part 4 General Conditions under Section 2.1.2. Along with the QA/QC Plan submittal, the Design-Build Project Manager and Quality Assurance Manager (QAM) shall provide a presentation of the QA/QC Plan for both design and construction utilizing Project related scenarios. Project scenarios shall include, but not be limited to:

1. Preparatory Inspection Meeting requirement, including incorporation of at least one each, Witness and Hold Point, as set forth in Sections 5.3 and 5.14, Department's guidance document for Minimum Requirements for Quality Assurance and Quality Control on Design Build and Public-Private Transportation Act Projects, January 2012 (January 2012 QA/QC Guide);

2. At least one (1) material which VDOT retains responsibility for testing as identified in Table 5-2, August 2012 QA/QC Guide;
3. Situation arising requiring the issuance of a Non-Conformance Report and subsequent review of the report, including completion of corrective measures and the issuance of a Notice of Correction of non-conformance work with proper log entries and proper interface with auditing and recovery requirements as set forth in Section 5.10 of the January 2012 QA/QC Guide for non-conforming work resulting from:
  - a. defective equipment
  - b. construction activities/materials which fail to conform as specified;
4. Inspection documentation capturing requirements as set forth in Section 5.20 and 5.21 of the January 2012 QA/QC Guide; as well as inspection of foundation and pavement subgrades that are to be performed and certified by the Design-Builder's licensed geotechnical engineer in accordance with the special provisions referenced in this Document;
5. Application for payment for Work Package which includes work element, including review and approval by Quality Assurance Manager;

Detail two (2) sample entries in Materials Notebook showing completion of Form C-25, including subsequent submission and review by Department Project Manager as set forth in Section 5.21. Refer to Section 803.73 of VDOT's Manual of Instruction for Materials Division, Form TL-142S, for an example of a completed Materials Notebook and VDOT Materials Division Memorandum Number MD299-07 for Materials Acceptance – October 4, 2007.

### **2.8.1 Design Management**

The Design-Builder is responsible for design quality in accordance with VDOT's Minimum Requirements for Quality Assurance and Quality Control on Design Build and Public-Private Transportation Act Projects (January 2012 QA/QC Guide). The Design-Builder's Design Manager shall be responsible for establishing and overseeing a QA/QC program for all pertinent disciplines involved in the design of the Project, including review of design, working plans, shop drawings, specifications, and constructability of the Project. This individual shall report directly to the Design-Builder's Project Manager, and is responsible for all of the design, inclusive of QA and QC activities. Members of the Design QA and QC team are responsible for review of all design elements to ensure the development of the plans and specifications are in accordance with the requirements of the Contract Documents. Design QA should be performed by one or more member(s) of the lead design team that are independent of the Design QC. The project design control plan will provide VDOT assurance that the design plans and submittals will meet all contract requirements.

Appendix 2 of the January 2012 QA/QC Guide provides minimum requirements that shall be met for development of the Design QA/QC Plan.

### **2.8.2 Construction Management**

The Design-Builder shall develop, operate, and maintain a Construction QA/QC Plan in accordance with VDOT's January 2012 QA/QC Guide. The Design-Builder shall have the overall responsibility for both the QA and QC activities and shall be responsible for all QA activities and QA sampling and testing for all materials used and work performed on the Project. These QA functions shall

be performed by an independent firm that has no involvement in the construction QC program/activities. There shall be a clear separation between QA and construction, including separation between QA inspection and testing operations and construction QC inspection and testing operations, including testing laboratories. Two independent, AMRL certified testing laboratories will be required, one for QA testing and one for QC testing.

The QAM shall have the authority to enforce requirements of the Contract Documents, and Reference Documents, when deficient materials or unsatisfactory finished products fail to conform to Contract Documents and Reference Documents. The QAM, in accordance with his/her assignment, shall monitor, and inspect the construction work as it progresses. The Design-Builder shall establish and maintain a Quality Assurance Auditing and Nonconformance Recovery Plan (AR Plan) for uniform reporting, controlling, correction and disposition and resolution of nonconformance (including disputed nonconforming items) issues that may arise on the Project. The Design-Builder's AR Plan shall establish a process for review and disposition of nonconforming workmanship, material, equipment or other construction and design elements of the Work including the submittal Design Review process. All deficiencies (hereinafter referred to as a Non-Conformance), including those pertaining to rules, regulations, and permit requirements, shall be documented by the QAM. A Non-Conformance Report (NCR) referenced by a unique number, shall be forwarded to the Contractor and VDOT within 24 hours of discovery of the Non-Conformance. Non-conformance procedures are provided in Section 5.10.5 of the January 2012 QA/QC Guide.

The Design-Builder also shall be responsible for providing QA and QC testing for all materials manufactured off-site, excluding the items listed below\*:

- Prestressed Concrete Structural Elements (beams, girders (VDOT adopted Bulb-T sections), and piles)
- Structural Steel Elements (beams, girders, gantries, and monotubes)
- Pipe (concrete, steel, aluminum, and high density polyethylene) for culverts, storm drains, and underdrains
- Precast Concrete Structures
- Asphalt Concrete Mixtures
- Aggregate (dense and open graded mixes)
- Metal Traffic Signal and Light Poles and Arms

\*Note: Items listed may not all be necessary to complete the project according to the RFP Design Documents.

VDOT will provide plant QA and plant QC inspection and/or testing of these items. In the event that VDOT determines that materials fail to meet the tolerances in the Road and Bridge specifications, a NCR will be issued by the VDOT Project Manager and addressed to the Design-Builder's QAM for resolution. The Design-Builder is required to submit documentation of the source of materials, including the source of each material to be incorporated into the project and the acceptance method that will be used for the material. A VDOT Form C-25 may be used to meet this requirement; however, the Design-Builder is required to submit a VDOT Form C-25, for all materials that VDOT retains responsibility for testing. The source of materials, C-25 is for informational purposes only and will not be approved or rejected by VDOT since it is the Design-Builder's responsibility to obtain materials that meet the contractual

requirements. The Design-Builder will be responsible for providing QA and QC testing of all off-site materials that are not identified above, including materials obtained from off-site soil borrow pits.

The Design-Builder's QAM shall report directly to the Design-Builder's Project Manager and be independent of the Design-Builder's physical construction operations. The QAM shall establish quantities prior to commencing construction, and provide VDOT a total number of QC, QA (Independent Assurance (IA) and Independent Verification Sampling and Testing (IVST)), Owner's (the Department) Independent Assurance (OIA), and Owner's Independent Verification Sampling and Testing (OVST) required as a result of the quantities and the sampling and testing requirements as set forth in Table A-3 and A-4 of the January 2012 QA/QC Guide. VDOT will provide all OIA and OVST tests and, therefore, final determination of the actual number of OIA and OVST tests to be performed will be made by VDOT based on these quantities.

The QAM shall be responsible for the QA inspection and testing of all materials used and work performed on the Project to include monitoring of the Contractor's QC activities, maintaining the Materials Notebook (including adherence to the Special Provision for Design-Build Tracking (DBT) numbers included in the RFP Information Package), documentation of all materials, sources of materials and method of verification used to demonstrate compliance with VDOT's requirements. This includes all materials where QA testing is to be performed by VDOT. The QAM shall be vested with the authority and responsibility to stop any work not being performed according to the Contract requirements. The construction QA and QC inspection personnel shall perform all of the construction inspection and sampling and testing work that is normally performed by VDOT, as prescribed in the Construction Manual, Inspection Manual, Materials Manual of Instructions and all other applicable Reference Documents. This includes the documentation of construction activities and acceptance of manufactured materials.

All sampling and testing should be performed by a laboratory that is accredited in the applicable AASHTO procedures by the AASHTO Accreditation Program (AAP). For test methods not accredited by AAP, the laboratory must comply with AASHTO R18 (most current Edition) and must be approved by the Department at its sole discretion. Two independent testing laboratories will be required, one for QA testing and one for QC testing. The entity(ies) performing QA operations, inspections, sampling, and laboratory testing and the entity(ies) performing QC operations, inspections, sampling, and laboratory testing shall be unique and independent from one another.

