REQUEST FOR PROPOSALS (RFP)

Electronic Toll Collection System RFP

August 30, 2021

All spaces below are to be filled in and this sheet must be incorporated within as the first page of the response to this Request for Proposals (RFP).

Firm Name: _____

Contact Name: _____

Address: _____

_____

Telephone: _____ Facsimile: _____

Email: _____

By my signature below, I certify that I am authorized to sign this proposal for the firm named above. I further certify that this proposal is made without prior understanding, agreement, or connection with any other company or person submitting a separate proposal for the same services and is in all respects fair and without collusion or fraud. This proposal shall remain open for acceptance for 150 days from the proposal due date. On behalf of the firm named above, I further certify that such firm has and will abide by all conditions set forth in this RFP.

Signature _____

Name and Title _____

Date _____

Refer ALL Inquiries to:

Paula Watson, Manager of Procurement
Paula.Watson@rmtaonline.org
804.523.3308

Only email inquiries accepted

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List of Acronyms

AET	All Electronic Tolling
ALPR	Automatic License Plate Recognition
ATA	American Trucking Association
AVDC	Automatic Vehicle Detection and Classification
AVI	Automatic Vehicle Identification
BAFO	Best and Final Offer
BOM	Bill of Materials
BTU	British Thermal Unit
COTS	Commercial Off-The-Shelf
CPI	Consumer Price Index
CPU	Central Processing Unit
CSC	Customer Service Center
CSV	Comma Separated Values
DBE	Disadvantaged Business Enterprise
DBMS	Database Management System
DOCX	Microsoft Word file format
DR	Disaster Recovery
DRP	Disaster Recovery Plan
DTE	Downtown Expressway
DVAS	Digital Video Audit System
EIA	Electronic Industries Alliance
ETCS	Electronic Toll Collection System
FAT	Factory Acceptance Text
FCC	Federal Communication Commission
FHWA	Federal Highway Administration
FSIIT	First Site Installation and Integration Test
GAAP	Generally Accepted Accounting Principles
GUI	Graphical User Interface

HVAC	Heating, Ventilation, and Air Conditioning
ICD	Interface Control Document
ISO	International Organization for Standardization
ISSL	Initial Spare Stock Listing
LAN	Local Area Network
LPN	License Plate Number
MMR	Monthly Maintenance Report
MOMS	Maintenance Online Management System
MOT	Maintenance of Traffic
MOV	QuickTime Movie (file extension)
MPP	Microsoft Project file format
MTBF	Mean Time Between Failures
MTTRR	Mean Time to Respond and Repair
NEC	National Electrical Code ®
NECA	National Electrical Contractors Association
NFPA	National Fire Protection Association
NTP	Network Time Protocol or Notice to Proceed (depends on context)
OCR	Optical Character Recognition
ORT	Open Road Tolling
OSHA	Occupational Safety and Health Administration
PDF	Portable Document Format
PMP	Project Management Plan
PPTX	Microsoft PowerPoint file format
RFID	Radio Frequency Identification
RFP	Request for Proposals
RMTA	Richmond Metropolitan Transportation Authority
RTM	Requirements Traceability Matrix
SAT	System Acceptance Test
SDDD	System Detailed Design Document

SFTP	Secure File Transfer Protocol
SICT	Site Installation and Commissioning Test
SLA	Service Level Agreement
SMA	Short Message Service
SSAE	Statement on Standards for Attestation Engagements
TFH	Toll Facility Host
TIA	Telecommunications Infrastructure Standard for Data Centers
TSI	Toll Systems Integrator
TVL	Transponder (Tag) Validation List
UPS	Uninterruptable Power Supply
USDOT	United States Department of Transportation
VDOT	Virginia Department of Transportation
VES	Violation Enforcement System
VFOIA	Virginia Freedom of Information Act
VPN	Virtual Private Network
WAN	Wide Area Network
WBS	Work Breakdown Structure
XLSX	Microsoft Excel file format

List of Appendices

1. Introduction

1.1. Purpose of Procurement

The Richmond Metropolitan Transportation Authority (RMTA) is soliciting proposals for an experienced and qualified Toll System Integrator (TSI or Proposer) to serve as the TSI to design, implement, and maintain an Electronic Toll Collection System (ETCS) for the RMTA Open Road Tolling (ORT) system. The services will include a Roadside System and a Toll Facility Host (TFH) design, development, installation, integration, provisioning, testing, training, commissioning, and maintenance. The goal of RMTA is for Proposers to offer as close to an "off the shelf" ORT ETCS as is possible to meet the requirements included herein. The proposed ORT ETCS shall have been in production for no less than one (1) year in a similar facility with similar or greater traffic volumes. RMTA anticipates that the ORT ETCS may require minor customization to meet all requirements described in this RFP.

Considering RMTA's intent to contract with a TSI to implement a proven, existing ORT ETCS with minimal customizations to meet RMTA's requirements, the implementation timeframes anticipated in this procurement are compressed significantly compared to those typical in the industry. Proposers are encouraged to consider RMTA's implementation timeframes and describe their capabilities and approaches to meet these timeframes in appropriate areas of their proposals.

RMTA may implement All-Electronic Tolling (AET) in the future, as described in section 3.13. The ORT ETCS should provide RMTA the ability to maximize re-use of components of the proposed solution for future upgrades, including the same software codebase, to support a migration to a potential future AET ETCS solution.

In this procurement, there is no traditional cash lane functionality or operations. RMTA will continue to operate these facilities.

The selected Proposer will be responsible for design, implementation, testing, and maintenance of the ORT ETCS and, as an option to be exercised at the sole discretion of RMTA, the design and implementation of an AET ETCS to be installed in the future. Both ORT and AET systems (hereinafter referred to as the "System") will perform all functions typical of an all-electronic tolling system, including at a minimum, the following functions:

- Roadside equipment
- Toll Facility Host System
- Automatic Vehicle Identification (AVI) and image-based transaction processing
- High availability TFH
- Network installation, configuration, and maintenance
- Maintenance Online Management System (MOMS)
- Interface with VDOT for transaction processing

1.2 RMTA ORT Toll Facilities

The work to be performed is located at the two (2) RMTA ORT toll facilities in a total of three (3) individual ORT Zones. The first facility is located at the Powhite Parkway, and the second facility is located at the Downtown Expressway in and around Richmond, Virginia, as shown in Figure 1: RMTA Express System. The Powhite Parkway facility contains two (2) ORT zones (one (1) zone in each direction of travel, northbound and southbound), and the Downtown Expressway facility contains one (1) ORT zone (westbound). There are no ORT zones at the Boulevard Bridge plaza.

The payment type currently accepted at these facilities is E-ZPass. Refer to Appendix F. Reference Drawings for information regarding lane-specific configurations.

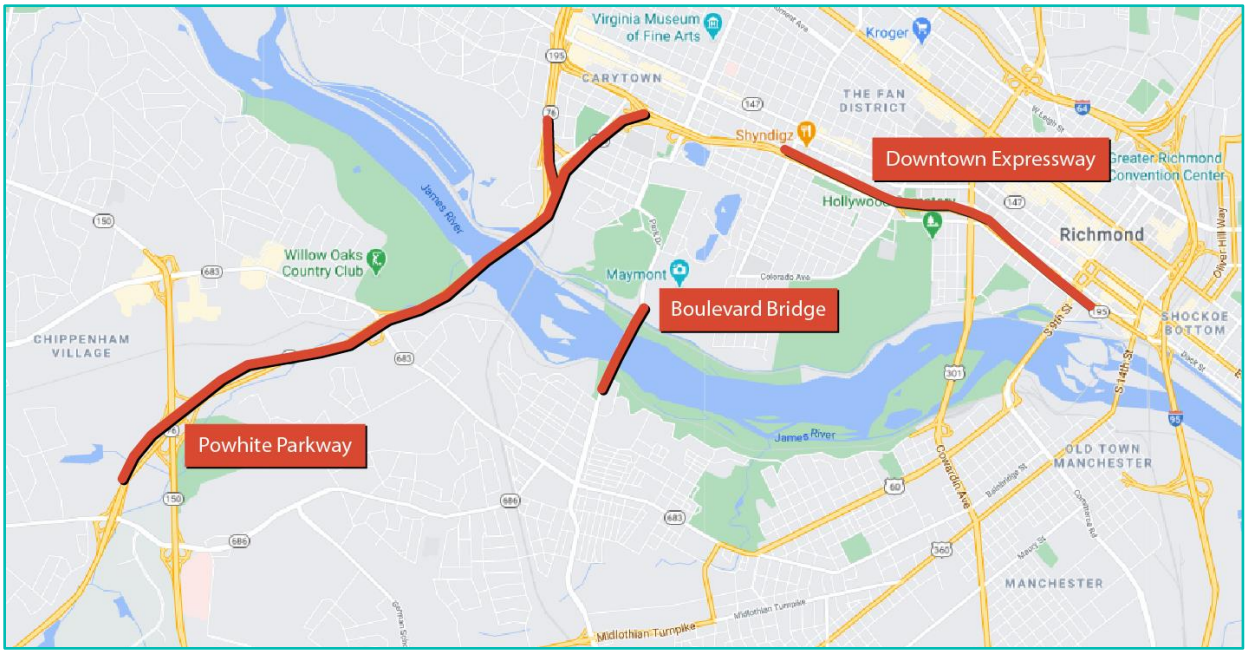


Figure 1: RMTA Express System

1.2.1 Powhite Parkway (Two ORT Zones)

The Powhite Parkway opened to traffic on January 24, 1973, and continues to be maintained by RMTA. The parkway covers 3.4 miles between Chippenham Parkway and the Cary Street ramp. It includes the 0.4-mile-long Powhite Bridge crossing the James River.

In September 1975, the Powhite Parkway Toll Plaza was widened to accommodate increased traffic. It was widened again in November 1988, and a new northbound on-ramp was built at the Forest Hill interchange. During this time, VDOT opened the Powhite Extension, which connects Powhite Parkway to western Chesterfield County.

In 1992, the Powhite Parkway was widened from three (3) to four (4) lanes northbound between Chippenham Parkway and the toll plaza. The number of lanes north of the bridge to Cary Street was increased from four (4) to six (6).

The Powhite Parkway Toll Plaza has 20 lanes, 14 physical lanes, and six (6) ORT lanes (three (3) in each direction). The Forest Hill interchange has eight (8) lanes to its on- and off-ramps to Powhite Parkway.

The Douglasdale ramps north of the river have two (2) unmanned lanes connected to the parkway. Most recently, the Powhite Parkway underwent an extensive construction project to widen the northbound and southbound lanes.

Today the Powhite Parkway is one of the most heavily traveled corridors in the Richmond metropolitan area.

1.2.2 Downtown Expressway (One ORT Zone)

The Downtown Expressway opened to traffic from Interstate 195 (near Byrd Park) eastward to 7th Street on Feb. 3, 1976.

The northbound connections to the former Richmond-Petersburg Turnpike (I-95) opened in August 1976, and the southbound connections were completed on Sept. 1, 1977.

In 1992, additional lanes were added to the 7th Street and 12th Street westbound on-ramps. At that time, the 11th Street on-ramp and Canal Street off-ramp were widened to two (2) lanes each.

The stretch from Meadow Street to the junction with I-95 is 2.5 miles long. It contains a combination barrier toll plaza with 15 lanes, including three (3) westbound Open Road Toll lanes.

The Second Street ramps have two (2) unmanned tolls. In March 1994, a toll collection attendant was stationed at the 11th Street and Canal Street ramps during peak traffic times.

The Second Street, 11th Street, and Canal Street ramps include unmanned tolls, none of which are ORT zones.

An average of approximately 39,000 vehicles utilize the Downtown Expressway each day.

1.2.3 Boulevard Bridge (No ORT Zones – Informational Only)

The Boulevard Bridge was built in 1925 by the Boulevard Bridge Corporation to make the Westover Hills residential community south of the James River more accessible for development.

RMTA purchased the 2,030-foot bridge on Nov. 24, 1969. The toll was a dime then and remained so until 1988 when it increased to 20 cents. Nearly ten (10) years later, the toll rate increased five (5) cents to 25 cents. Currently, the toll is 35 cents.

The steel-truss bridge was closed on August 17, 1992, for 18 months of renovation work. The renovation included replacing the concrete deck; widening the existing lanes on the bridge; and replacing the old

toll building, booths, and equipment. A new reversible toll lane was installed to handle peak traffic from either direction. The bridge reopened on October 30, 1993.

1.3 RMTA Facilities Identified for ORT to AET Conversion

In addition to the requirements for the "off the shelf" ORT ETCS herein, RMTA is also requesting that Proposers provide information on the design, development, installation, testing, commissioning, and maintenance of the AET ETCS for RMTA's consideration to potentially be installed at the Powhite Parkway and the Downtown Expressway at the discretion of RMTA.

Refer to section 3.13 for additional information on ORT to AET Conversion.

1.4 RMTA System Transactions

Notice to Proposers:

The COVID-19 pandemic led to a series of public responses, including social distancing, restrictions on mass gatherings, closure of educational facilities, and closure of non-essential services. These closures and responses resulted in declines in traffic along the RMTA's toll roads beginning in mid-March 2020. As some of these restrictions are eased, and transactions have begun to increase, it is still too early to predict the long-term impacts on travel. Therefore, the forecasts provided below do not account for any recent or long-term COVID-19 pandemic impacts. These traffic projections are provided solely for the purpose of sizing the System.

Table 1 provides information about the RMTA toll facilities' transaction data for the Fiscal Year 2019.

Table 1: FY2019 Transaction Data and Required TSI System Capacity

Facility	FY19 Transactions (Entire Plaza including mixed-use lanes)	FY19 ORT Zone Transactions	Required TSI System Yearly Transaction Capacity
Powhite Parkway	38,173,000	22,000,000	50,000,000
Downtown Expressway	22,702,000	6,600,000	30,000,000
Boulevard Bridge	4,047,000	N/A	N/A
RMTA System Total	**64,922,000**	**28,600,000**	**80,000,000**

Figure 2 depicts the percent share of transactions by Facility for the Fiscal Year 2019.

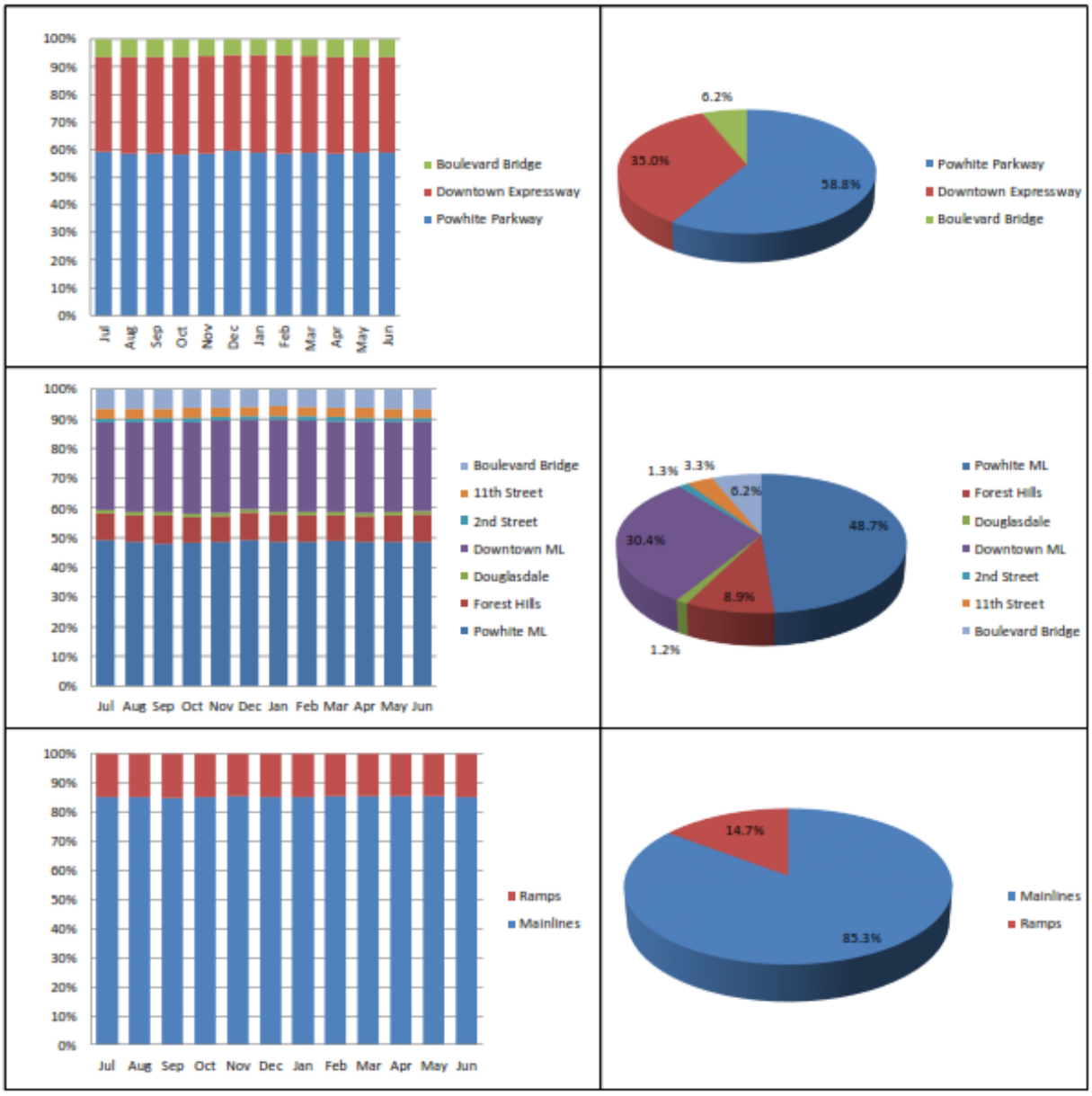


Figure 2: RMTA Fiscal Year 2019 Percent Share of Transactions by Facility

1.5 Schedule of Events

The schedule of events set out herein represents the best estimate of the procurement schedule that RMTA will follow. Any changes to the schedule will be posted to the RMTA website prior to the closing date of this RFP.

Table 2: Schedule of Events

Event	Date
Date of Issuance	August 30, 2021
Intent to Respond	September 7, 2021, 4:00 P.M. EST
Mandatory Pre-Proposal Conference	September 20, 2021, 9:30 A.M. EST
Mandatory Site Visit	September 20, 2021, 10:00 A.M. EST
Terms of Discussion Form Due	September 27, 2021, 4:00 P.M. EST
Proposer Inquiries Due	September 27, 2021, 4:00 P.M. EST
Last Day Answers Posted to the RMTA Website	October 4, 2021, 4:00 P.M. EST
Proposals Due/Close Date and Time	October 25, 2021, 4:00 P.M. EST
Oral Interviews	November 15, 2021
Intent to Award (on or about)	December 2021
Notice to Proceed (on or about)	January 2022

1.6 Issuing Officer

Paula Watson, Manager of Procurement
Paula.Watson@rmtaonline.org
804.523.3308 (Leave message for return call)

1.7 Contract Term

RMTA anticipates entering into a contract with the TSI for an initial term of six (6) years and an option to renew for up to two (2) additional two (2) year periods. The initial term includes implementation, a Warranty Phase and a Maintenance Phase.

1.8 Performance Surety

Upon the occurrence of an Event of Default and without waiving or releasing the TSI from any obligations, RMTA shall be entitled to make demand upon and enforce any bond, and make demand upon, draw on and enforce and collect any letter of credit, guaranty or other performance security

available to RMTA under this Contract with respect to the Event of Default in question. Where access to a bond, letter of credit or other performance security is to satisfy damages owing, RMTA shall be entitled to make demand, draw, enforce, and collect, regardless of whether the Event of Default is subsequently cured. RMTA will apply the proceeds of any such action to the satisfaction of the TSI obligations under this Contract, including payment of amounts due to RMTA. The preceding does not limit or affect RMTA's right to give notice to or make demand upon and enforce any bond, and make demand upon, draw on and enforce and collect any letter of credit, guaranty, or other performance security, immediately after RMTA is entitled to do so under the bond, letter of credit, guaranty, or other performance security.

2 General Information and Instructions

By submitting a response to the RFP, the Proposer is acknowledging that the Proposer:

1. Has read the entirety of the information and instructions
2. Agrees to comply with the information and instructions contained herein

2.1 Restrictions on Communications with Staff

Proposers shall not communicate with any RMTA staff or RMTA representatives/consultants about this procurement except through the Issuing Officer named herein for questions concerning this RFP which may be submitted pursuant to section 2.2, or as otherwise outlined in this RFP. Prohibited communication includes all contact or interaction, including but not limited to telephonic communications, emails, faxes, letters, or personal meetings, such as lunch, entertainment, or otherwise. RMTA reserves the right to reject the proposal of any Proposer violating this provision.

2.2. Questions, Clarifications, and Recommendations

No questions other than written questions will be accepted. Informal verbal inquiries are not allowed. All Proposers must submit questions by the deadline identified in section 1.5. All questions about this RFP must be submitted to the Proposer's assigned SharePoint site as follows:

1. Citation of the relevant section of the RFP: Question
2. Citation of the relevant section of the RFP: Question

Responses to questions posed will be posted on the RMTA website for the benefit of all Proposers. Interested parties are responsible for monitoring the RMTA website for information, updates, or announcements regarding this RFP.

The final Contract that RMTA expects to award as a result of this RFP is included as Appendix B. Contract to this RFP. Therefore, all costs associated with complying with the requirements of such terms should be included in any pricing quoted by the Proposers. While questions, clarifications, and recommendations are encouraged, any exceptions to RMTA Terms and Conditions shown in Appendix B. Contract must be indicated as an exception in the proposal. Only those exceptions will be considered for negotiation.

The final Contract, containing any acceptable and agreed upon requests, will be posted by the deadline specified in section 1.5. All requests will be taken into consideration by RMTA; however, the final Contract that is posted will contain the final Contract terms and conditions that are acceptable to RMTA.

2.3 Mandatory Pre-Proposal Conference

Proposers must attend the Mandatory Pre-Proposal Conference. The Pre-Proposal Conference will be held September 20, 2021, at 9:30 A.M. EST at the Kennedy Conference Room located at the Powhite Toll Plaza, 6500 Powhite Parkway, Richmond, Virginia, 23225.

RMTA will provide the Proposers with information relevant to the existing facilities and upcoming projects. Please note that oral answers given at the conference represent a good faith effort to provide useful information; however, any verbal responses provided at the conference shall not be deemed to have altered or revised this RFP document unless a formal amendment is issued. Only those material changes executed via an addendum to the RFP will be binding.

2.4 Mandatory Site Visit

RMTA will provide the Proposers with information relevant to the existing ORT facilities, including the existing server room, and potential future AET locations. This information will include a site visit to the existing RMTA roadside facilities.

The dates for the mandatory site visit are identified in section 1.5. Each firm is limited to two (2) attendees.

Please note that oral answers given at the mandatory site visits represent a good faith effort to provide useful information; however, any verbal responses provided at the mandatory site visits shall not be deemed to have altered or revised this RFP document unless a formal amendment is issued. Only those material changes executed via an addendum to the RFP will be binding.

2.5 RMTA Right to Request Additional Information – Proposer Responsibility

Prior to award, RMTA must be assured that the selected Proposer has all the resources to successfully perform under the Contract. This assurance includes, but is not limited to, an adequate number of personnel with required skills, availability of appropriate equipment in adequate quantity to meet the on-going needs of RMTA, financial resources to complete performance under the Contract, and relevant experience in similar endeavors. If such information is requested, the Proposer will be so notified and submit the requested information within the time requested by RMTA.

2.6 Failing to Comply with Submission Instructions

Proposals received after the identified due date and time or submitted by any other means than those expressly permitted by the RFP will not be considered. Proposers' responses must be complete in all

respects, as required in each section of this RFP, or the Proposer's response/proposal may not be considered.

2.7 Rejection of Proposals; RMTA's Right to Waive Immaterial Deviation

RMTA reserves the right to reject any or all responses, waive any irregularity or informality in a Proposer's proposal, and accept or reject any item or combination of items. It is also within the right of RMTA to reject responses that do not contain all elements and information requested in this RFP. A Proposer's response will be rejected if the response contains any defect or irregularity. Such a defect or irregularity constitutes a material deviation from the RFP requirements. RMTA will determine defects on a case-by-case basis.

2.8 RMTA's Right to Amend and/or Cancel this RFP

RMTA reserves the right to amend this RFP prior to the proposal due date and time. As necessary, an Addendum to the RFP will be made in writing and communicated to the Proposers.

EACH PROPOSER IS INDIVIDUALLY RESPONSIBLE FOR REVIEWING ADDENDA AND ANY OTHER POSTED DOCUMENTS AND MAKING ANY NECESSARY OR APPROPRIATE CHANGES AND/OR ADDITIONS TO THE PROPOSER'S RESPONSE.

Proposers shall acknowledge receipt of each addendum and understanding in the format provided in Appendix H. Proposal Forms.

Finally, RMTA reserves the right to cancel this RFP at any time.

2.9 Appeals and Protests

Proposers may agree to, comment on, appeal or protest the procurement process and timeline described herein. All such comments, appeals and protests shall first be made to:

Attn: Manager of Procurement
Richmond Metropolitan Transportation Authority
901 East Byrd Street, Suite 1120
Richmond, Virginia 23219
Paula.Watson@rmtaonline.org

2.10 Costs for Preparing Proposals

The cost for developing the proposal and participating in the procurement process (including the protest process) is the sole responsibility of the Proposer. RMTA will not provide reimbursement for any costs.

2.11 Release of Information and Public Information Act Compliance

Ownership of all data, materials, and documentation originated and prepared for RMTA shall belong exclusively to RMTA and be subject to public inspection per the Virginia Freedom of Information Act (VFOIA). Trade secrets or proprietary information submitted by a Proposer shall not be subject to disclosure under VFOIA; however, the Proposer must invoke the protections of §2.2-4342F, in writing, either before or at the time of proposal submission. The written notice must clearly and distinctly identify the data or materials to be protected and state the reasons why protection is necessary. The classification of an entire proposal document, line-item prices, or total proposal prices as proprietary or trade secrets is not acceptable. It will result in the rejection of the proposal.