All construction QA and QC personnel shall hold current VDOT materials certifications for the types of materials testing that they are assigned to perform in accordance with Section 3.6 of the January 2012 QA/QC Guide, and for the safety and use of nuclear testing equipment as required by the Road and Bridge Specifications. The QA programs shall be performed under the direction of the QAM. The QC programs shall be performed under the direction of the Construction Manager. Substitution of Construction Manager and the QAM shall require VDOT approval. In addition, VDOT shall have the right to order the removal of any construction QA and QC personnel, including the QAM and the Construction Manager for poor performance at the sole discretion of the VDOT Project Manager. The QA/QC plan shall include rapid reporting of non-compliance to the VDOT Project Manager, and shall include the remedial actions to be taken as discussed in Section 105.12 of Part 5.

The Design-Builder shall provide, prior to Final Application for Payment, a complete set of Project records that include, but are not limited to the following:

- Project correspondence
- Project diaries
- Test reports
- Invoices
- Materials books
- Certified survey records
- DBE/EEO records
- Warranties
- As-Built drawings
- Special tools

## 2.9 Field Office

The Design-Builder shall provide office space, equipment, and services consistent with requirements for a Field Office. This field office should be configured and equipped for joint operations by Design-Builder and VDOT staff. The configuration and equipping of the field office shall be coordinated between the Design-Builder and the VDOT Project Manager prior to on-site placement of the field office. The field office will be operational throughout the duration of the project and shall be removed upon final project acceptance.

## 2.10 Plan Preparation

### 2.10.1 Geopak and Microstation

When the Design-Builder is given the Date of Commencement, they will be furnished with the following software and files which run in WindowsXP or Windows 7 only: Geopak (current version used by VDOT), MicroStation (current version used by VDOT) and VDOT Standard Resources Files, and all the design files used to develop the RFP roadway and bridge plans.

### 2.10.2 Software License Requirements

VDOT shall furnish license(s) for all the software products VDOT makes available to the Design-Builder. The License(s) will be supplied upon request by the Design-Builder, based on the data provided on a completed Software License Form, LD-893, and subsequently reviewed and approved by the VDOT Project Manager.

All License(s) are provided for use on the Project detailed on the request only for the duration specified for that Project. Any adjustment made to the Project schedule will be taken into consideration in adjusting the time the license(s) are available. Justification for the number of license(s) requested **MUST** include the estimated number of total computer hours for the task of design, detailing, relating Project management and other computer based engineering functions requiring the software requested.

The appropriate use of all license(s) provided to the Design-Builder will become the responsibility of the Design-Builder regardless of who on the team uses the license(s). The Design-Builder will be responsible for keeping track of the license(s) provided to them or a team member and the

prompt return of the license(s) and removal of the software from any system used solely for the Project for which it was obtained.

### **2.10.3 Drafting Standards**

All plans shall be prepared English units and in accordance with the most recent version of the VDOT's Road Design Manual, Vol. I, VDOT's CADD Manual, VDOT's I&IM, VDOT's Traffic Engineering Design Manual and VDOT's Manual of Structure and Bridge Division, Vol. V, Part 2, Design Aids, Typical Details, AASHTO and the MUTCD.

The approved plans shall be furnished by the Design-Builder with appropriate signature blocks and Professional Engineer seal on each sheet indicating approval for construction.

### **2.10.4 Electronic Files**

All plans shall also be submitted in electronic format using the provided versions of MicroStation CADD software. Files shall be submitted in both DGN & PDF formats. VDOT will furnish electronic files of all applicable standard detail sheets upon request by Design-Builder. The files will use standard VDOT cell libraries, level structures, line types, text fonts, and naming conventions as described in the most recent version of the VDOT CADD Manual and VDOT's Manual of the Structure and Bridge Division, Vol. V- Part 2, Design Aids and Typical Details. Files furnished to Design-Builder in electronic format shall be returned to VDOT and removed from Design-Builder's and its designer's computer equipment upon completion of this Project.

### **2.10.5 Plan Submittals**

In addition to electronic files as described in Section 2.10.4 above, the Design-Builder shall prepare and distribute hard copy paper plans in the quantities as specified below, for each of the following deliverables (at a minimum, as other submittals and/or work packages may be necessary or desired):

- Right of Way Plans (if applicable)
- Released for Construction Plans
- Right of Way and/or Construction Revisions
- Record Plans (As-Built)
- Approved Shop Drawings
- Design Calculations

The Right of Way and/or Construction plans may be submitted for approval in logical subsections (such as from bridge to bridge) or consisting of work packages such as: 1) clearing and grubbing along with erosion and siltation control, 2) grading and drainage, 3) final roadway, and 4) traffic control. Individual bridge plans may be submitted in logical components such as: 1) foundation, 2) remaining substructure, and 3) superstructure. A submittal schedule and planned breakdown of work packages shall be submitted to VDOT for review and approval as part of the planned Project Baseline schedule.

Right of Way and/or Construction Plans shall be accompanied by 1) a VDOT LD-436 checklist filled out as appropriate for the specific submittal, and 2) a written notice signed by the Design-Build Design Manager that includes the following:

- The logical subsections or work packages for which review and approval is being requested
- Confirmation that the submittal has been checked and reviewed in accordance with the Design-Builder’s approved QA/QC plan.
- Confirmation that the submittal either meets all requirements of the Contract Documents and Reference Documents or that any deviations from the Contract Documents and Reference Documents have been identified and previously approved by VDOT.

The Design-Builder shall submit all Right of Way and/or Construction plans to VDOT and FHWA simultaneously, for review and approval. VDOT shall receive two (2) full-size sets and ten (10) half-size sets of each submission, with the exception of the Released for Construction Plans (see Section 2.10.9 below). FHWA shall receive two (2) half-size sets of each submission. The plan submissions shall be delivered to the following addresses:

Virginia Department of Transportation  
Attention – David Evans  
8010 Mason King Court  
Manassas, VA 20109

Federal Highway Administration, Virginia Division  
Attention – Iris Rodriguez, Operations/LPA Engineer, Martha Kapitanov, Highway Safety Engineer  
400 N. 8<sup>th</sup> Street, Suite 750  
Richmond, VA 23219-4825

VDOT and FHWA shall have the right to review all Right of Way and Construction Plans and provide comments regarding compliance with the requirements of the Contract Documents and Reference Documents. The Design-Builder shall be responsible for satisfying all such comments. Formal responses to VDOT and FHWA comments shall be provided in subsequent submittals.

VDOT and FHWA shall have the right to disapprove any design approach that is not in compliance with the requirements of the Contract Documents and Referenced Documents.

VDOT’s written approval of any deviations from requirements of the Contract Documents and Reference Documents shall be attached to the plans submitted for review.

#### **2.10.6 Right of Way Plans**

If right of way is acquired on this Project Right of Way Plans and any associated Design Calculations shall be submitted to VDOT and FHWA simultaneously for review. The time frame for plan review and approval shall be in accordance with the requirements of the Contract Documents. All VDOT and FHWA comments must be adequately addressed before the Right of Way Plans will be approved. Notice to Commence Right of Way Acquisition will be granted in accordance with Section 2.6 above. The Design-Builder shall be responsible for the design details and ensuring that the design and right of way acquisition work are properly coordinated.

### **2.10.7 Construction Plans**

Construction Plans, and any associated Design Calculations, shall be submitted to VDOT and FHWA simultaneously for review. The time frame for plan review and approval shall be in accordance with the requirements of the Contract Documents. All VDOT and FHWA comments must be addressed to the satisfaction of the commentator before Construction Plans are recommended for approval to the Chief Engineer. This plan milestone includes plans that may be submitted as soon as sufficient information is available to develop Construction Plans for certain portions or elements of the Project (or work packages). The Design-Builder shall meet commitments for review and approval by other entities/agencies as specified in other portions of the RFP and its attachments. The Design-Builder shall be responsible for the design details and ensuring that the design and construction work are properly coordinated.

### **2.10.8 Released for Construction Plans**

*Released for Construction Plans* are those that are issued for construction after approval by VDOT's Chief Engineer. Notice to Commence Construction will only be issued by the VDOT Project Manager upon approval of the Construction Plans (or Work Packages) by the Chief Engineer.