2.12 Minimum Qualifications

Proposer must have the following minimum qualifications:

1. ORT or AET Experience: Two (2) or more installations currently operating in revenue collection, at least one (1) of which must be three (3) or more adjacent travel lanes. The installation shall have been in production for no less than one (1) year in a similar ORT or AET facility with similar or greater traffic volumes
2. Maintenance Experience: Two (2) active contracts with toll agencies or concessionaires where the Proposer is currently providing comprehensive maintenance of hardware and software for a roadside toll collection system where such maintenance services have been provided for at least three (3) years
3. RMTA anticipates in-person site visits to tour at least one (1) current installation provided by shortlisted Proposers. RMTA reserves the right to require shortlisted Proposers to provide a virtual site visit due to COVID-19 or other travel restrictions in effect

In addition, each Proposer shall identify the following Key Staff:

- Project Manager
- Quality Manager
- Maintenance Manager

The following Key Staff shall possess the minimum qualifications described below:

- The Project Manager shall have at least five (5) years of experience managing similar projects in the toll collection or similar industry
- The Quality Manager shall have at least two (2) years of experience in quality assurance and testing on similar projects
- The Maintenance Manager must have at least two (2) years of experience managing the maintenance activities on similar projects

2.13 References

Proposers shall provide a listing of all ORT and AET projects awarded to the Proposer between 2016-2021 where the Proposer is/was the prime contractor or, alternatively, is/was the key subcontractor primarily responsible for the integration and deployment of the ORT/AET, regardless of whether the project is currently in the design, implementation, or maintenance phase.

Proposers must provide the information shown below, in the sequence shown, as the response to this section. Each Proposer shall include the following information for each project identified:

- Brief project description
- Client name
- Client contact (name, telephone & email)
- Status: Active, Completed, Maintenance, Terminated, other
- Start date
- Completion date (if completed)
- Project contract award value
- Current contract value
- On time: Yes or No
- On budget: Yes or No

The client contact names provided may be used as reference checks by RMTA, so please ensure the contact information is accurate and current.

Proposers shall provide this information in reverse chronological order of contract execution (beginning with the most recent contract execution). Proposers shall provide this information in a list or table format.

Proposer must also submit no less than three (3) verifiable references that the Proposer wishes RMTA to consider as the most relevant for RMTA to review in its consideration of the Proposer's qualifications regarding this procurement opportunity. The qualifying Proposer and Proposer's references do not need to be based in the U.S. References must include Project Name, Contact Name, Phone, and E-mail Address.

2.14 Small, Women and Minority Owned (SWaM) Participation/Disadvantaged Business Enterprise (DBE)

As with all contracts solicited by RMTA, Proposers are strongly encouraged to include SWaM-DBE participation where possible. In the submittal, the Proposer must complete the SWaM-DBE Participation Form located in Appendix H.

2.15 Proposer Responsibility

2.15.1 Litigation History

Describe any litigation the Proposer or any sub consultants has been involved in in the past five (5) years. Describe experience with litigation with owners and/or contractors. List any active or pending litigation and explain.

2.15.2 Insurance

In accordance with Appendix B. Contract, provide name of insurance carrier for the prime contracting Proposer, types and levels of coverage, and deductible amounts per claim.

2.15.3 Finance

To demonstrate the Proposer possesses the adequate financial resources necessary for this Project, each Proposer shall include a complete set of the then previous three (3) years of consolidated financial statements, including, without limitation, balance sheet and income statements, and notes related thereto. Financial statements should demonstrate positive cash flow from operating activities for the then previous three (3) years. If an audited financial statement for the prior year is not available, an unaudited financial statement may be provided, certified as true, complete, and accurate by the Proposer's Chief Financial Officer or its outside accounting firm.

2.15.4 Failure to Complete

In the past five (5) years, has the Proposer or any proposed sub consultants ever been removed from a contract or failed to complete a contract as assigned? Submit full details of the terms for removal from the contract. Identify the other party, its name, address, and telephone number. Present the Proposer's position on the matter. If the Proposer team members have experienced no such termination for default in the past five (5) years, indicate accordingly.

2.15.5 Statement of Disclosure

Provide a statement of disclosure of all potential legal or otherwise significant conflicts of interest possibly created by Proposer being considered in the selection process or by the Proposer's involvement in the resulting project(s). Proposer should provide information as to the nature of the relationship(s) with the parties in such potential conflict.

2.16 Submittal Instructions

Listed below are key action items and instructions related to this RFP. Section 1.5 identifies the dates and times for these key action items. This portion of the RFP provides instructions regarding preparing and submitting a proposal to the RFP.

2.16.1 Preparing a Response

When preparing a response, the Proposer must comply with the following:

1. Use the nomenclature and follow the format instructions provided.
2. Complete Appendix D. Price Proposal.
3. Complete each question in Appendix C. RMTA Technical Response Guide as instructed therein and include this Appendix C. RMTA Technical Response Guide as a part of the proposal.
4. Label all files using the corresponding section numbers of the RFP so that RMTA can easily organize and navigate the Proposer's proposal.
5. The proposal shall not utilize less than 11-point font.
6. The proposal shall not exceed the page limits listed in section 2.16.2.

2.16.2 Submitting the Response

An email confirming the Proposer's Intent to Respond to this RFP and to attend the mandatory Pre-Proposal Conference is required by September 7, 2021. Intent to Respond emails must be sent to Paula.Watson@rmtaonline.org. Upon receiving the Intent to Respond e-mail, each Proposer will be assigned an individual SharePoint site to upload questions and proposal documents.

Proposals must be divided into two (2) appropriately labeled and sealed files - a Technical Proposal and a Price Proposal.

The contents of each package will include:

1. Technical Proposal:
    a. RFP Cover Page
    b. Cover Letter, not to exceed two (2) pages
    c. Executive Summary, not to exceed three (3) pages
    d. Statement and References of Minimum Qualifications, per section 2.12, not to exceed ten (10) pages
    e. Appendix C. RMTA Technical Response Guide, **not to exceed 100 pages**
    f. Appendix H. Proposal Forms
        i. Acknowledgement of Addenda
        ii. Non-Collusion Affidavit
        iii. Terms of Discussion Form
        iv. SWaM-DBE Participation Form
        v. Performance Surety

    DO NOT INCLUDE ANY PRICE INFORMATION IN THE TECHNICAL SUBMISSION.

2. Price Proposal:
    The Proposer must complete and sign the XLSX in Appendix D. Price Proposal.

The Proposer's complete response must be uploaded to the Proposer's assigned SharePoint site on or before the due date and time. Proposals must be uploaded using commonly accepted software

programs to create electronic files. RMTA can view documents submitted in the following format: Microsoft Word (DOCX), Microsoft Excel (XLSX), and portable document format file (PDF). **Price Proposals must be uploaded to the separate Price Proposal folder.**

Use caution in creating electronic files. If RMTA cannot open an electronic file due to a virus or because the file has become corrupted, the Proposer's response may be considered incomplete and disqualified from further consideration.

2.17 Proposal Evaluation and Award

The objective of the evaluation process is to identify the Proposer whose proposal is the most advantageous to RMTA. Once the evaluation process has been completed, a final score will be tallied. A recommendation will be made by the RMTA Evaluation Team concerning the most advantageous proposal to RMTA. The ultimate selection of a Proposer, if any, will be made by the RMTA Board of Directors.

2.17.1 Administrative/Preliminary Review

Upon receipt, each proposal will be reviewed by the Issuing Officer to determine the proposal's compliance with the following requirements:

1. The proposal was received by the deadline.
2. The proposal is complete and contains all required documents.
3. The Proposer meets RMTA minimum qualifications as stated in section 2.12.
4. Technical Proposal does not include any pricing or cost information.

Responses to all minimum qualifications will be evaluated on a pass/fail basis. All proposals that satisfy all administrative/preliminary review criteria will have their technical proposal reviewed and scored in accordance with section 2.17.2 of this RFP.

The RMTA Evaluation Team may require one (1) or more of the responding firms to provide an oral presentation.

2.17.2 Scoring Criteria

The evaluation is comprised of the following:

Table 3: Scoring Criteria

Category	Description	Points
Minimum Qualifications	The Proposer must include evidence that it meets RMTA minimum qualifications as stated in section 2.12.	Pass/Fail
Proposer Responsibility	The Proposer must demonstrate satisfactory ability to implement the Contract based on criteria as stated in section 2.15	Pass/Fail

Category	Description	Points
References	References, including reference projects' similarities to this scope of work, as stated in section 2.13	200 points
Technical	Scored Technical Response Guide Sections	500 Points
Price	Price of proposed products and/or services	300 Points
	Total	**1000 Points**

2.17.3 Price Proposal

Each Proposer is required to submit a Price Proposal as part of its response. The Price Proposal will be evaluated and scored. By submitting a response, the Proposer agrees that it has read, understood, and will abide by the following instructions/rules:

1. The submitted Price Proposal must include all costs of performance pursuant to the final posted Contract.
2. Price Proposals containing a minimum order/ship quantity or dollar value will be treated as non-responsive and may not be considered for award unless otherwise called for in the RFP.
3. If there is a discrepancy between the Proposer's unit price and extended price, the unit price shall govern.
4. The price for the potential AET lanes will be a firm fixed price for two (2) years from the date of proposal submittal. Beyond that, the pricing may adjust in accordance with the Consumer Price Index (CPI-U, South Urban) annually but not exceed more than 3%, regardless of the change in the CPI.

2.17.4 Price Structure and Additional Instructions

RMTA intends to structure the price format to facilitate comparison among all Proposers and foster competition to obtain the best market pricing. Therefore, RMTA requires that each Proposer's price be in the format outlined in Appendix D. Price Proposal. Each Proposer is cautioned that failure to comply with the instructions listed below, submission of an incomplete offer, or submission of an offer in a different format than requested may result in the rejection of the Proposer's proposal.

Enter all information directly into the price sheet(s). Enter numbers on each price sheet in "number" (two-place decimal), not "currency" or another format unless otherwise stated. That is, omit dollar signs, commas, and any other non-essential symbols (e.g., $1,234.50 should be entered as 1234.50). Prices must be in US Dollars.

The Technical Proposal shall not include any pricing from the Price Proposal.

The Price Proposal will be reviewed for reasonableness and proper allocation across Project deliverables. Failure to reasonably allocate cost among the deliverables may result in proposal disqualification.

The reasonableness review will be a general review of the overall price proposal and address potential frontend loading of price items such as mobilization.

2.17.5 Price Scoring

The RMTA Manager of Procurement will utilize the lowest total price to determine the most competitive Price Proposal. The Proposer deemed to have the most competitive Price Proposal overall, as determined by the RMTA Manager of Procurement, will receive the maximum score for the cost criteria. Other proposals will receive a percentage of the maximum score based on the percentage differential between the most competitive Price Proposal and the specific proposal in question as follows:

$$\text{Price Score under Evaluation} = \left(\frac{\text{Lowest Price Proposal}}{\text{Price Proposal under Evaluation}} \right) \times 300$$

2.17.6 Evaluating Technical Requirements

The RMTA Evaluation Team will review each proposal to determine its compliance with the RFP technical requirements. A total technical score will be assigned to each Proposer.

2.17.7 Final Technical Score

The Proposer with the highest technical score will have its final technical score adjusted to 500 points. All remaining Proposers shall have their scores adjusted as follows:

$$\text{Adjusted Technical Score under Consideration} = \left(\frac{\text{Technical Score under Consideration}}{\text{Highest Scoring Unadjusted Technical Score}} \right) \times 500$$

2.17.8 Evaluating Reference Requirements

The RMTA Evaluation Team will review each proposal to determine its compliance with the RFP reference requirements. A total reference score will be assigned to each Proposer.

2.17.9 Final Reference Score

The Proposer with the highest reference score will have its final reference score adjusted to 200 points. All remaining Proposers shall have their scores adjusted as follows:

$$\text{Adjusted Reference Score under Consideration} = \left(\frac{\text{Reference Score under Consideration}}{\text{Highest Scoring Unadjusted Reference Score}} \right) \times 200$$

2.17.10 Evaluating Price Proposal and Total Combined Score

The Price Proposals will be reviewed and scored in accordance with section 2.17.5. To expedite the evaluation process, the RMTA Manager of Procurement reserves the right to analyze the Price Proposals independently, but at the same time the RMTA Evaluation Team is analyzing the Technical Proposals and

references. Neither the Price Proposals nor the cost analysis will be disclosed to the RMTA Evaluation Team until the RMTA Manager of Procurement completes the final evaluation and scoring of the RFP Proposal Factors.

2.17.11 Total Combined Score

The Proposer's price score will be combined with the Proposer's technical and reference scores to determine the Proposer's overall Total Combined Score.

2.17.12 Best and Final Offers (BAFO)

RMTA reserves the right to request BAFO prices from the Proposers after finalizing combined technical and price proposal scores. RMTA is not required to request a BAFO.

2.17.13 Shortlist

Once Proposers have been evaluated based on their written technical responses, they will be ranked according to their scores. RMTA will deem a Proposer as potentially qualified only if the Proposer meets the minimum qualifications and the Proposer's reference and technical scores are within a competitive range. RMTA may invite Proposers meeting the above criteria to oral interviews.

It is the intent of RMTA to shortlist a manageable pool of no fewer than three (3) and no more than five (5) Proposers. RMTA reserves the right to proceed with the procurement with a smaller or larger number of shortlisted Proposers. It is at the sole discretion of the RMTA Evaluation Team and RMTA whether interviews of shortlisted Proposers will be required.