The Released for Construction Plans shall be distributed simultaneously to VDOT and FHWA. VDOT shall receive one (1) full-size set and five (5) half-size sets of Released for Construction Plans, along with all electronic files. FHWA shall receive two (2) half-size hard copy sets, along with all electronic files, of the Released for Construction Plans. The plans shall be delivered to the following addresses:

Virginia Department of Transportation  
Attention – David Evans  
8010 Mason King Court  
Manassas, VA 20109

Federal Highway Administration, Virginia Division  
Attention – Iris Rodriguez, Operations/LPA Engineer, Martha Kapitanov, Highway Safety Engineer  
400 N. 8<sup>th</sup> Street, Suite 750  
Richmond, VA 23219-4825

### **2.10.9 Record As-Built Plans**

The final plan milestone is Record (As-Built) Plans. As-Built Plans shall be prepared, signed and sealed by a Professional Engineer licensed in Virginia, and submitted to VDOT with the final application for payment. These plans will show all adjustments and revisions to the Construction Plans made during construction and serve as a permanent record of the actual location of all constructed elements.

## **2.11 Training**

The Design-Builder shall provide documentation and training for the installation, operation, and maintenance of the ITS equipment constructed by the Project in accordance with the Special Provision for ITS Training included in the RFP Information Package. Training shall include the following:

- Infrastructure Components:

- Fiber-optic communications cable
- Fiber-optic interconnect centers
  - Splice trays and other related fiber-optic equipment in accordance with the RFP Conceptual Plans and the Technical Information and Requirements
- Uninterrupted Power Supply (UPS) equipment
- Auxiliary power system
- Device Components:
  - CCTV camera
  - Dynamic message sign (DMS)
  - Pavement condition sensor (PCS)
  - Vehicle detection
- Network Components:
  - Ethernet edge switch
    - Ethernet test switch
  - Video encoders
  - Network configuration
  - Servers

## 2.12 Structures

The scope of work shall consist of installation of wooden poles for CCTV cameras and vehicle detection, vertical monotube poles or butterfly structures for Dynamic Message Signs (DMS) and other ITS devices; metal support structures (towers) for Road Weather Information Systems (RWIS); and structures for static signs as identified in the RFP Conceptual Plans included in the RFP Information Package. The Design-Builder shall use standard VDOT sign structures (as specified in the VDOT Road and Bridge Standard) for interstate static signs. The Design-Builder may reuse an existing structure after inspection, repair of any defects, and certification that the structure meets all current sign structure design criteria and is fully compliant with the Technical Information and Requirements and Special Provisions listed in Section 2.1 for this Project. Any existing structure that the Design-Builder proposes to reuse must be certified for the identified loads, including a statement sealed by a Professional Engineer in the State of Virginia that the reused structure is fully compliant with the Technical Information and Requirements and Special Provisions listed in Section 2.1 for this Project. Base plates on poles/uprights of all structures used on this Project—including butterfly, monotube, and any reused existing structures—shall have a minimum of six (6) anchor bolts with 1 ½ inch diameter each and a minimum vertical clearance of 19 feet shall be maintained over all roadways and shoulders at all times during and after construction, with the exception of reused existing structures having a vertical clearance less than 19 feet. For these structures, the minimum vertical clearance shall not be less than the existing clearance.

### 2.12.1 CCTV Wooden Camera Pole

The camera poles are intended to support ITS components consisting of one or more of the following: CCTV cameras, battery cabinets, vehicle detectors, antennas, and/or ITS controller cabinets. The camera poles shall be round wood poles. The Design-Builder should design, furnish, and install one standard pole size providing a camera mounting height of 45-ft.

### **2.12.2 Dynamic Message Sign Structures**

The Design-Builder shall furnish and install structures with foundations in accordance with VDOT 2007 Road and Bridge Standards and the requirements specified herein and locations as shown in the RFP Conceptual Plans. DMS Structures are intended to support ITS components consisting of one or more of the following: Dynamic Message Sign, Vehicle Detectors, CCTV cameras, battery cabinets, antennas, and/or ITS controller cabinets.

Structural design of steel poles and associated foundations shall be performed on a case-by-case basis and shall account for the individual or combined loads of ITS components at each discreet pole location.

### **2.12.3 RWIS Tower**

The Design-Builder shall furnish and install a steel tower with a concrete foundation to support the RWIS station. Structural design of steel tower and associated foundation shall be performed on a case-by-case basis and shall account for the individual or combined loads of ITS components at each RWIS location.

### **2.12.4 Lightning Protection**

Structures intended to support DMS, CCTV and/or RWIS devices shall be installed with an air terminal and main conductor terminated at the structure ground rod. The air terminal shall be a minimum of 24” in length and listed UL-96. The main conductor shall be #2 AWG copper. The main conductor shall be connected to the air terminal with a compression clamp and to the ground rod using an exothermic weld.

## **2.13 Hydraulics**

### **2.13.1 Drainage**

At this time, it is not anticipated that any existing drainage facilities will be impacted during this project, however, if the Design-Builder does impact existing drainage structures or facilities, it will be the responsibility of the Design-Builder to complete a drainage design. The drainage design work may include the design of culverts, open channels, storm sewers, underdrains, adequate outfall analysis, stormwater management facilities, and erosion and sediment control in compliance with the standards and reference documents listed previously in Section 2.1 and the VDOT Erosion and Sediment Control & Stormwater Management Program. Drainage analysis shall be limited to those drainage conveyance facilities which are impacted by the associated work related to this contract.

It is the responsibility of the Design-Builder to obtain any additional survey information that is necessary to accommodate final design including, but not limited to, survey of modified or new drainage structures/culverts not identified in the RFP Conceptual Plans and survey necessary to delineate drainage areas.

### **2.13.2 Stormwater Management Plan and Erosion and Sediment Control**

Effective July 1, 2013 the administration of the Virginia Erosion and Sediment Control and Stormwater Management regulatory programs was transferred from the Virginia Department of

Conservation and Recreation (DCR) to the Virginia Department of Environmental Quality (DEQ). References and links to DCR manuals and documents contained herein may no longer be correct as these programs are being transferred between the State agencies. The erosion and sediment control certification requirements shall still apply, but with the DEQ having oversight over the certification program beginning July 1, 2013.

An Erosion and Sediment Control (ESC) Plan and Narrative, Stormwater Pollution Prevention Plan (SWPPP, and a post construction Stormwater Management (SWM) Plan shall be prepared and implemented by the Design-Builder in compliance with applicable requirements of the standards and referenced documents listed in Part 2, Section 2.1, including the Virginia Erosion and Sediment Control Law and Regulations, and the Virginia Stormwater Management Program (VSMP) Law and Regulations.

It shall be the responsibility of the Design-Builder to have a qualified person within their team structure, other than the ESC and post construction SWM Plan designer, who is authorized by the Department of Environmental Quality (DEQ) to perform plan reviews, independently review and certify that the ESC Plans and Narrative and post construction SWM Plan for the Project are in accordance with VDOT's Approved ESC and SWM Standards and Specifications. Before implementing any ESC or post construction SWM measures not included in VDOT's approved ESC and SWM Standards and Specifications, a variance or exception respectively must be requested through the District Drainage Engineer in accordance with the latest version of I&IM-LD-11 and I&IM-LD-195.

The Design-Builder shall complete and submit the ESC and SWM Plan Certification form (LD-445C) to the VDOT Project Manager. The Design-Builder shall provide VDOT two (2) paper and two (2) electronic copies each on CD of the final ESC Plan and Narrative, SWPPP and post construction SWM Plan incorporating all calculations, analysis, documentation and evaluations required. The ESC Narrative shall specifically include calculations (with supporting data) documenting that the design meets the adequate outfall requirements of the VSMP Regulations for each location where stormwater is discharged from the Project.

The land-disturbing activity for the Project is greater than 2,500 square feet, therefore coverage under the VSMP General Construction Permit for the Discharges from Construction Activities (VSMP Construction Permit) is required. The Design-Builder shall coordinate and submit required permit coverage application information to the VDOT Project Manager. The Design-Builder shall complete the applicable sections of the VSMP Construction Permit Registration form (LD-445), VSMP Construction Permit Contact Information (LD-445A), VSMP Construction Permit Fee Registration form (LD-445B). These forms along with the completed ESC and SWM Plan Certification form (LD-445C) shall be submitted to the VDOT Project Manager. The VDOT Project Manager will review the submitted information and, if complete and acceptable, process a request for coverage under the VSMP Construction Permit in accordance with VDOT's guidelines as outlined in the latest version of I&IM-LD-242. If any information submitted by the Design-Builder is found to be incomplete and/or unacceptable, the assembly will be returned to the Design-Builder for corrective action and resubmission.