After the optional interview process, the RMTA Evaluation Team will finalize its preliminary technical scoring. The updated scoring will consider both the technical score and results of clarification provided in the interviews.

After compilation of the complete technical scoring, the RMTA Evaluation Team will open the sealed Price Proposals for only those proposals deemed qualified as stated above. The Evaluation Committee will then apply the formula provided in section 2.17.5 to each proposal's total price to calculate the price score.

2.17.14 Oral Interview (Optional at RMTA's Discretion)

All Proposers, except those whose proposal was removed from further consideration as described in section 2.17.13, are required to attend and participate in an oral interview at a day and time assigned by RMTA.

The oral interview:

- Provides an opportunity for the Proposer to clarify or elaborate on the proposal

- Allows the RMTA Evaluation Team to ask questions regarding the Proposer's proposal as well as questions related to due diligence performed by RMTA or their designee(s)
- Ensures that the RMTA Evaluation Team has a full understanding of the proposed System and services, including any exceptions to the procurement documents
- Provides a means for the RMTA Evaluation Team and Proposer to discuss the Contract exceptions previously stated in writing by the Proposer

The proposal of any Proposer unwilling or unable to attend and participate in an oral interview will be removed from further consideration.

2.17.15 Selection and Award

The responsive and responsible Proposer receiving the highest Total Combined Score and whom RMTA intends to contract will be submitted to the RMTA Board of Directors. The ultimate selection of the TSI, if any, will be made by the RMTA Board of Directors.

2.18 Proposal Withdrawal and/or Revision Following Submission

A submitted proposal may be withdrawn, and changes to a submitted proposal can be made prior to the proposal due date and time. If a Proposer notes an error or omission in its response that was overlooked prior to submitting the proposal, the Proposer may contact the Issuing Officer to request the proposal be withdrawn. Unless and until the Proposer resubmits a revised response, RMTA will have no offer from the Proposer to evaluate for possible Contract award. Any resubmission must be received by RMTA no later than the proposal due date and time.

2.19 Conflict of Interest

Upon submission of a proposal, the Proposer affirms that it, its officers, members, and employees at present, have no interest and shall not acquire any interest, direct or indirect, which would conflict or compromise in any manner or degree with the performance or its services hereunder. The Proposer further covenants that in the performance of the Contract, the Proposer shall periodically inquire of its officers, members, and employees concerning such interests. Any such interests discovered shall be promptly presented in detail to RMTA.

2.20 Proposer Responsibility

A Proposer is deemed responsible if RMTA believes the Proposer to have the financial and technical capabilities to deliver the scope of work pursuant to this RFP. RMTA reserves the right to conduct additional due diligence into any Proposer's responsibility status.

Note that this section on the RMTA Technical Response Guide (Appendix C. RMTA Technical Response Guide) requires Proposers to provide documentation regarding litigation history, financial stability, failure to complete, and other items that may impact the determination of Proposer responsibility.

2.21 Governing Law

This procurement and all resulting contracts and change orders shall be governed by the laws of the Commonwealth of Virginia, including but not limited to the Virginia Public Procurement Act, Va. Code §2.2-4300 et seq. RMTA shall select the fully qualified Proposer who, in the opinion of RMTA, has made the offer best suited to RMTA and shall award the Contract to that Proposer. The award document will be a contract incorporating by reference all the requirements, terms, and conditions of this RFP and the Proposer's proposal as negotiated.

In accordance with Virginia Code §§ 2.2-4319 and 2.2-4359, RMTA may cancel this RFP (or any portion thereof) or reject proposals at any time prior to an award. RMTA is not required to furnish a statement of the reasons why a particular proposal was not deemed to be the most advantageous.

The Proposer shall comply with all applicable Federal, State, and local laws and regulations, including rules and regulations of RMTA. If any funds are received from federal or state grants, the Proposer shall comply with all applicable requirements of such grants.

2.22 Taxes, Permits, and Licenses

Each Proposer shall be responsible for determining all sales, employment, use, personal property, or any other tax responsibilities that may be incurred through any contracts, transactions, deliveries, or performance of services resulting from this RFP prior to submitting a proposal. All such taxes due are the sole responsibility of the selected Proposer, and in no case shall RMTA accept, assume, or in any way be responsible or liable for same, unless specifically provided for in the resulting Contract. RMTA is exempt from all sales and use and property taxes.

The selected Proposer shall obtain and maintain at their own expense all necessary permits and other licenses to comply with all applicable laws, Federal, State, or municipal, along with all regulations and ordinances of any regulating body.

3 Scope of Work

The following is the scope of work for this RFP.

3.1 General Project Overview

The goal of RMTA is for Proposers to offer as close to an "off the shelf" ORT ETCS as is possible to meet the requirements included herein. This ORT ETCS will be subject to conversion to AET as an optional service provided by the TSI upon RMTA's direction at a future date. The proposed ORT ETCS shall have been in production for no less than one (1) year in a similar facility with similar or greater traffic volumes. RMTA anticipates that the ORT ETCS may require minor customization to meet all requirements described in this RFP. RMTA does not have unique or excessive Business Rules or System requirements. RMTA expects that by using an existing "off the shelf" ORT ETCS, the selected TSI will implement the systems quickly, efficiently, and with fewer system modifications than may be typical in the industry.

In broad terms, the scope of this procurement is the provision and maintenance of an ORT ETCS that includes roadside functionality (AVI, AVDC, VES, DVAS, MOMS), a reporting system, and an interface to the Virginia Department of Transportation (VDOT) E-ZPass Customer Service Center (CSC) system. The TSI shall be responsible for all aspects of System design, testing, installation, integration, training, and maintenance.

The TSI shall furnish and install an ORT ETCS to include the following at a minimum:

1. Roadside Systems, devices, equipment, and infrastructure to support existing tolling operations for ORT. This includes three (3) existing ORT Toll Zones, each of which are comprised of three (3) travel lanes and two (2) shoulders, all of which are to be fully instrumented (i.e., five (5) fully instrumented travel lanes in each travel zone), with performance consistent with Project Service Level Agreements (SLAs). Lanes are generally 12' wide with 4' shoulders except Powhite South with one (1) 8' shoulder and one (1) 4' shoulder. All measurements shall be field verified by Proposers during on-site visits and prior to proposal submittal.
2. Roadside Systems, devices, equipment, and infrastructure to support potential future AET operation, with performance consistent with Project SLAs.
3. Processing, tracking, and storing all transactions and images generated by roadside tolling equipment.
4. An interface with VDOT's E-ZPass CSC system, where all ORT/AET transactions will be routed.
5. A comprehensive reporting system.
6. Network design, implementation, maintenance, and monitoring.
7. MOMS.
8. TSI will not be responsible for furnishing AVI readers as noted in section 3.5.2.

3.1.1 Data Communications

The TSI is responsible for the provision and installation of all data communication infrastructure required to support all Systems provided by the TSI. The only exception to this is the LAN infrastructure at each plaza building and at RMTA's administrative building which is currently in place connecting desktop workstations to central communication switches/closets. The TSI shall coordinate with the RMTA, as further described below, to utilize these existing LANs to provide connectivity to end user workstation at these facilities.

The TSI shall furnish, install and maintain all equipment and network links required for communications between locations/building/plazas utilized by the System. This includes:

1. TSI provided Toll Facility Host (TFH)
2. TSI provided Roadside Systems
3. Interface to the VDOT E-ZPass CSC System
4. RMTA administration building and Powhite/DTE plaza building end-user workstations
    a. The RMTA administration building is located at 901 East Byrd Street, Suite 1120, Richmond, VA 23219
5. All other Systems provided by the TSI

For any proposed changes to the existing RMTA communications network, as part of the System Detailed Design Document (SDDD) submittal the TSI shall prepare a revised communications network diagram that communicates proposed network equipment, including the following:

1. Switches
2. Firewalls
3. Physical layer distribution/patch panels
4. Third-Party Interfaces

The TSI shall furnish diagrams and full technical specifications for each proposed change to the existing communications network.

The TSI shall be responsible for specifying the bandwidth requirements to support communications between any external service provider(s) and hosting site(s) and all RMTA internal (e.g., Zone Controllers, VES processing/storage devices) computers and other System equipment.

The TSI shall use network monitoring software to monitor the network status and performance.

Existing data communications to non-ORT lanes and administration buildings must not be interrupted/disturbed without prior RMTA approval.

3.1.2 Electrical Infrastructure

The existing UPS locations (including backup generator infrastructure) are Powhite Parkway southbound, Powhite Parkway northbound, and the Downtown Expressway. In addition to providing power for other plaza facility needs, these UPS locations service the RMTA toll system, as well as

electrical outlets available to the System and network server rooms. Each existing ORT Toll Zone is powered by two (2) single phase 240v breakers. The existing electrical service associated with each existing UPS circuit within each facility that will power the System shall be confirmed by the TSI's analysis.

Additionally, the enclosures at Powhite Parkway southbound and Powhite Parkway northbound each have installed clean power subpanels.

The TSI shall prepare As-Built electrical plans detailing connections, conduit, junction boxes, pull boxes, disconnects, and wire to proposed equipment and devices as required to reflect the final installation. The TSI shall furnish and install conduit, wires, cables, and appurtenances as needed to implement the approved design. The TSI may use the existing electrical system to minimize new work where possible, constrained by retaining existing electrical service to the legacy roadside equipment and devices during the transition to the proposed System. Electrical service to non-ORT lanes and administration buildings must not be interrupted/disturbed without prior RMTA approval.

3.1.3 Roadway Infrastructure

The Powhite Parkway southbound and Powhite Parkway northbound ORT Toll Zones both have enclosures with a height of 88", a length (door side) of 24", and a width of 38.5". The inside racks at both locations are 19" by 32U. All current equipment inside these enclosures is dedicated to the existing toll system. RMTA anticipates that the TSI shall remove and replace this existing equipment. The enclosures at both locations have an HVAC unit (5100 BTU heating and 11,000 BTU cooling). The conduits that go into these enclosures are a single 1.5" and a single 2" conduit.

Figure 3: Powhite Roadway Enclosure (representative of both directions)

The Downtown Expressway zone enclosure has a height of 93", length (door side) of 26", and width of 40.5". The inside rack is 19" by 32U. All current equipment inside this enclosure is dedicated to the existing toll system. RMTA anticipates that the TSI shall remove and replace this existing equipment. This enclosure has an HVAC unit (no heating and 11,000 BTU cooling). The conduits that go into this enclosure are a single 3", a single 2", and a single 1.5" conduit.

Figure 4: Downtown Expressway Roadway Enclosure

3.2 General Requirements

The requirements described in this RFP include the technical requirements for the design, development, fabrication, programming, integration, testing, installation, implementation, operations, system administration) and maintenance of the ORT ETCS and potential future AET Conversion. The requirements are largely specified on a functional level to permit the TSI flexibility in the design and development of the System. The System shall utilize proven and reliable technology capable of meeting RMTA operational, maintenance, and performance requirements.

TSI shall furnish, mobilize, and secure all required facilities, equipment, and resources necessary for initiating, fulfilling, and concluding the Contract and may include such portions of the following as are required:

1. Setting up at the various worksites, storage areas, and other facilities in compliance with RMTA standard specifications and any other state or local law, rules, regulations, or ordinances and the subsequent demobilization and removal from the site of said equipment, appurtenances, and the like upon completion of the work.
2. Obtaining necessary permits and licenses and payment of fees as required by local, state, and federal law.
3. Coordinating design, installation, and testing activities with RMTA or RMTA-Designated Representatives during various stages of the Project.
4. Lighting for all work areas.
5. Sampling, testing, and or certifying of materials.

The TSI shall be responsible for purchasing and maintaining equipment required to develop, test, and implement the ORT ETCS and future upgrades and changes.

All equipment, supplies, and materials furnished under the Contract shall be new, off-the-shelf, and field-proven. All equipment shall meet applicable standards. The TSI shall not furnish any item to RMTA

previously used for development work, was part of a previously purchased system, or any items that have been salvaged and rebuilt, without prior RMTA approval.

The delivered System shall comply with the following standards:

1. All measures shall be US Customary.
2. All keyboards shall be QWERTY.
3. All currency shall be in US dollars with two (2) decimals.
4. All numbers shall be English (United States).
5. The time zone used on all timestamps for Transaction Records, reports, or screens shall be Richmond, VA local time unless specified otherwise.
6. All equipment and other hardware furnished by the TSI shall have a service life of at least eight (8) years after the equipment is put into service in a revenue collection capacity.

3.2.1 Compliance with Installation & Design Standards

The TSI shall adhere to all installation standards, applicable laws, ordinances, and codes as specified in applicable standards and VDOT Standards and Details. The TSI shall be responsible for all costs associated with any permits, plan reviews and inspections, and shall procure any required documentation related to proper installation standards, laws, ordinances, or codes. The TSI shall label all wiring and cabling at both ends in accordance with TIA/EIA-606-A.