A working conceptual ESC and post construction SWM Plan and SWPPP for the entire Project must be submitted for review and approval with the initial application for permit coverage. This initial conceptual Plan submittal shall include the proposed total expected Land Disturbance Area and Land Development Area, including any off-site facilities, for the entire Project. Where the Project will be

constructed in segments, the Design-Builder shall submit a finalized ESC Plan, a post construction SWM Plan and a SWPPP, including the expected Land Disturbance Area, for the proposed initial work segment in addition to the conceptual plan for the entire Project. It is expected that the individual work segment submittals will be self-sustaining and not incur a deficit in post construction SWM design requirements requiring mitigation on future work segments. Subsequent work segment submittals shall include required modifications to the Land Disturbance Area value. However, these modifications, in total, shall not exceed the initially submitted Land Development Area value. The Design-Builder shall not proceed with work to be covered by the permit until permit coverage is secured and the VDOT Project Manager releases the work in writing. It is noted that permit coverage, and subsequent release of work, can take up to 90 days from the time that the Design-Builder submits a request for coverage that includes all required information. This represents a hold point in the Design-Builder's CPM Schedule. Design-Builder shall provide a completed SWPPP Certification form (LD-455E) before commencement of any land disturbing activity and shall complete and include the SWPPP General Information Sheets in the plan assembly per the latest version of I&IM-LD-246. The SWPPP Certification form (LD-455E) and SWPPP General Information Sheets shall be updated with each work segment submittal as necessary. The Design-Builder shall be responsible for compliance with construction-related permit conditions and shall assume all obligations and costs incurred by complying with the terms and conditions of the permit. Any fines associated with permit or regulatory violations shall be the responsibility of the Design-Builder. Upon completion of the entire regulated land disturbing activity (including final stabilization of all disturbed areas), the Design-Builder shall provide as built Permanent Best Management Practice (BMP) information in Section VI of the SWPPP General Information Sheets for each post construction BMP placed into service on the Project, complete and sign the VSMP Construction Permit Termination Notice form (LD-445D) and submit both documents to the VDOT Project Manager for processing. The Design-Builder shall also have on-site during any land disturbing operations an individual or individuals holding a DEQ Inspector Certification, a DEQ Responsible Land Disturber (RLD) Certification and a VDOT Erosion and Sediment Control Contractor Certification (ESCCC) to ensure compliance with all DEQ and VDOT erosion and sediment control plan implementation requirements.

### **2.13.3 Stormwater Management Facilities**

VDOT has determined that permanent Stormwater Management Facilities may not be required for the Project; however the Design-Builder shall be responsible for verifying and validation the Project's post-stormwater management requirements for the final design.

The Design-Builder shall be responsible for the design and construction of stormwater management facilities as required for the Project in accordance with the latest version of IIM-LD-195, and the other standards and reference documents listed in Section 2.1, including the Virginia Stormwater Management Program Law and Regulations. The Design-Builder is to ensure proper ingress and egress to any stormwater management facility and that any specific proprietary facilities have proper maintenance details included in the plans.

### **2.14 Traffic Control Devices**

The Project shall include all Traffic Control Devices (TCD), including temporary and permanent installation of the following: signing. All TCD designed and installed under the Project shall be in accordance with standards and references in Section 2.1. The Signing and Pavement Marking Plans,

Transportation Management Plan (TMP), including Temporary Traffic Control/ Public Information and Traffic Operations Plans are required from the Design-Builder for final approval by VDOT and shall be included as a planned work package. The Design-Builder shall comply with the Special Provision for Personnel Requirements for Work Zone Traffic Control.

All existing TCD impacted by the Project shall be modified, upgraded, or replaced by the Design-Builder to meet current VDOT standards.

### **2.14.1 Signs**

The Design-Builder shall be responsible for modifications to existing signs and structures, and furnishing and installing all required new signs and structures as indicated on the RFP Conceptual Plans includes in the RFP Information Package or as described in these requirements. An existing sign inventory shall be completed prior to site demolition in accordance with the VDOT Traffic Engineering Design Manual. The final lines of sight and sight distances must be considered in the placement of all Project signing. DMS signs removed by the Project shall be salvaged intact and delivered to VDOT at 811 Commerce Road, Staunton, VA 24401 after making arrangements 48 hours in advance by calling Mr. Jackie Christian at (540) 480-0352. All signs and sign structures to be removed during the construction of the Project shall be disposed of by the Design-Builder, except that, where appropriate as determined by VDOT, existing VDOT sign panels that are found to be in good condition and are in conformance with the current size requirements of the 2009 MUTCD and/or 2011 Edition of the Virginia Supplement to the 2009 MUTCD may be reused. The proposed location of all sign poles, posts, and structures shall be field staked in accordance with Section 700.04(e) of the VDOT 2007 Road and Bridge Specifications.

#### **2.14.1.1 Signing Plan Requirements**

The signing plans shall be prepared at a scale equal one (1) inch = fifty (50) feet when plotted full size at thirty-five (35) inches by twenty-three (23) inches. The signing plans shall show the proposed sign message, MUTCD or Virginia Supplement sign designation (if applicable), size and location of all signs. The structure type used for mounting sign shall be noted on the signing plans. These signing plans shall show the location and messages of all existing signs. The Design-Builder may relocate an existing sign panel onto a new structure if the sign meets current standards and VDOT approves. All existing sign removals and relocations shall be shown on the signing plans. The signing plans also shall include the location and type of delineation devices (including pavement markings).

#### **2.14.1.2 Design of Sign Panels and Locations**

Proposed and replaced sign panels shall be in accordance with the VDOT 2007 Road & Bridge Specifications and other references in Section 2.1. The Design-Builder shall coordinate all sign locations with all proposed and existing signing, landscaping, fencing, signals, utility, drainage, and all other roadside features to assure proper clearances and adequate sight distances. Existing signing that is in conflict with, that are located in proximity to, or that will have its visibility impacted by proposed signing or structures, including proposed DMS structures, shall be removed and replaced with new sign replicating the existing message at a new location. Sign sizes shall adhere to the latest edition of the FHWA Standard Highways Signs Book, the current edition of the MUTCD, the 2011 Virginia Supplement to the 2009 MUTCD, and all applicable Traffic Engineering Division Numbered memoranda.

The Design-Builder shall use Standard VDOT sign structures for new and relocated VDOT owned signs. Ground-mounted VDOT sign structures on I-64 shall use Standard SSP-VIA or SSP-VA structures, unless otherwise approved by VDOT. The Design-Builder shall utilize the current edition of the MUTCD, 2011 Virginia Supplement to the 2009 MUTCD, the Standard Highway Signs and Markings Book and the Virginia Standard Highway Signs Book to design all non-standard signs that do not have a MUTCD or VDOT standard sign designation. Non-Standard sign designs shall be approved by VDOT's State Traffic Engineer and FHWA. The Clearview font shall be utilized for all positive contrast guide signs in accordance with the 2011 Virginia Supplement to the 2009 MUTCD and applicable Traffic Engineering Division Numbered Memoranda.

The Design-Builder shall coordinate the permanent location of sign structures and all proposed, relocated, or modified with Integrated Directional Signing Program (IDSP) signs such as Supplemental Guide Signs (SGS), Specific Travel Services (Logo) Signs, General Motorist Services Signs (GMSS), Tourist Oriented Directional Signs (TODS), and all other signs approved and maintained as part of the IDSP. All impacts to IDSP signs shall be reviewed and approved by the IDSP Manager before relocation, fabrication, and installation. Whenever possible all proposed, relocated, or modified IDSP signs should not be installed in sign assemblies with other non-IDSP signs. IDSP signs should be installed on 2 ½ inch square tube posts and concrete foundations in accordance with Standards STP-1, Standards SSP-VA structures and foundations, or Standards SSP-VIA structures and foundation as appropriate and as approved by the IDSP Manager.

#### **2.14.2 Pavement Markings/Markers**

At this time, it is not anticipated that any existing pavement markings/ markers will be impacted during this Project, however, if the Design-Builder does impact existing pavement markings/ markers, it is the responsibility of the Design-Builder to replace those markings/ markers. If necessary, the pavement markings, markers, and delineators shall conform to the requirements of the 2009 MUTCD and the 2011 Virginia Supplement to the 2009 MUTCD. All pavement marking plans shall be in accordance with VDOT Traffic Engineering Design Manual, Section III.