Table 4: Compliance Requirements

ID	Requirement
REQ-1	All enclosures/cabinets shall have nameplates installed to ensure unique identification.
REQ-2	All elements of the System shall be compliant with all applicable standards including: 1. American National Standards Institute (ANSI) 2. Institute of Electrical and Electronics Engineers (IEEE) 3. National Electrical Safety Code (ANSI/IEEE C2) 4. National Fire Protection Association: ○ NFPA-70, also known as the National Electrical Code or NEC ○ NFPA-502: Recommended Practice on Fire Protection for Limited Access Highways, Tunnels, Bridges, Elevated Roadways and Air Right Structures ○ NFPA-780: Standard for Installation of Lightning Protection Systems® 5. Building Officials and Code Administrators, Inc. (BOCA) 6. Electrical Testing Laboratories (ETL) 7. Illuminating Engineers Society (IES) 8. National Electrical Manufacturers Association (NEMA) 9. Underwriters Laboratories, Inc. (UL) 10. National Electrical Contractors Associations - National Electrical Installation Standards

3.2.2 Cooperation with Others

The TSI shall use best efforts to minimize any disruption to RMTA normal business operations (including a.m. and p.m. peak hours as applicable) when the TSI is performing services. The TSI shall work closely with RMTA and its contractors in coordinating any activity which may affect other contractors' or RMTA's operations.

The TSI shall cooperate with other parties, including vendors, governmental agencies, and other maintenance providers, as required, to ensure that design, implementation, and maintenance functions are handled effectively, efficiently, and according to all laws, rules, regulations, and specifications of any applicable vendors, governmental agencies, and other maintenance providers.

3.2.3 System Security

The TSI shall implement the System using commercially reasonable best practices for ensuring comprehensive System security, to include all interfaces and communications networks.

The TSI shall not circumvent any System security approved by RMTA.

Table 5: System Security Technical Requirements

ID	Requirement
REQ-3	The System shall provide strict controls of System administrator functions.
REQ-4	For each user, the System shall display all screens and reports available to them based on the assigned user group. The System shall limit user groups to only viewing data and not entering data on some screens. On other screens, the System shall limit certain user groups from even viewing the data.
REQ-5	The System shall only allow authorized personnel access to information on the System.
REQ-6	Using a system of unique User ID and password control, the System shall provide controlled user access, including permission control and various levels or roles for access to system control, files, directories, and application software to all System elements.
REQ-7	The System shall limit access to all information on the System to authorized RMTA representatives, and TSI personnel only and all such access shall be controlled by multi-factor authentication.
REQ-8	The System shall comply with the Commonwealth of Virginia security requirements that are available at: https://www.vita.virginia.gov/policy--governance/itrm-policies-standards
REQ-9	The System shall cause its MOMS function to issue an alert whenever the number of consecutive unsuccessful log-in attempts for a single user exceeds a threshold, and RMTA shall approve such a threshold.

ID	REQUIREMENT
REQ-10	The System shall comply with commercially reasonable best practices for accessing the System from remote locations, including but not limited to multi-factor authentication, virtual private networks, and strong encryption of any other communications.
REQ-11	The System shall secure all its data such that it cannot be edited or deleted. All data records and files shall only be appended to, and, in all cases where such appending occurs, the System shall "flag" each append to ensure data integrity and provide a complete audit trail.
REQ-12	The System shall record and retain all System access, logins, and modifications such that all suspect use is fully traceable.
REQ-13	The System shall provide firewalls; intrusion detection and prevention; unauthorized access detection and prevention; virus protection; spam protection, denial-of-service attack protection, and all other System security measures to: 11. Protect the System from cyber-security risks created or propagated by System users, adjoining systems and third parties. 12. Ensure the continued operation of the System per all contractual requirements and in a manner that does not adversely affect adjoining systems operated by others.

3.2.4 Maintenance of Traffic

RMTA will provide all MOT for the Project. For activities that require lane closures the TSI shall communicate all lane closure requests at least two (2) weeks in advance of the anticipated closure to RMTA for approval. TSI shall not close any ORT Toll Zone, in whole or in part, without prior RMTA approval.

3.3 Installation Requirements

3.3.1 Installation

The TSI shall be responsible for installing all proposed hardware, equipment, and devices required to operate and maintain a System that meets all the requirements described herein. The TSI shall supply all qualified installation personnel, tools, materials, equipment required, and traffic control devices to perform installation activities.

The TSI shall install all components manufactured/provided by any third parties in accordance with the manufacturer's installation instructions. The TSI shall arrange on-site and remote support services, as needed, from a third-party vendor(s) for proper installation and operation of such equipment at no additional cost to RMTA.

The TSI shall be responsible for procuring, installing, and maintaining any additional infrastructure (excluding any existing infrastructure described herein) that may be required to operate and maintain the System. This infrastructure may include, but is not limited to, additional electrical and

communication conduit, ducting, pull boxes, junction boxes, wires, cables, connectors, terminals, and equipment labels.

The TSI shall be responsible for providing, installing, configuring and maintaining the proposed System software and any supporting software (e.g., operating system, networking, database, monitoring) on all proposed computers, workstations, and servers. If this work impacts existing systems, then the work shall be coordinated with RMTA operations and may need to occur after hours or on the weekends to minimize impacts to RMTA operations. All TSI-provided Systems need to be compatible with RMTA-provided workstations, and RMTA designated representative-provided workstations.

3.3.2 Installation Plan, Checklist, and Drawings

The TSI shall develop an Equipment Installation Plan, Checklist, and Drawings for review and approval by RMTA. This Installation Checklist will include a detailed component list and description of how each device/item is installed. This Equipment Installation Plan, Checklist, and Drawings shall include (at least) columns for Manufacturer, Model No., Serial No., Release (for firmware if required), and Operating System for comparison with design documentation and product-specific cut sheets.

The Equipment Installation Plan, Checklist, and Drawings will include a description of the responsibilities at each installation of the Installation Manager, the Test Manager, and the Quality Manager, the relationship between all construction, installation, testing, training, and transition tasks for all elements of the System in this work sequence.

Additionally, the Installation Plan, Checklist, and Drawings shall include details on how the TSI shall authorize and accept responsibility for the application of power to equipment, run all initial diagnostics and System generation programs necessary to provide a complete working System and authorize and accept responsibility for RMTA's use of the System to collect toll revenue and process toll violations.

The TSI shall submit installation drawings detailing new installation requirements for RMTA review and approval. The TSI shall maintain all documentation regarding the equipment installation and shall make these drawings accessible to RMTA or their representatives upon request.

The TSI shall submit the Installation Plan, Checklist, and Drawings in accordance with Appendix J. Project Deliverable Schedule.

3.3.2.1 Electrical Work Requirements

1. All required electrical work will be performed by electricians licensed in the Commonwealth of Virginia and shall be performed in accordance with all applicable regulations. Appropriate NEC compliance shall be adhered to with all electrical articles for installation pertaining to wiring, enclosures, and other electrical equipment, including lightning protection.
2. The TSI shall tie into the existing site grounding and lightning protection system. During AET Conversion, the civil contractor will provide grounding arrays for each gantry. The TSI will tie its surge/lightning protection system into these arrays.

3. Before shutdown or discontinuation of service on any circuit, system, or feeder, the TSI shall coordinate the related on-site work activities with RMTA to minimize shutdown periods. The TSI shall coordinate the shutdown or discontinuation with RMTA a minimum of seven (7) days prior to when such shutdown or discontinuation is needed.
4. All field wires and cables shall be terminated on screw lugs or connectors; wherever possible, connectors shall be keyed or polarized to prevent incorrect connections.
5. All wire and cable terminations shall be labeled per industry standards.
6. Surge suppression shall be provided for all field wiring susceptible to lightning or other transient surges.
7. All lane equipment shall be fused or otherwise protected against over-current, over-voltage, and under-voltage.
8. All equipment shall be properly bonded and connected to the grounding electrode system.
9. All field cabinets shall have surge suppression on copper wires and/or cables entering the cabinet.

Table 6: General Electrical Requirements

ID	REQUIREMENT
REQ-14	The TSI shall provide all electrical protection devices required for the protection, operation, and maintenance of the System.

3.3.2.2 COMMUNICATION WORK REQUIREMENTS

Any communications infrastructure work that results in disruptions to the existing communications system shall be coordinated in advance to notify RMTA and all parties affected and should be planned to be conducted when impacts are minimized.

3.3.2.3 ENVIRONMENTAL REQUIREMENTS

Proposed Roadside System equipment and devices shall be installed per manufacturer requirements. The TSI shall thoroughly investigate all environmental factors that may affect the operation, reliability, and life of proposed equipment and devices and select items appropriate for operation in the installed site environment and available existing infrastructure.

Table 7: Environmental Technical Requirements

ID	REQUIREMENT
REQ-15	All elements of the System installed in the server room of the Powhite Plaza South administration building shall meet all performance and reliability requirements when operated inside their closed/locked enclosures under the following conditions: 1. Temperature: 32 to 120 degrees Fahrenheit 2. Relative Humidity: 5 to 95 percent, noncondensing

ID	REQUIREMENT
REQ-16	All elements of the System Zone subsystem shall meet all performance and reliability requirements when operated inside their locked/closed enclosures under the following conditions: 1. Temperature: Ambient air temperature of minus 25 to 140 degrees Fahrenheit, with and without direct sunlight 2. Relative Humidity: 5 to 100 percent 3. Salt Fog: Salt atmosphere with 5 percent salinity

3.3.3 HANDLING, STORAGE AND DELIVERY

The TSI shall protect the quality of products required by the Contract by using documented inspection, handling, storage, and preservation processes.

3.3.4 SPARE HARDWARE

The TSI shall develop and submit an Initial Spare Stock Listing (ISSL) to provide an adequate level of spare parts required to meet all performance and availability requirements (SLAs) during the implementation and initial Warranty Phase of the Project delivery. Once operations have begun, the TSI shall use the ISSL as the starting point in creating a specific approach to calculating optimum supply levels as the System continues to mature as part of its normal service life. Supply levels can be fully ascertained only if the performance and repair characteristics of the specific equipment are known, documented, and updated. Therefore, it is expected that the ISSL will become a living document that is subject to change and update throughout the System's service life.

The TSI shall maintain a spare parts/component inventory and adjust stock levels to the most cost-effective, efficient levels. All spares shall be fully tested and stored in a serviceable condition to support rapid response time. The TSI shall use the MOMS application for inventory control and parts listing.

The proposed MOMS shall include an equipment inventory database to be used to order, stock, repair, and replenish all equipment in the System. The database shall include identification information such as nomenclature, part number, serial number, supplier, date of delivery, age or usage limitation, repair and replenishment lead times, cost, and shelf life.

In addition, re-order and repair instructions shall be prepared when the available inventory falls below established thresholds. The thresholds can be established based on repair and replace rules embodied in the MOMS subsystem. The TSI shall make recommendations for anticipated replacement of equipment in the coming fiscal year at least three (3) months before the new fiscal year, which begins July 1. RMTA will review these recommendations and, upon agreement with the TSI, make the necessary budget adjustments.

The MOMS shall have the capability of accessing the inventory and spare parts database in an automated form. This function shall be integrated with the work order generation function, which will

automatically update and maintain the System and spare parts inventory based on work orders and technician input during a work order closeout.

3.3.5 Bill Of Materials

The TSI shall provide a Bill of Materials (BOM) for all hardware, COTS software, and equipment supplied under this Contract, including spare inventory. All COTS hardware shall be described by the manufacturer, vendor contact information, model or part number, and feature set. The BOM shall be included with the Project Management Plan submittal after Notice to Proceed (NTP) (see section 3.8.1). The BOM will be reviewed and approved by RMTA. TSI shall not order any hardware, software, or network equipment that will be owned by RMTA at Project Acceptance (including hosted or cloud-based solutions) without prior RMTA approval. RMTA reserves the right to physically inspect hardware prior to invoice payment.

The BOM shall reflect the current design with confirmed quantities and prices. The BOM shall include the following, at a minimum:

1. Identify all assemblies that service personnel will transition and troubleshoot as a unit in the field ("field-replaceable units").
2. Detail the following for each field-replaceable unit and each equipment element the TSI will use in bench repair:
    a. A primary source listing the manufacturer; manufacturer address and telephone number; manufacturer make, model number, part number and version; manufacturer serial numbers that are on-site at RMTA ORT toll facilities and the identifiers of all engineering changes that were applied to each (after their original manufacture)
    b. A secondary source listing the manufacturer; manufacturer address and telephone number; manufacturer make, model number, part number and version; manufacturer serial numbers that are on-site at RMTA ORT toll facilities and the identifiers of all engineering changes that were applied to each (after their original manufacture)
    c. The quantity currently installed and planned for installation at RMTA ORT toll facilities for this Project.
    d. The recommended quantity of spares to be maintained at RMTA ORT toll facilities for this Project.
    e. The quantity currently in stock as spares or otherwise available but not installed at RMTA ORT toll facilities for this Project.
    f. Any support agreement or other agreements related to maintenance of such field replaceable unit, or its sub-assemblies, with original equipment manufacturers and other firms.
3. A section listing recommended spare quantities of field-replaceable units; recommended quantities of each equipment element that the TSI will use in bench repair; and the current lead time required for receiving additional quantities of each.
4. The manufacturer's specification of Mean Time Between Failure (MTBF) for all individual field-replaceable units or higher-level assemblies as part of their BOM.

The BOM shall reflect and track any changes to the identified hardware provided within the TSI's Price Proposal.