### **2.15 Roadside Hardware**

The Project shall include all roadside hardware, including permanent installation of guardrail. All roadside hardware designed and installed under the Project shall be in accordance with standards and references in Section 2.1.

All existing roadside hardware impacted by the Project shall be modified, upgraded, or replaced by the Design-Builder to meet current VDOT standards.

#### **2.15.1 Guardrail**

The Design-Builder shall ensure that the clear zone within the project limits where work is being performed is free from hazards and fixed objects. In the event that redesign, removal, or relocation of hazards and fixed objects from the clear zone for work being performed by the Project is not feasible, the Design-Builder shall design and install appropriate barrier system for protection in accordance with NCHRP 350 or AASHTO Manual for Assessing Safety Hardware, and VDOT standards. The same clear zone requirement applies to existing conditions affected by this Project where guardrail upgrade will be required. At locations where the Design-Builder will install a new device or modify an existing structure,

the affected guardrail must be upgraded per the current version of VDOT's IIM-LD-220.3. Seven (7) days prior to installation of guardrail the Design-Builder shall request VDOT field verification of proposed layout. Accompanied by the Design-Builder, VDOT representative will inspect the locations and advise on any necessary adjustments. The Design-Builder will be responsible for coordinating with VDOT for the limits of guardrail upgrades for their specific design.

## **2.16 Transportation Management Plan (TMP)**

The Design-Builder shall develop and incorporate a Traffic Management Plan (TMP) in accordance with the requirements of L&D Memorandum IIM-241. The TMP shall document how traffic will be managed during the construction of the Project. The Design-Builder shall coordinate all work in accordance with the TMP. The TMP shall incorporate and address at a minimum the temporary traffic control plan, the public communications plan, traffic operations analyses (including incident management) for all phases of work, with proposed lane/road closures, and all construction accesses for approval by VDOT.

### **2.16.1 Maintenance of Traffic**

The Design-Builder's TMP shall include a Maintenance of Traffic Plan (MOT) detailing all phases of work, proposed road closures, maintenance of traffic through work area, and all construction accesses for approval by VDOT's Project Manager. This plan also shall address safe and efficient operation of adjacent public transportation facilities and State Highways. This plan shall reflect the noted Scope of Work and all applicable VDOT Standards and Specifications regarding time of work. This plan shall be in accordance with the current edition of L&D IIM-241 and incorporate all strategies meeting the criteria described in the IIM for temporary traffic control, public communication and outreach, and transportation operations. The Design-Builder will be responsible for any changes to the TMP resulting from any Design-Builder changes to the sequence of construction.

The phases in the Design-Builder's sequence of construction that accompany an approved work package shall be followed unless the Design-Builder submits and secures VDOT approval for a sequence which will both expedite construction while lessening the effect of such construction upon the traveling public. The intent of the sequence of construction is that portions of the Project in the different phases may be allowed to be constructed provided they do not interfere with existing traffic flow and/or do not cause any delay in the Project completion. Under no circumstances will concurrent construction left and right of any lane of traffic be allowed, unless otherwise approved by the Department.

The Maintenance of Traffic Plans shall extend an appropriate distance beyond the construction tie-in locations to allow for the required length of shift per the current edition of the Virginia WAPM and the Federal Manual on Uniform Traffic Control Devices. Any areas that are immediately adjacent to traffic, excavated below the existing pavement surface, within the clear zone, and not protected by positive barrier, at the conclusion of each work day shall be backfilled in accordance with Appendix A of the VAWAPM.

Construction signs and pavement markings (temporary) shall be installed, maintained, adjusted, and removed by the Design-Builder throughout the duration of the Project.

At locations on I-64 where Traffic Barrier Service, Concrete, or Group II Channelizing Devices are used, a minimum width of two (2) feet shall be maintained between the edge of the traffic lane and Traffic Barrier Service, Concrete, or Group II Channelizing devices. For all other roadways, a minimum width of one (1) foot shall be provided between the traffic lane and the Traffic Barrier Service or Group II Channelizing devices.

The Design-Builder shall utilize the Virginia State Police (VSP) during rolling lane closures on I-64 for operations associated with events such as demolition and/or installing signing adjacent to travel lanes. The Design-Builder shall coordinate VSP usage as needed for other lane closures and traffic changes on I-64 and the ramps. All rolling lane closures shall be in accordance with Traffic Engineering Memorandum TE-352. The Design-Builder shall be responsible for coordinating through VDOT for VSP service. VDOT shall be responsible for all costs incurred by VSP specific to the Project.

Reductions in the speed limits within the work zones on I-64, ramps, or the secondary roadways shall, in accordance with TE-350, be reviewed and approved by the VDOT's Traffic Engineer. The Design-Builder shall be responsible for Work Zone Speed Analysis prepared by a Professional Engineer licensed and registered in the Commonwealth of Virginia, and shall be completed and provided to the VDOT Project Manager.

Flag persons shall be certified according to the Virginia Flagger Certification Program.

Where construction impacts the ramp intersections with local roads, pedestrian and bicycle traffic shall be accommodated on the MOT plan. Where construction occurs within the vicinity of pedestrian and bicycle paths, path traffic shall be maintained at all times. Construction vehicles shall not park on, store materials on, or block the paths without prior approval by VDOT's Northwest Regional Traffic Engineer. Where existing pedestrian routes are blocked or detoured, information should be provided about alternative routes that are usable by pedestrians with disabilities, particularly those who have visual disabilities. Access to temporary bus stops, reasonably safe travel across intersections with accessible pedestrian signals (see Section 4E.09 of the 2009 MUTCD), and other routing issues should be considered where temporary pedestrian routes are channelized. Barriers and channelizing devices that are detectable by people with visual disabilities shall be provided.

The minimum allowable traffic lane widths are 12 feet on I-64, including ramps, and 11 feet on all other roadways through the Project area. The Design-Builder shall submit detour, lane, and shoulder closure requests according to VDOT's Special Provision for Section 108 – Prosecution and Progress of Work.

The Design-Builder shall coordinate all work associated with the Project to include, but not limited to, projects listed in Section 2.1.3.2 in accordance with VDOT's Special Provision for Section 105.09 – Cooperation Among Design-Builders.

### **2.16.2 Allowable Work Hours**

The Design-Builder shall follow VDOT's Special Provision for Section 108 – Prosecution and Progress of Work (Roadway and Night Work Limitations) for limitations of operation along I-64.

All preparatory or exploratory work to any existing facilities including, but not limited to, geotechnical investigations shall follow the WAPM and the Special Provision for Section 108 – Prosecution and Progress of Work chart for any planned lane closures.

Due to the unique weather environment within and adjacent to the limits of the project, particularly with the frequency and severity of fog conditions and high winds, VDOT reserves the right to suspend the Contractor’s operations whenever the fog light system is on, and/ or high wind advisories are posted on the local variable message signs, or as directed by the Engineer.

Upon suspension of the Contractor’s operations due to weather conditions, the necessary removal of any work zones should be accomplished immediately and continuously until complete and in accordance with the Traffic Management Plan.

### **2.16.3 Holiday Restrictions Allowable Work Hours**

In addition to the Limitations of Operations defined by Section 108.02 of the Division I Amendments (Part 5) to the Standard Specifications, the Design-Builder shall not be permitted to conduct any operations within the Project limits according to VDOT’s Special Provision for Section 108 – Prosecution and Progress of Work (Roadway and Night Work Limitations).

### **2.16.4 Weekend Restrictions**

All weekend lane closures and construction activities are subject to the requirements of the Special Provision for Section 108 – Prosecution and Progress of Work, and for additional weekend restrictions associated with special events.

### **2.16.5 Lane Closure Restrictions**

Lane or road closures shall be in accordance with the table in VDOT’s Special Provision for Section 108 – Prosecution and Progress of Work.

Complete closures of the mainline can only occur with substantiation of need by the Contractor and written authorization by VDOT, and shall be coordinated with VDOT Traffic Management Center (TMC) seven (7) days in advance of closure.

### **2.16.6 Ramp Lane Closures**

Complete ramp closures may be permitted in accordance with the times listed in the table in VDOT’s Special Provision for Section 108 – Prosecution and Progress of Work and subject to approval by VDOT. A request for the approval of a complete ramp closure by VDOT shall include the detour design and associated cost shall be included in the price proposal.