3.4 Transition from Existing System

The TSI shall transition RMTA's existing ORT and TFH system(s) from legacy equipment and systems to TSI-provided equipment and TFH Systems.

RMTA envisions the following transition approach:

1. Before any transition activities can occur, the TSI shall ensure that all communications network infrastructure is in place and ready to send Transaction Records and images from TSI-provided ORT Toll Zones to the TSI-provided TFH.
2. The TSI shall ensure the TSI-provided TFH has connectivity to VDOT's E-ZPass CSC (both test and production environments) and has been fully tested with VDOT to ensure the TSI's proper implementation of the VDOT interface.
3. The TSI shall conduct the TFH FAT testing and resolve any priority 1 or 2 defects, as described in section 3.11.1, prior to proceeding with the transition.
4. Upon RMTA's approval of the above activities and the TSI's ORT transition schedule, the TSI will transition the first of the three (3) ORT locations. RMTA will provide guidance as to which of the ORT locations should first transition to the new System.
5. The TSI will then proceed with the installation and transition activities at the first ORT Toll Zone. RMTA anticipates this installation work to occur over a weekend, while ORT traffic is diverted to the manual lanes. The TSI must complete installation of at least the AVI system during the first weekend of installation activities and may use evening (off-peak hours) during the following week to complete installation and configuration/tuning activities. The weekend directly following the TSI's installation and configuration/tuning activities, the TSI will conduct the First Site Installation and Integration Test (FSIIT).
6. Upon successfully completing the FSIIT, the ORT Toll Zone will be transitioned into the new overall System to accept live traffic once MOT is removed and traffic again flows freely through the transitioned Toll Zone.
7. After all priority 1 and 2 Go-Live issues have been addressed at the first ORT location, RMTA and the TSI will agree to the transition schedule for the remaining two (2) plazas, which will follow the same approach used for the first site.

3.4.1 Transition Plan

The TSI shall submit a System Transition Plan to RMTA for review, comment, and approval prior to starting any System transition activities. This Transition Plan shall include specific dates and times and shall describe all required tasks and activities on a site-by-site basis.

The System Transition Plan shall provide a comprehensive description of all aspects of the transition activities associated with the Project, including the following:

1. A detailed transition schedule including all task durations, dependencies, resources, key "Go/No-Go" checkpoints
2. Details of TFH and ORT Toll Zone transition and associated quality assurance tasks on a site-by-site basis
3. A description of transition resources, including personnel and equipment (should changes occur to the personnel, an updated staffing list shall be submitted to RMTA.)
4. A description of any special or unique installation requirements on a site-by-site basis
5. A description of all MOT requirements on a site-by-site basis
6. Testing, validation, and monitoring efforts required to ensure all System components are functioning as designed
7. Rollback requirements as applicable on a site-by-site basis
8. Information on all VDOT E-ZPass System interface prerequisites and validation activities to ensure Transaction Records and images are being correctly routed to VDOT
9. Details on all infrastructure activities and other third-party prerequisites and dependencies
10. Description of how the TSI shall set up the various worksites, storage areas, sanitary and other facilities as required by local or state law, or by regulation, and the subsequent demobilization and removal from the site of said equipment, hardware, appurtenances, and the like upon completion of the work.

This System Transition Plan shall be delivered in accordance with Appendix J. Project Deliverable Schedule.

3.5 Roadside System Requirements

The following sections provide requirements about the roadside subsystem.

3.5.1 Zone Controller Subsystem

The TSI shall provide Zone Controllers for all ORT locations. Zone Controllers shall be required to meet all applicable Service Level Agreements, as described in Appendix E. Service Level Agreement (SLA) Requirements.

Table 8: Zone Controller Subsystem Technical Requirements

ID	Requirement
REQ-17	Each Zone Controller shall be a fully redundant configuration such that when any hardware element or process on the primary controller fails or degrades, the secondary controller shall automatically assume the functions of the primary controller.
REQ-18	The Zone Controller failover system shall ensure no loss of Transaction Records or revenue due to a single Zone Controller failing.
REQ-19	Failover of a single Zone Controller shall not disrupt the operation of the rest of the System(s).

ID	REQUIREMENT
REQ-20	Alarm messages shall be generated and transmitted to the MOMS whenever a Zone Controller failover or outage event occurs.
REQ-21	Each Zone Controller shall cause the MOMS function to log, store and send an alert each time a Transponder status file is not updated or replaced within a given time, where such a time shall be configurable on the System by RMTA.
REQ-22	The Zone Controller hardware in all Zone Controllers shall be capable of processing Transaction Record volumes of at least 3,000 vehicles per lane per hour.
REQ-23	The Zone Controller shall contain all tools necessary for Transaction Records, violation records, and violation image files to be automatically loaded from all Toll Zones of the System onto portable media, hand-carried from the System locations to the TFH location, loaded onto the TFH, and processed by the TFH whenever the WAN is unavailable.

3.5.1.1 STAND-ALONE OPERATION

Table 9: Stand-Alone Technical Requirements

ID	REQUIREMENT
REQ-24	The Zone Controllers shall be capable of operating in a stand-alone mode during communications disruptions between the Zone Controller and the TFH. The Zone Controllers will store transactions for at least thirty (30) days and will store images for at least 5 days.
REQ-25	While in standalone mode, the Zone Controllers shall be capable of storing all Transaction Records, events, and maintenance messages for a minimum of seven (7) days.
REQ-26	Complete lane Transaction Records buffered in the lane when communications are lost shall be forwarded to the TFH when communications are restored.
REQ-27	When operating in stand-alone mode, the last configuration, security access, and application files downloaded from the TFH shall be used until communication is restored or files are uploaded locally.
REQ-28	Upon restoring communication with the TFH, all backlogged messages shall be transmitted without affecting near real-time transmission of ongoing transactions.

3.5.1.2 SOFTWARE

Table 10: Zone Controller Software Technical Requirements

ID	REQUIREMENT
REQ-29	The operating systems, databases, COTS software, and System software provided by the TSI shall support near real-time transaction creation.
REQ-30	The proposed operating systems and databases shall be currently supported versions/releases (i.e., no beta releases) with a future upgrade path.

ID	REQUIREMENT
REQ-31	The Zone Controller operating system and application version will be the same across all ORT Toll Zones and facilities.
REQ-32	All messages between the Zone Controller and the VES (e.g., camera triggers, device health status and image link data), AVI and AVDC subsystems, and the TFH shall use a documented, non-proprietary protocol. This protocol shall be made available to RMTA during the Design Phase of the Project.
REQ-33	Zone Controllers shall be required to detect and frame vehicles and associate all Transaction Records (including those with valid Transponders) with VES images.
REQ-34	Zone Controllers shall process data obtained from AVI, AVDC, VES and other roadside devices and equipment systems to generate Transaction Records for passing vehicles. One (1) and only one (1) Transaction Record shall be created for each vehicle that travels through a Toll Zone, and Zone Controllers shall ensure all required data has been written to the Transaction Record before transmitting it to the TFH.
REQ-35	Each Transaction Record shall contain at least the following: 1. Unique transaction number 2. ORT Toll Zone identifier 3. Time and date of passage 4. The lane number in which the vehicle was detected 5. The axle count and corresponding RMTA vehicle class as determined by the System 6. VES images (or link to them) 7. All other data elements required by the VDOT CSC ICD

3.5.1.3 TIME SYNCHRONIZATION

Table 11: Time Synchronization Technical Requirements

ID	REQUIREMENT
REQ-36	Zone Controllers shall be time-synchronized to the TFH at the time of Zone Controller startup and periodically after that.
REQ-37	The Zone Controller shall synchronize or transmit time synchronization messages with every connected Toll Zone subsystem or equipment capable of maintaining time.

3.5.1.4 CONFIGURATION FILES

Table 12: Configuration Files Technical Requirements

ID	REQUIREMENT
REQ-38	All parameters and settings required to operate the Zone Controller application shall be maintained in a configuration file or files.
REQ-39	A copy of the current Zone Controller configuration files shall be maintained on the TFH and shall be available for downloading along with the Zone Controller application file, as needed.

ID	REQUIREMENT
REQ-40	Changes made in the field shall be backed up to the TFH. Any configuration files changed in the field shall be logged and assessed for applicability to all Zone Controllers and downloaded to other Zone Controllers, accordingly.
REQ-41	All Zone Controllers shall have default configuration files that allow the lane to start up automatically.

3.5.2 AVI (RFID) SUBSYSTEM

All Automatic Vehicle Identification (AVI) readers and antennas ("AVI Equipment") for use on the Project are being furnished by RMTA, including AVI Equipment installation design and configuration specifications. RMTA will also contract with the AVI Equipment supplier to provide reader/antenna tuning services to assure the AVI Equipment is correctly reading 99.9% of all properly installed TDM protocol transponders that traverse the Toll Zone. The AVI Equipment will be configured in a tri-protocol mode to also read interoperable transponders of the 6C and SeGo protocols.

RMTA will procure all necessary AVI readers (Kapsch Janus Multiprotocol Reader II – MPR2) and related lane kits (consisting of antennas and related components) via the third-party procurement. RMTA will also utilize the professional services aspect of the E-ZPass Group's contract to engage Kapsch's design services to provide the reader and antenna installation specifications at each ORT Toll Zone. The resulting design will ensure reader and antenna functionality meet the performance requirements prescribed in the third-party procurement and will integrate with all AVI equipment currently in place servicing the non-ORT lanes at each location, including necessary AVI synchronization cabling supporting all readers in each facility. All AVI hardware procured by RMTA will be conveyed to the TSI for proper handling and storage, including spare components.

The TSI is responsible for the installation, configuration, and maintenance of all AVI hardware, software, and related equipment consistent with the design requirements provided by Kapsch. The TSI will fully integrate the readers and antennas into the TSI's System to meet the functionality and performance requirements identified in this RFP.

The TSI is responsible for reviewing and ensuring the accuracy of all required Federal Communication Commission (FCC) licensing materials provided by the AVI supplier or RMTA. The TSI shall validate AVI location/frequency details in compliance with FCC standards and provide details to RMTA prior to RMTA's submission to the FCC. After initial installation, the TSI is responsible for completing any FCC required maintenance forms and providing these to RMTA for submission to the FCC. RMTA is responsible for submitting the completed forms to the FCC and the payment of all related FCC licensing costs.

Table 13: AVI (RFID) Subsystem Technical Requirements

ID	REQUIREMENT
REQ-42	The AVI subsystem shall support the three (3) protocols suggested for use by the International Bridge, Tunnel and Turnpike Authority's (IBTTA) National Interoperability initiative. These protocols are: Kapsch's TDM protocol as utilized by the E-ZPass Group; the 6C Coalition's implementation of the ISO 18000-63 standard ("6C"); and the TransCore SeGo protocol.
REQ-43	AVI subsystem installation shall include readers, antennas, all required enclosures to house the AVI equipment (if not utilizing existing enclosures), cabling, mounting brackets and ancillary components required for the proper functioning/operation of this Subsystem to comply with functionality and performance requirements.
REQ-44	The AVI Subsystem shall be capable of correctly reading tags properly mounted (according to each tag manufacturer's specification) to vehicles and supporting any of the required protocols.
REQ-45	Each AVI reader stores (buffers) all information related to at least 400,000 Transponder reads while operating in a stand-alone mode (i.e., there is no Zone Controller connectivity). After periods of communication loss or other interruptions of service affecting a Zone Controller's interaction with an AVI reader, the System shall create Transaction Records based on the buffered tag read information. These Transaction Records will be transmitted to the TFH to facilitate the processing and transmittal of the Transaction Records to VDOT. These Transaction Records will be marked by the System as buffered tag Transaction Records to segregate them for auditing, reporting and processing purposes.

3.5.3 VIOLATION ENFORCEMENT SUBSYSTEM (VES)

The TSI shall provide all necessary hardware, software and related equipment required to support VES requirements described herein.

VES requirements include the following at a minimum:

Table 14: Violation Enforcement Subsystem (VES) Technical Requirements

ID	REQUIREMENT
REQ-46	All transactions (including those associated with valid Transponders) shall have images captured and associated.
REQ-47	The VES shall capture four (4) rear full-color overview images and one (1) Region of Interest (ROI) image of every vehicle that passes under a gantry.
REQ-48	The VES shall automatically select and designate a single best overview image within the image set for each transaction. Overview images must include legible license plate information and vehicle image data that clearly identify the make, model and color of the vehicle to allow the printing of images on notices sent to customers.
REQ-49	The VES shall buffer/store images locally (either in the Toll Zone or an image server system) until successful image transmission to the TFH.

ID	REQUIREMENT
REQ-50	The VES shall store all images in a JPEG format with a minimum compression quality factor ("Q Factor") of 10:1.
REQ-51	Images shall be stored image-by-image as separate digital files, in open-standard file architecture linked to the Transaction Record.

3.5.3.1 VES CAMERAS AND ILLUMINATION

The TSI shall provide new VES Cameras and any required illumination devices. All proposed VES cameras shall provide for the following at a minimum:

Table 15: VES Cameras and Illumination Technical Requirements

ID	REQUIREMENT
REQ-52	Cameras having color and monochrome capabilities shall be used at all locations.
REQ-53	Cameras and illumination devices shall support a capture rate of no fewer than two (2) vehicles per second.
REQ-54	In all lighting and weather conditions, cameras shall capture images of the rear license plates and vehicle overview of all vehicles that pass under a gantry with sufficient sharpness to determine vehicle make, model and color, and to read state jurisdiction.
REQ-55	Cameras shall meet or exceed the following properties to meet the performance metrics in Appendix E. Service Level Agreement (SLA) Requirements: • High resolution image technology greater than 2000 pixels in the horizontal direction • Minimum of 150 pixels per license plate image width • Provide a contrast to noise ratio of at least 10:1 • Real-time adaptive light sensing • Field of view that covers at least 14' horizontal and 8' vertical •
REQ-56	Camera illumination shall be mounted/installed in such a way as to prevent distracting or affecting the vision of drivers.
REQ-57	Cameras shall automatically adjust, with or without traffic, to accommodate all lighting and weather conditions to maintain adequate brightness and contrast settings such that images meet Appendix E. Service Level Agreement (SLA) Requirements.
REQ-58	Each image set associated with a Transaction Record will include – at least - a full color overview image of the rear of the vehicle and an ROI image that contains the Region of Interest as identified by the camera.
REQ-59	Images will be stored at the TFH, and transmitted to VDOT for processing in JPEG format, or as required by the VDOT E-ZPass System ICD.

3.5.4 Automatic Vehicle Detection and Classification Subsystem

The TSI will be required to certify that the road surface in the RMTA ORT Toll Zone(s) is suitable for the installation of any proposed in-ground (inductive loops) AVDC system if an in-ground system is proposed. The existing road surface in RMTA ORT Toll Zones is fiber reinforced concrete.

The TSI provided AVDC subsystem shall be capable of the following:

Table 16: Vehicle Detection and Separation Subsystem Technical Requirements

ID	Requirement
REQ-60	The AVDC subsystem shall detect all vehicles traversing the ORT Toll Zone and provide sufficient information to allow the System to create one (1) and only one (1) Transaction Record per vehicle passage.
REQ-61	The AVDC subsystem shall classify, via axle count, all vehicles traversing any lane in the ORT Toll Zone.
REQ-62	The AVDC subsystem shall provide vehicle event messages and signals to the Zone Controller and may also directly trigger the VES cameras.
REQ-63	The status of the AVDC subsystem shall be reported to the MOMS.
REQ-64	The AVDC subsystem shall correctly separate vehicles moving below 30 miles per hour within two (2) feet distance measured front to rear, and within five (5) feet distance measured front to rear above 30 miles per hour, to ensure that multiple vehicles are not identified as a single vehicle.
REQ-65	The AVDC subsystem shall correctly associate multi-unit vehicles (e.g., a vehicle towing a trailer) using a minimum 2-inch tow bar (measured perpendicular to the lane direction of travel) to ensure that the multi-unit vehicle is identified as a single vehicle.

3.5.5 Uninterruptible Power Supply (UPS) Subsystem

The existing generators and UPS units in both ORT plaza buildings are not considered part of the existing toll system and the TSI shall utilize these existing UPS units to power the System. If the existing UPS units do not have sufficient capacity to power the TSI's System, the TSI will notify RMTA of the power requirements. The TSI shall not disturb or otherwise affect the availability, operation, or performance of these existing UPSs, or any other RMTA systems connected to it. Except for those specific lanes or ORT Toll Zones where RMTA has authorized the TSI to begin removal of existing toll system elements, the TSI shall not disturb or otherwise affect the availability, operation or performance of existing toll system elements connected to the existing UPS units.

Table 17: UPS Subsystem Technical Requirements

ID	Requirement
REQ-66	All standby generators currently installed will be integrated into the System to function in the event of power failure.

ID	REQUIREMENT
REQ-67	All System equipment shall be UPS protected and supported with a minimum of thirty (30) minutes runtime.

3.5.6 DIGITAL VIDEO AUDIT SYSTEM (DVAS)

The TSI shall provide a comprehensive DVAS that enables RMTA staff to perform video-based verification/reconciliation and audit for toll transactions for all ORT lanes.

The DVAS shall include the following:

Table 18: DVAS Technical Requirements

ID	REQUIREMENT
REQ-68	The DVAS will operate in continuous video record mode. Backup requirements are covered in Data Retention Schedule.
REQ-69	The DVAS shall include but is not limited to two (2) or more high-resolution color cameras at each of the ORT Toll Zone locations (six (6) cameras total), all associated camera triggering, and supplemental lighting.
REQ-70	DVAS cameras shall be positioned such that all vehicles passing through any lane in an ORT Toll Zone are clearly visible, are not obstructed by other vehicles or infrastructure, and can have their axles counted.
REQ-71	The DVAS shall provide all screens and tools necessary to monitor an overall video image of each ORT Toll Zone, including shoulders and each vehicle as it travels through these locations.
REQ-72	All video and transaction data accessible by the DVAS shall be read-only.
REQ-73	The DVAS shall support four (4) concurrent RMTA users with no degradation in performance.
REQ-74	The DVAS shall interface with the Zone Controller(s) for vehicle transactional data to include elements such as AVI tag reads, location (lane, Gantry/Plaza), date/time, axle count, violation indication, and the image file name for this transaction.
REQ-75	Whenever video data is being reviewed, the corresponding transactional data shall be displayed on screen. As video is “scrolled,” transactional data elements shall “scroll” with the video.
REQ-76	A video review and playback application must be available to RMTA staff and RMTA representatives to access the digital video audit function at any location with no additional fees or conditions.
REQ-77	DVAS user interface shall provide the capability to search, select and review video based on timeframe, location (lane/gantry), tag number, transaction number, and shall allow the selected video to be replayed in real-time, in slow motion, frame by frame, and shall allow the user to “scroll” through the selected video with a pointing device (mouse).
REQ-78	The DVAS shall provide the ability to print selected video images with associated transactional data.

ID	REQUIREMENT
REQ-79	All digitized video with corresponding synchronized transactional data shall be stored to allow historical viewing and analysis (see Appendix I. RMTA Data Retention Guidelines).
REQ-80	Video shall be stored in an unencrypted format and available for review without the use of special equipment or software in a standard format (e.g., AVI, MP4, MOV).
REQ-81	Video shall be available for streaming to remote locations (off-site from RMTA).
REQ-82	DVAS cameras shall allow an authorized operator/user to individually configure them, and configuration settings shall be available on a per camera basis.

3.6 TOLL FACILITY HOST (TFH) SYSTEMS

The TSI shall provide the design, development, testing and implementation of TFH functionality, which shall meet the performance requirements described in Appendix E. Service Level Agreement (SLA) Requirements. The TSI shall provide fully redundant TFH functionality utilizing the TSI's choice of technologies, including active/active high availability clustering, a failover Disaster Recovery (DR) site, cloud-based DR, or other effective, proven solutions.

The TSI shall determine the most suitable method to provide the required TFH functionality for the three (3) ORT Toll Zones based on the particulars of the TSI's TFH design and the TSI's proposed network design. RMTA is open to cloud-based TFH solutions, on-premises solutions, or a combination of both to meet RMTA's availability and disaster recovery requirements.

TSIs will be given an opportunity to understand on-premises server room size and availability for TSI provided TFH and related equipment during the mandatory site visits as described in section 2.4 above.

RMTA requires a TFH system to perform functions that meet the requirements as described herein.

Table 19: TFH System Requirements

ID	REQUIREMENT
REQ-83	The TFH shall provide all tools and functions necessary for authorized RMTA users to perform all System management, configuration, and administration functions remotely via the most common COTS personal computers and browser applications.
REQ-84	The TFH shall provide all RMTA workstations connected to the RMTA wide area network to log in and access TFH menus or applications without installing software on the said workstation.
REQ-85	All TFH provided functionality shall be controlled by user privileges and access rights and shall provide the appropriate menus and screens to authorized RMTA users from any workstation connected to the RMTA wide area network.
REQ-86	The TFH shall allow authorized RMTA users to perform toll rate schedule development, management, and release/activate activities from any workstation connected to the RMTA wide area network.

ID	REQUIREMENT
REQ-87	TFH must be accessible without a VPN network if accessed through the RMTA network and by way of a VPN/remote desktop if the user is not on the RMTA network.
REQ-88	The TFH shall provide a subsystem and/or functionality for generating reports.
REQ-89	The TFH shall provide a subsystem and/or functionality for transaction auditing to include a Graphic User Interface (GUI) and report(s).
REQ-90	The TFH shall provide a subsystem and/or functionality for VES image storage and retrieval.
REQ-91	The TFH shall provide a subsystem and/or functionality for interfaces to internal and external systems.
REQ-92	The TFH shall provide a subsystem and/or functionality for MOMS.
REQ-93	The TFH shall log and report the receipt and processing of all data records and files described in section 3.6.6.4.
REQ-94	The TFH shall store all data records and files described in section 3.6.6.4 in a manner that makes it easy for RMTA users to search for a record, locate it, display it, make a copy of it in PDF file format, make a copy of it in XLSX format, make a copy of it in CSV format, and email it in any of these formats.
REQ-95	The TFH shall actively monitor the processing of data records and files and log, store and send an alert (see 3.12 Maintenance Online Management System) in the event of any processing failures, errors or stoppages or any degradation in processing performance. Such active monitoring includes but is not limited to “heartbeat” methods, file size and frequency methods, and methods based on transmission acknowledgment timing.
REQ-96	The TFH shall actively monitor such processing, transmission, loading and activating, and the TFH shall log, store, and send an alert (see section 3.12) in the event of any failures, errors or stoppages or any degradation in performance.
REQ-97	The TFH shall be integrated with a primary and secondary network time protocol (NTP) server, and these shall be the same as for all other System elements. Both NTP servers shall be certified NTP servers and subject to approval by RMTA.
REQ-98	All TFH elements shall synchronize with these same NTP servers at configurable intervals, no less than every five (5) minutes, and all software used for time synchronization shall support monotonic changes to time.
REQ-99	The TFH shall proactively monitor, log, and report all communication between all System equipment at configurable intervals, no less often than every five (5) minutes.
REQ-100	The TFH shall monitor, log, and report all message queues and System processes at configurable intervals, no less often than every five (5) minutes.
REQ-101	The TFH shall monitor the quality of all (electric utility and/or RMTA generator) power supplied to all System elements.
REQ-102	The TFH shall provide a scalable platform that supports the transaction levels indicated in Table 1: FY2019 Transaction Data and Required TSI System Capacity.
REQ-103	The TFH shall scale to support the estimated annual transaction growth (above) with no major hardware, software, building floor space, HVAC, or infrastructure changes.

ID	REQUIREMENT
REQ-104	The TSI shall ensure through contract, agreement, or licensing that all System data will be accessible for export by the TSI and available to RMTA on request.

3.6.1 USER INTERFACE

Table 20: Screen Technical Requirements

ID	REQUIREMENT
REQ-105	The TFH shall provide the tools and functions necessary for authorized RMTA users to easily maneuver through screens and view transactional, financial, operational and maintenance data.
REQ-106	The TFH shall provide finance and budget screens that show the various transaction types and revenues at any time.
REQ-107	The TFH shall provide reporting screens for transactions and revenue by: 1. Lane or group of lanes 2. Time or a range of times 3. Day or range of days 4. Week 5. Month 6. Quarter 7. Year Such screens shall show expected revenue and provide transaction and summary level information.
REQ-108	The TFH shall provide reporting screens on non-revenue transactions, those involving non-revenue Transponders, and those occurring during special events by: 1. Lane or group of lanes 2. Time or a range of times 3. Day 4. Week 5. Month 6. Quarter 7. Year Each such special event reporting screen shall show the transactions that occurred during this mode of operation, the event type, the paid amount, and the expected toll revenue not collected.
REQ-109	The TFH shall provide screens and tools for authorized RMTA users to view all data and the contents of all files transmitted to/from or manually entered into or generated by the TFH.
REQ-110	The TFH shall control user privileges for all such screens by user group, and such control shall be easily reconfigurable by authorized RMTA users.
REQ-111	The TFH data shall provide all screens and tools for authorized RMTA users to audit and reconcile the TFH with the expected revenue and payments made.

ID	REQUIREMENT
REQ-112	The TFH shall provide all screens and tools for authorized RMTA users to: 1. Print screens using printers provided by others on the RMTA wide area network. 2. Save screens in the specified formats

3.6.2 REPORTS

The TSI shall deliver a reporting system that supports the operational, financial, performance, and System audit requirements of RMTA.

RMTA will accept the TSI's existing production system suite of reports. RMTA will compare desired reports to the TSI's reports. The TSI will create up to fifteen (15) ad-hoc reports during the first year of operations.

Table 21: Report Technical Requirements

ID	REQUIREMENT
REQ-113	Reports shall all be able to be generated on a daily, weekly, and monthly basis.
REQ-114	The reporting system shall support full transaction-level reconciliation and auditability from the lane to posting at the VDOT E-ZPass System.
REQ-115	Report generation/execution times shall be governed by the SLAs defined in Appendix E. Service Level Agreement (SLA) Requirements.
REQ-116	The reporting system report generation screens shall be standardized such that layout, data entry fields, selection buttons, search functionality, and similar features are the same across all reports.
REQ-117	The reporting system shall support the generation, display, export, and storage of reports automatically on a user-defined frequency/time or on user demand.
REQ-118	The reporting system shall support user role access regarding the generation of reports.
REQ-119	The reporting system shall generate, display, export, and store reports with column and row titles labeled using terms clearly defined in user documentation and applied consistently throughout all reports.
REQ-120	The reporting system shall generate, display, export, and store reports with segregation of relevant data by Facility/Plaza.
REQ-121	The reporting system shall generate, display, export, and store reports and allow for the selection of one (1) or more specific Facilities/Plazas.
REQ-122	The reporting system shall generate, display, export, and store reports with a range of output options, including PDF, CSV, XLSX (or later), or screen display.