## **2.17 Infrastructure Components for Intelligent Transportation System**

The Design-Builder shall be responsible for providing design, installation, and maintenance until final acceptance, integration, testing, training, documentation, and final submission of As-Built plans for the infrastructure components.

The Design-Builder shall avoid and minimize disruption to the existing network. The addition to the network and interface shall seamlessly reside and be fully interoperable with legacy network. At no

point shall the contractor disable communication or power to any existing devices without prior coordination with VDOT. Alternative methods of communication and power will need to be provided to the existing devices during the replacement of the existing power and communication lines.

### **2.17.1 Power System**

The work shall consist of furnishing and installing a new primary voltage feeder within the project area as shown on the RFP plans. The new primary voltage feeder shall include medium voltage recloser switchgear to provide back-up electrical service at the Power House. Step down transformers and secondary power feeds shall be installed to service the ITS devices within the project area.

The work shall include installation of trenches, bored, or exposed conduit, and junction boxes as required to replace the existing power system and to connect newly installed equipment to the power system, to form a complete and functional power system for the ITS field devices and Hub assemblies using the methods identified in the RFP Conceptual Plans.

The work shall also include removal of power cable as shown on the plans and installation of new primary feeder cable will be installed in new 3” conduit. No existing power infrastructure for the in-road fog light system shall be altered or replaced.

The Design-Builder shall coordinate with Dominion Virginia Power (DVP) for installation of the primary power feed, step down transformer to 2,400-v, and a primary power metering point at Exit 96. The Design-Builder shall install a recloser at both Exit 96 and at the Power House, as well as 2,400-v primary voltage cable between Exit 96 and the Power House.

New primary power cable will be installed from the Power House to approximately MM 104. The Design-Builder will install step down transformers to power the new and Existing ITS device located between the Exit 96 interchange and MM 104 through the new primary feeder.

### **2.17.2 Fiber Optic Cable System**

The work shall consist of furnishing and installing a new fiber optic backbone and drop cables from the ITS devices in the project area to new ITS Hub Assemblies or slicing to existing fiber optic cables.

All fiber optic drop cables will have a minimum of 24 fibers. All fiber optic backbone cables will have a minimum of 96 fibers. All underground fiber optic cable shall be installed in new or existing conduit; no aerial or direct buried fiber will be permitted. Fiber optic cable shall be installed separately and must never be intermingled with power conductors in pull boxes, manholes, junction boxes, vaults, or conduit.

The fiber optic cable shall be all-dielectric, dry-filled, loose-tube, dispersion-unshifted, single-mode fiber (SMF) with low water peak, gel free, and suitable for underground (i.e., in conduit) and aerial outside plant installation. All components that comprise a single length of cable shall be continuous and shall be of the same material. Commercial off-the-shelf materials, equipment, and components shall only be furnished.

The work shall include installation of trenches, bored, or exposed conduit, junction boxes, and splice enclosures as required to replace the existing fiber optic network, to connect newly installed equipment to the fiber network, and to form a complete functional fiber optic communication network from the field devices and Hub assemblies to the TOC using the methods identified in the RFP Conceptual Plans.

The work shall also include removal of existing fiber optic cable as shown on the plans and installation of new fiber optic cable in existing conduit.

The Design-Builder shall install the Fiber Optic system in accordance with the VDOT Special Provisions listed in Section 2.1.

### **2.17.3 Fiber Optic Hub Locations**

The work shall consist of furnishing and installing new fiber hubs in accordance with the Technical Information and Requirements, Special Provisions listed in Section 2.1, and RFP Conceptual Plans. Each fiber Hub consists of cabinet enclosure and associated ancillary items. Cabinet installations for Fiber Optic Hubs shall be enclosed in ground mounted cabinets.

The fiber optic hubs are used to link the proposed and existing ITS devices in the project area to the Traffic Operations Center. Each fiber optic hub shall include equipment as outlined in Section 2.1, and RFP Conceptual Plans.

The Design-Builder shall furnish and install primary transient voltage surge suppression (TVSS) at each Fiber Optic Hub location to protect the equipment from lightning, transient voltage surges, and induced current. This also includes connecting the primary surge protection at the service entrance or main disconnect.

### **2.17.4 Cabinets**

The work shall consist of furnishing and installing the power and field equipment cabinet components in accordance with the Technical Information and Requirements, Special Provisions listed in Section 2.1, and RFP Conceptual Plans. Power and field equipment cabinet consists of cabinet enclosure and associated ancillary items.

ITS Controller Cabinets and ITS Communication Hub Assemblies are used for housing power distribution and disconnect, ITS equipment, and network devices including, but not limited to, Ethernet switches, device/terminal servers, digital video encoders, CCTV interface panels, DMS controllers, vehicle detector interface assemblies, transient voltage surge suppressors, uninterruptible power supplies, solar power controller/charging equipment, and fiber optic cable termination/patch panels.

ITS Controller Cabinets installations will be pole-mounted. ITS Communication Hub Assemblies will be ground-mount.

Where existing cabinets have equipment that may be abandoned, the Design-Builder shall investigate, verify, and accept the working condition of the devices prior to commencing work and accepting responsibility for the cabinet. The Design-Builder shall be responsible to bring existing cabinets and infrastructure that may be reused to be fully compliant with the Technical Information and

Requirements and Special Provisions listed in Section 2.1 for this Project. The Design-Builder shall be responsible for ensuring and demonstrating that any active components remaining in reused cabinets remain in operation without interruption or deviation.

The Design-Builder shall furnish and install primary transient voltage surge suppression (TVSS) in each equipment cabinet for all ITS devices connected directly or at remote locations to protect the equipment from lightning, transient voltage surges, and induced current. This also includes connecting the primary surge protection at the service entrance or main disconnect.

### **2.17.5 Uninterruptible Power System**

This work shall consist of furnishing and installing uninterruptible power systems (UPS) for ITS devices at locations in accordance with the Technical Information and Requirements, Special Provisions listed in Section 2.1, and the RFP Conceptual Plans.

UPS assembly shall provide complete non-interruptible power protection, voltage regulation, and surge and spike protection for all ITS devices and communications equipment powered by it. The UPS shall instantly transfer the cabinet to the battery back-up mode in the event the main AC power source goes offline. The UPS shall be a commercially available package containing all wiring connectors, software, mounting brackets, and cables. The UPS assembly shall consist of a UPS with batteries, surge suppression, LED status indicators for “On-line,” “Battery On,” “Replace Battery,” and “Overload,” customizable output relays and input contacts, and network management cards (IP addressable).

The UPS shall include remote monitoring and control functions with a software/firmware package that is Microsoft web-based and, at a minimum, provides the ability to determine in real time the status of the commercial power (on-off), backup power (on-off), the duration of available UPS backup battery time at the rated UPS load (hours/minutes), and any errors.

The UPS shall be of sufficient design to fully operate all ITS devices and communications equipment located within the ITS cabinet and powered from the ITS cabinet, including the CCTV, camera controller and video encoder, vehicle detector and Road Weather Information Station (RWIS) for a minimum of eight (8) hours. Those ITS devices not needing UPS backup include DMS Type 1 and 2. Longer battery runtimes shall be utilized based on the life safety roles served by devices. The Design-Builder shall be responsible for determining the appropriate size/capacity of the UPS, but in no case shall the UPS be smaller than 2.3KVA. The Design-Builder shall be responsible for providing a portable generator hookup where power demand and cabinet constraints outweigh minimum battery runtime capacity.

The Design-Builder shall install and integrate UPS components in the respective designated ITS Controller Cabinets, in accordance with the electrical requirements for the respective Cabinet Specifications.

### **2.18 Device Components of Intelligent Transportation System**

The Design-Builder shall be responsible for providing design, installation, and maintenance until final acceptance, integration, testing, training, documentations, and final submission of As-Built plans for the device components.

The final placement of all ITS devices on the roadside shall be such that maintenance activities can be performed on the device without requiring the closure of a vehicle travel lane.

The Design-Builder shall provide VDOT with a sample unit or unit intended for spare parts of all ITS devices related to ATSMS (RWIS, Vehicle Detection, and Pavement Condition Sensor) being installed for VDOT to use for software integration. The Design-Builder shall furnish such equipment to VDOT within twenty-one (21) calendar days of plans being approved for construction.

### **2.18.1 Closed-Circuit Television (CCTV) Cameras**

Furnish and install a closed circuit television (CCTV) color camera in a pressurized housing. The CCTV shall be a digital or analog type device as described in the Special Provisions. The installed equipment shall provide unobstructed video images of the roadway, traffic, and other current conditions minimally to the location of the adjacent CCTV camera, respond to camera control commands from the operator, and transmit video images to remote locations.

The CCTV camera shall be mounted at a height of 45-ft above the adjacent roadway and shall produce clear, detailed, and usable video images of the areas, objects, and other subjects visible from a roadside CCTV field site. The video produced by the camera shall be true, accurate, distortion free, and free from transfer smear, over-saturation, and any other image defect that negatively impacts image quality under all lighting and weather conditions in both color and monochrome modes. The camera enclosure shall minimize glare and provide overexposure protection for the camera when pointed directly at the sun.

The Design-Builder shall **upgrade the existing CCTV** cameras to communicate with the TOC through the Managed Field Ethernet Switch and to operate on power provided through the primary or secondary feeder line installed with this project.

### **2.18.2 Dynamic Message Sign (DMS)**

Two types of DMS units shall be utilized in this Project.

**Type 1** (Interstate DMS): Full matrix, 3-line, 15 characters per line, 18-inch character height, and amber pixel color. The signs shall be installed where “Interstate DMS” units are called for on the RFP Conceptual Plans.

**Type 2** (Arterial DMS): Full matrix, 3-line, 15 characters per line, 12-inch character height, and amber pixel color. The signs shall be installed where “Arterial DMS” units are called for on the RFP Conceptual Plans.

The DMS controller and circuit breaker shall be installed in the pole mounted equipment cabinet, not within the DMS assembly. The DMS controller software shall support NTCIP V2.35 and shall be backward compatible with VDOT’s current version 1 of the NTCIP communication protocol and the functions and features contained within VDOT’s existing TOC central control software.

### **2.18.3 Vehicle Detectors**

Furnish and install vehicle detection systems (VDS) using nonintrusive high definition (HD) microwave radar vehicle detector capable of vehicle presence detection and traffic data collection in

accordance with the Special Provisions listed in Section 2.1 and the RFP Conceptual Plans. The materials, equipment, and components shall be new, commercial off-the shelf products. Reconditioned equipment or system components shall not be used. The work shall include installing the VDS at the appropriate mounting angle and mounting height in accordance with the manufacturer's recommendations. For VDS installation on a DMS or CCTV pole with a lowering device, the VDS shall be installed with a universal mounting bracket and with a minimum 10 ft. horizontal extension arm. The VDS shall not obstruct the lowering devices on CCTV poles. The universal mounting bracket shall be adjustable on two axes for optimum alignment.

The vehicles detectors shall, at a minimum, produce vehicle presence, volume, speed, and occupancy data for each detected lane. Defining, configuring, adjusting, and programming detections parameters, zones, size, placement, and sensitivity shall be achievable by laptop computer both in the field and remotely. Once programmed the vehicle detector shall not require periodic adjustments to the detection zones unless physical roadway conditions change, such as lane shifts or closures.

Furnish software that is compatible with NWRO Software System and shared hardware platform. The software application shall provide PC desktop display of the detection zones and control of any vehicle detector connected to the network to conduct system setup, calibration, diagnosis, and data retrieval operations. All components of the vehicle detection system shall be fully compatible and operational with NWRO's central system software (OpenRoad's OpenTMS) and offer an open API and software development kit available to VDOT at no cost for integration with third party software and systems.

The Design-Builder shall **upgrade the existing vehicle detectors** to communicate with the TOC through the Managed Field Ethernet Switch and to operate on power provided through the primary or secondary feeder line installed with this project.

#### 2.18.4 Road Weather Information System (RWIS)

Furnish and install Road Weather Information System (RWIS) capable of detecting weather conditions and traffic data collection in accordance with the Special Provisions listed in Section 2.1 and the RFP Conceptual Plans. The materials, equipment, and components shall be new, commercial off-the shelf products. Reconditioned equipment or system components shall not be used.

All RWIS sites, both new and existing, shall have the required sensors to detect and produce data for, but not limited to, road surface temperature and condition, visibility, precipitation type, precipitation intensity and accumulation, wind direction, wind speed, temperature, relative humidity, barometric pressure, and solar radiation values. All sensors shall be non-intrusive type sensors with the exception of the roadway subsurface sensor.

~~The RWIS shall, at a minimum, detect and produce data displaying atmospheric conditions including visibility, precipitation type, precipitation intensity and accumulation, wind direction, wind speed, temperature, relative humidity, barometric pressure and solar radiation values. The RWIS shall also detect and produce data from non-invasive sensors displaying roadway surface condition. The RWIS road surface temperature and condition sensors shall, at a minimum, detect and produce data displaying the present condition of the adjacent roadway including surface temperature, subsurface temperature, precipitation data that includes precipitation type, percent of ice, and precipitation depth/amount. The~~

Design-Builder shall **install new RWIS** stations at the locations shown on the plan. ~~The RWIS stations shall detect and produce data displaying atmospheric and roadway conditions noted above.~~

The Design-Builder shall **upgrade all the existing RWIS** stations to communicate with the TOC through the Managed Field Ethernet Switch and to operate on power provided through the primary or secondary feeder lines installed with this project. The existing wireless communication systems and solar power systems will remain in place to provide redundancy.

The RWIS materials and equipment shall include a support tower or pole that provides a mounting platform for atmospheric sensors free of influences from topography, buildings, and vehicles. Ensure that the tower/ pole also supports any lightning protection devices (e.g air terminal) for the site. The RWIS controller and supporting devices shall all be enclosed in a cabinet mounted directly to the RWIS support tower or pole.

Furnish software that is compatible with NWRO Software System and shared hardware platform. The software application shall provide PC desktop display of the data retrieval operations. All components of the RWIS shall be fully compatible and operational with NWRO’s central system software and offer an open API and software development kit available to VDOT at no cost for integration with third party software and systems.

### **2.18.5 Modify Existing Road Weather Information System**

Furnish and install additional sensors as necessary to connect with an existing Road Weather Information System (RWIS). At completion of the modifications the RWIS shall, at a minimum, detect and produce data ~~displaying atmospheric conditions including for, but not limited to, road surface temperature and condition,~~ visibility, precipitation type, precipitation intensity and accumulation, wind direction, wind speed, temperature, relative humidity, barometric pressure and solar radiation values. All sensors shall be non-intrusive type sensors with the exception of the roadway subsurface sensor. The materials, equipment, and components shall be new, commercial off-the shelf products. Reconditioned equipment or system components shall not be used.

~~The modified RWIS shall also detect and produce data from non-invasive sensors displaying roadway surface condition. The additional~~ The road surface temperature and condition sensors proposed shall, at a minimum, detect and produce data displaying the present condition of the adjacent roadway including surface temperature, subsurface temperature, precipitation data that includes precipitation type, percent of ice, and precipitation depth/amount.

All additional sensors shall be fully compatible and operational with NWRO’s central system software and offer an open API and software development kit available to VDOT at no cost for integration with third party software and systems.

### **2.19 Network Components of Intelligent Transportation System**

The Design-Builder shall be responsible for providing design, installation, and maintenance until final acceptance, integration, testing, training, documentations, and as-build plans for the devices.

The Design-Builder shall avoid and minimize disruption to existing network. The addition to the network and interface shall seamlessly reside and be fully interoperable with legacy network.

### 2.19.1 Field Ethernet Switches

Furnish and install an environmentally hardened, device-level **Managed Field Ethernet Switch (MFES)**. The MFES shall provide wire-speed fast Ethernet connectivity at transmission rates of 100 megabits per second or 1 gigabit per second from the remote ITS device location to the ITS network trunk interconnection point. The MFES shall support a minimum combination of 10 fiber optic and copper Ethernet ports as indicated in the Special Provisions listed in Section 2.1. At least three of the fiber optic ports shall be Gigabit-enabled allowing ring configuration as well as simultaneously connecting isolated/spur routes.

The ITS Network Administrator shall be able to manage each MFES individually or as a group/cluster for switch configuration, performance monitoring, and troubleshooting. These specifications require additional minimum management intelligence (i.e., Layer 2+) typical of most current industrial Ethernet deployments. The MFES shall include Layer 2+ capability providing architecture standardization, open connectivity (i.e., interoperability), bandwidth management, rate limiting, security filtering, and general integration management of an advanced Ethernet switching architecture.

The furnished MFES shall be fully compatible and interoperable with the ITS trunk Ethernet network interface, and the MFES shall support half and full duplex Ethernet communications. The MFES shall feature non-blocking on all ports, and the full-duplex operation shall have no collisions. The MFES shall have non-blocking, store, and forward switching. The MFES shall provide a selectable feature that redirects the fiber connectivity in cases where the fiber link from the head end is severed and the data to /from the MFES has an alternate fiber route path to maintain communications as a self-healing function.

Furnish and install **Primary Network Switches (PNSW)** providing Ethernet connectivity, digital encoded video distribution, network traffic, and ITS device control data. The PNSW shall be installed at the ITS Communication Hub Assemblies and at the TOC. PNSW installed in the ITS Communication Hub cabinets shall be environmentally hardened as described in the Special Provisions. PNSWs shall be connected to field devices by way of Managed Field Ethernet Switches (MFES). Connection to Managed Field Ethernet Switches shall be through Ethernet links over fiber optic cable. The PNSW shall be capable of Gigabit Ethernet, Asynchronous Transfer Mode (ATM), and Packet Over SONET (POS) transmission protocols.

### 2.19.2 Field Video Encoders

Furnish and install Digital Video Encoder (DVE) hardware to create a video-over-IP network system that will be integrated with central software decoding platforms. Provide digital video encoders that are fully compatible with NWRO's central system software and existing software decoders. Furnish DVE units that utilize open source and commercially available software decoders including VLC and Apple QuickTime Media Player.

### 2.19.3 Network Configuration

The Design-Builder shall contact the VDOT Project Manager and coordinate network configuration control meetings with VDOT's networking staff prior to the installation of networking equipment and throughout the duration of installation and configuration efforts. The Design-Builder shall be responsible for configuring the equipment as approved by VDOT's Project Manager. This shall include any and all configuration settings required (including simple network management protocol

(SNMP) management settings, port activation alarms, etc.). Meetings shall begin at least one (1) month prior to the start of installation of this equipment and shall continue through at least one (1) month past the conclusion of testing and acceptance of installed equipment. Prior to commencing work, the Design-Builder shall develop a Requirements Definition Document (RDD) that will form the basis for the overall network architecture and design. It is expected that the Design-Builder will work closely with VDOT's networking staff to configure the network. The document will contain:

- Complete description of the proposed implementation of the access, distribution, and core layers for the Ethernet network as described in the RFP Conceptual Plans and Special Provisions listed in Section 2.1;
- Development of an IP Design Scheme with ranges assigned to each node to be integrated by the Design-Builder;
- Proposed IP subnet definition and addressing including any and all masks;
- Proposed IP multicast configuration including multicast routing (i.e., protocol independent multicast (PIM) sparse or dense) and Rendezvous Point (RP) designation as necessary;
- Proposed Recommendations for failover and redundancy including network device power, supervisor cards, and network ports;
- Proposed configuration and guidelines for Virtual LAN assignments including management VLANs, device VLANs, and routing VLANs;
- Proposed configuration and guidelines for specific port assignments on each of the Layer 2 and 3 devices; and
- Proposed interface/integration points with the existing ITS network.

VDOT will provide the Design-Builder with an IP address range or ranges to use for developing the IP address scheme. The RDD shall be prepared by a qualified networking professional and approved by VDOT. The qualified networking professional shall be present during the installation and testing of the local area network as well as during system testing.

The Design-Builder shall install and secure the networking equipment in the field equipment cabinets, at the Hub's, and at the Traffic Operations Center as defined on the RFP Conceptual Plans, the Technical Information and Requirements document, and the Special Provisions listed in Section 2.1. Standards CAT 5E and optical fiber cables shall be used for each connection, as required in the Special Provisions listed in Section 2.1.

Patch cables shall be defined as cables connecting a device to a patch panel, wall outlet, or another device. The patch panel provides a connection to permanently installed cabling generally.

The current communications system consists of a VDOT maintained Ethernet network centered at the Power House located at Exit 99, and multiple commercial T1 connections extending from Exit 96 to Exit 107. The VDOT Ethernet network includes fiber optic cable extending from approximately MM 98 to MM 103.

The conceptual design for this project includes a complete Ethernet network linking the existing and proposed ITS devices, dynamic message signs and CCTV cameras within the corridor to the VDOT TOC. Layer 2, Managed Field Ethernet Switches (MFES) will be installed at each device location and will be connected to the PNSW's via a new fiber optic cable. The MFES will communicate with the existing PNSW's and shall be configured for failover; such that all ITS devices, DMS and CCTV within

the corridor shall be capable of communicating with the TOC through any of the PNSW's in the event of the failure of one PNSW.

The intention of this project is to replace the existing communication system and establish interconnected ITS Hubs at locations shown in the RFP reference documents, such that the ITS devices have redundant communication paths to the TOC.

The Design-Builder shall test, accept, and maintain the dedicated fiber for the duration of construction. Unused fiber shall be subject to testing and VDOT acceptance prior to the end of the Project.

## **2.20 Inspection, Integration, and Testing of Intelligent Transportation System**

Inspection, integration, and testing involve a three-tier sequential process that consists of Stand Alone functionality, System Operation, and Acceptance Testing as defined herein. Stand Alone Testing requires field acceptance at device, cabinet, communication hub and Traffic Management Center (TMC) levels in order to proceed to System Operational Testing. The System Operation Testing will show that the devices can communicate to the TOC via the VDOT communication system and the leased communication lines. Testing at the TOC should be performed through a dedicated interface, separate from the TOC operations. This System Operation Testing shall successfully demonstrate that users at the TOC can fully control all aspects of the AT&SM system before the Design-Builder can commence Acceptance Testing. The Design-Builder shall make arrangements for the witnessing of tests by VDOT staff or representatives by sending notification seven (7) days prior to scheduled test.

The Design-Builder shall be responsible for establishing and executing a plan for inspecting, integrating, and testing of all infrastructure and device components furnished and installed by the Project. The QAM shall be responsible for ensuring that the inspection, integration, and testing plan established by the Design-Builder and approved by VDOT is properly executed, variances are reported and corrective actions are made.

The Design-Builder shall supply written test procedures for VDOT approval a minimum of thirty (30) days before testing can be started. The Design-Builder shall submit reports for all testing levels to verify procedures followed, results recorded, timetable, and action required. The testing report shall include relevant information such as calibration data of all test equipment, charts, graphs, evidence, photographs, failure analysis, corrective action, traceability and audit trail, with certification signature of both Design-Build Project Manager and QAM.

The Design-Builder shall submit a schedule for Acceptance Testing that shall be performed over a sixty (60) consecutive day period under real-world operation conditions without system failure. The system shall not lockup, fail, or crash due to use, operator entry of data, or equipment malfunction during the 60 days. Operators will record any deficiency as it occurs and VDOT may employ a third-party to inspect the system and record any deficiencies. Any system failure of Design-Builder supplied equipment or discovery of deficiency that causes a system failure shall be cause to halt and repeat Acceptance Testing in its entirety for another full 60-day period after correction of problem.

This 60-day acceptance test shall demonstrate that the equipment functions as required without intervention by the Contractor. Where the equipment must be replaced, or require any adjustment, the acceptance test period will be restarted and continue to completion of the 60-day period.

Where execution of the acceptance test is interrupted due to an event, such as area-wide power outage, the test period will be extended for the period of the event, such that the total period of the test includes 60 calendar days of operation where the Department may monitor the performance of the equipment.

During Acceptance Testing, the Design-Builder shall respond and arrive on site within two (2) hours of notification from VDOT. All repairs, including communication failures, shall be completed within four (4) hours.

The Design-Builder shall provide manufacturer’s warranties on all furnished equipment for material and workmanship that are customarily issued by the equipment manufacturer. The warranty period shall commence from successful completion of the field acceptance testing.

## 2.21 System Support Equipment for Intelligent Transportation System

The Design-Builder shall “furnish only” and not install system support materials under this Project. All system support materials shall include all necessary hardware.

Furnish new and unused system support equipment that is identical to the materials installed and accepted under this Project. Furnish the following materials and quantities:

<u>Item</u>	<u>Quantity</u>
CCTV Camera Assembly	2
Video Encoder	2
Field Ethernet Switch	8
Vehicle Detector Assembly	2

DMS items and quantities as noted in the Special Provisions for Intelligent Transportation System – Dynamic Message Signs