3.6.3 System Audit Requirements

Table 22: System Audit Technical Requirements

ID	Requirement
REQ-123	The TFH shall provide audit trails and audit functionality for all transaction processing activities performed by the System automatically or by users.
REQ-124	A screen/report shall be provided that allows authorized users to understand all changes made to a transaction and the User ID associated with these changes.
REQ-125	System changes shall be included with an appropriate User ID.
REQ-126	This screen/report shall include selection criteria such as time period, location, facility, and other criteria such that specific System audits can be performed.

The TSI will support all RMTA third-party System audits with Subject Matter Expert assistance, including the creation of audit-required queries and reports.

3.6.3.1 Roadside Transaction Auditing

Table 23: Roadside Transaction Auditing Technical Requirements

ID	Requirement
REQ-127	The TFH shall include functionality to fully audit all roadside Transaction Records.
REQ-128	The TFH shall receive, process, and store all Transaction Records from all System zone locations.
REQ-129	The TFH shall log and report the receipt and processing of all such Transaction Records. The TFH shall attribute each Transaction to the calendar day in which the vehicle passed through the toll lane or Toll Zone.
REQ-130	For each Transaction Record generated by the ORT Toll Zone Subsystem, the TFH shall coordinate and log the transmission of one (1) complete set and only one (1) complete set of violation images to the VDOT E-ZPass System.
REQ-131	The TFH shall log and report all such transmissions and attempted transmissions of violation image sets to the VDOT E-ZPass System.
REQ-132	A GUI shall be provided that allows authorized users to select a date, time, location, and other criteria to audit Transaction Records sent from the ORT Toll Zones and received by the TFH. This GUI includes screens and reports showing the details of each Transaction Record.
REQ-133	The results of all roadside transaction audits shall be reports that contain relevant roadside information and relevant TFH information available in Excel or comma-delimited formats.

ID	REQUIREMENT
REQ-134	The specific data elements that will be contained in these audit reports shall be agreed to during the Design Phase but shall include at least the following: 1. Roadside Transaction (Sent) a. Date and time b. Location c. Transaction ID d. Transponder numbers e. LPN f. Image set location 2. TFH (Received) a. Date and time b. Location c. Transaction ID d. Transponder numbers e. LPN f. Image set location
REQ-135	These audit reports shall include summary numbers that indicate the number of Transaction Records sent for the selection criteria and the number of Transaction Records received for the selection criteria.
REQ-136	When configured to interface with the VDOT E-ZPass System via SFTP, all System elements shall be GAAP compliant and meet the SSAE Type 2 Audit requirements.

3.6.4 INTERFACES

The TSI shall utilize non-proprietary industry-standard protocols and data structures to accomplish the communications required between various components, peripherals, and subsystems. The TSI shall fully detail these protocols and data structures in the Interface Control Documents (ICDs) developed or complied with during the Design Phase of the Project.

Table 24: Interfaces Technical Requirements

ID	REQUIREMENT
REQ-137	At a minimum, all messages between the Zone Controller, VES, AVI system, vehicle separation sensors, and the TFH shall utilize a documented, open (available to RMTA during the Design Phase and subsequently throughout the Contract term) transmission protocol or protocol stack.
REQ-138	The TFH shall be required to interface with the VDOT E-ZPass System as described in section 3.6.4.1.
REQ-139	The TFH shall process, send, load, and activate 100% of the updated Transponder status lists on each Zone Controller in the ORT Toll Zone Subsystem.
REQ-140	The TFH shall process, send, load, and activate 100% of individual E ZPass Transponder status updates on each Zone Controller in the ORT Toll Zone.

ID	REQUIREMENT
REQ-141	This TFH shall provide an RMTA user(s) with an easy method of re-initiating any transmissions that were not successful (e.g., Transponder status lists).

3.6.4.1 VDOT E-ZPASS SYSTEM INTERFACE

RMTA requires that transaction data corresponding to all transaction records and associated images formed by the System be transmitted to VDOT for final disposition. The TSI will design and develop the VDOT interface as prescribed in Appendix K. VDOT ICDs.

3.6.5 TFH HARDWARE

If the TSI proposes to utilize physical servers located on RMTA premises, the TSI shall furnish and install all required enclosure(s) to house the TFH in the locations described above in section 3.6. The TSI shall furnish and install all other hardware, associated mounting fixtures, cabling, and other items to provide a fully functional TFH consistent with all requirements specified in this document and elsewhere in the Contract.

3.6.5.1 WORKSTATIONS

The TSI shall provide workstations with all devices (desktop computers, docking stations, printers, scanners, headsets, cabling, keyboards, pointing devices (mice), monitors) required for RMTA staff to perform daily job requirements with respect to the System. Physical workstations shall be desktops no more than 20 inches in height, 9 inches in width, and 19 inches in depth. Monitors shall be no less than 20” across and 12” tall. The TSI shall provide a single workstation at each of the RMTA plaza buildings. These 3 workstations shall support full use of the System and interfaces with all 3rd party systems provided by the TSI. Over the term of the Contract this includes adding software needed for RMTA to perform its work and removing software that may impair performance. RMTA will provide all required licenses, 3rd party applications and/or required information for the use of non-TSI provided software.

3.6.5.2 SERVERS AND RACKS

Table 25: Servers and Racks Technical Requirements

ID	REQUIREMENT
REQ-142	TFH components shall be installed in fully equipped computer cabinets typical of a data center environment and include servers, storage devices, network equipment, power strips, casters, front covers, side covers, rear covers, cover locks, equipment mounting rails and shelves, casters, fans, filters, other features, and accessories consistent with the Telecommunications Infrastructure Standard Requirements for Data Centers (TIA-972).

ID	REQUIREMENT
REQ-143	The System solution shall include all proposed or existing cabinets, enclosures, servers, storage systems, workstations, cabling, power distribution units, and any ancillary equipment as may be necessary to provide a complete and acceptable transaction processing, data management and reporting system that meets the requirements of this RFP.
REQ-144	Any proposed TFH subsystem or component, including servers and all associated hardware elements, shall be of the latest commercially available design and shall be currently supported via maintenance and warranty programs by the manufacturer.
REQ-145	The System shall include proven configurations that support future upgrades to system processors, memory components, and storage systems.
REQ-146	All hardware and equipment supplied for this Project, excluding consumable materials (i.e., material that needs continuous replenishment), shall meet all requirements contained herein, including established SLAs, and shall adhere to specified warranty and service contract requirements.

3.6.5.3 DATA STORAGE

Table 26: Data Storage Technical Requirements

ID	REQUIREMENT
REQ-147	The System shall include an efficient solution for storing and accessing data and files for the on-site (or cloud based) TFH and the Disaster Recovery service. The TSI shall follow the Data Retention Guidelines (Appendix I. RMTA Data Retention Guidelines) for all data retained by the TFH.
REQ-148	The System shall maintain and store files for the following: 1. Lane and TFH configuration and executable files, including version numbers, date and time entered in the production subsystem. 2. RMTA ORT toll facilities toll rates and toll schedules 3. TVL and other file versions, including updates by date and time received. 4. Vehicle and license plate image files including toll transaction ID link, location code, date, and time. 5. Security access authorization files by date and time built. 6. System logs from the TFH servers
REQ-149	The System shall store all toll Transaction Records, toll lane events, maintenance messages and work order records.
REQ-150	The System shall provide authorized users the ability to access the above data through a GUI for displaying and generating reports.
REQ-151	The System shall make at least twelve (12) months of the above data available online and display and report in the TFH subsystems.

3.6.6 SOFTWARE

The TSI shall check for all updates for all COTS software from original manufacturers according to a schedule included with the Project Management Plan (PMP).

The TFH shall log and store the date and time when all software patches, fixes, and other changes available from the manufacturer of the COTS software and non-COTS products were installed on the System.

RMTA anticipates twenty (20) end-users of the System.

As part of the Maintenance Plan (section 3.11.2), the TSI shall describe how they shall maintain the versioning and maintenance of all COTS products. This versioning and maintenance shall include a methodology for keeping all products current and the planning and upgrade testing needed to accomplish this requirement. This versioning and maintenance shall include an end-of-Project checklist verifying all products are the current version and include any executed service contracts.

The TSI shall furnish and apply all COTS software and/or firmware patches and updates to the System. Critical and security related changes shall be applied within thirty (30) calendar days of release by the software's manufacturer. All other software and/or firmware patches shall be applied within sixty (60) calendar days of release by the software's manufacturer. In the event that patches or updates for any operating system, network, database, middleware or other COTS software are no longer available from the software's manufacturer, the TSI shall immediately:

- Notify RMTA that patches and/or updates are no longer available.
- At RMTA's direction, furnish and install replacement COTS software having similar functional capabilities, capacity and quality in the RMTA's sole determination.
- Furnish and install any equipment and other software related to the replacement COTS software at no cost to the RMTA.
- Update all documentation to reflect the replacement COTS software.
- Conduct all testing necessary to test the replacement COTS software and other System changes, if any, to RMTAs satisfaction.

The TSI shall be responsible for all Project software licensing throughout the term of the Contract. The TSI shall maintain a spreadsheet, submitted annually to RMTA (or as renewal requires), with the pertinent licensing information for all software requiring a RMTA license contract. The TSI shall request RMTA at least 60 days prior to the expiration date of license or product for any license or product that requires action by RMTA.

Table 27: Software Requirements

ID	REQUIREMENT
REQ-152	All System software shall be parameter-driven and configurable and provide flexibility for the TSI to readily change said parameters and configurations.

ID	REQUIREMENT
REQ-153	All System software that has a user interface shall provide a GUI for all user interface functions.
REQ-154	The proposed operating systems and databases shall be currently supported versions with a documented upgrade path from the vendor.
REQ-155	All COTS software descriptions shall include the following: 1. Manufacturer 2. Version number 3. Feature set 4. Number of user licenses provided
REQ-156	All non-COTS software source code shall only become the property of RMTA pursuant to events described in the Software Escrow Agreement and shall be maintained at the current production version if use is continued after Project completion.

3.6.6.1 OPERATING SYSTEM

The TSI shall maintain the operating system by loading all available updates and security patches throughout the term of the Contract. Critical and security-related changes shall be applied within thirty (30) calendar days of release by the software's manufacturer. All other changes shall be applied within sixty (60) calendar days of release by the software's manufacturer.

The TSI shall furnish all operating system licenses for the System to meet all operations, maintenance, and performance requirements.

The TSI shall retain allowed copies (i.e., backups) for all software on non-volatile media for periodic system maintenance, upgrades, or restorations.

Table 28: Operating System Requirements

ID	REQUIREMENT
REQ-157	The operating system for the TFH server(s) shall be COTS multi-user, multi-tasking and shall be the previous version if the latest version/release date is less than 12 months earlier than the proposal submittal date.
REQ-158	All operating systems, databases, other middleware, and other System COTS software furnished by the TSI shall be field-proven.
REQ-159	All operating systems, databases, other middleware, and other System software furnished by the TSI shall be supported with patches and fixes from their respective manufacturer for at least ten (10) years after completing System Acceptance Test (SAT).
REQ-160	The proposed operating system shall have COTS maintenance support services for the term of the Contract.

3.6.6.2 Database Management System (DBMS)

Table 29: Database Management System Requirements

ID	Requirement
REQ-161	TSI DBMS version/release date shall be the previous version if the latest version/release date is less than 12 months earlier than the proposal submittal date.
REQ-162	The selected DBMS shall have a published upgrade path and support upgrades to the operating system, applications, memory, disk drives, and processors.

3.6.6.3 System Failover and Recovery

RMTA requires the TFH hosting location(s) to adhere to data center Tier 2 (or greater) power, cooling, redundancy, and security requirements. The Tier 2 (or greater) data center standard must comply with the Telecommunications Infrastructure Standard requirements for Data Centers (TIA-942).

Alternatively, a cloud-based backup/system failover and recovery solution is acceptable if it meets the TFH availability and performance SLAs in Appendix E. Service Level Agreement (SLA) Requirements.

Table 30: System Failover and Recovery Requirements

ID	Requirement
REQ-163	The TFH(s) locations(s) shall be equipped with appropriate power and network connectivity to ensure that a seamless transition from one (1) TFH location to another other active/redundant TFH location can be accomplished within the required timeframe to support TFH availability and performance SLAs (see Appendix E. Service Level Agreement (SLA) Requirements).
REQ-164	Each TFH location shall contain two (2) wide area network connections from separate local loops and shall be configured with active-active failover to ensure communication resiliency and uninterrupted service.
REQ-165	The TSI's design shall ensure that no data captured/created in the facilities is compromised when a TFH fails and/or is brought back to full operation.
REQ-166	The TFH locations shall have the appropriate networking infrastructure to support RMTA bandwidth and operational requirements.
REQ-167	The TFH shall contain all tools necessary for Transponder status files to be automatically loaded onto portable media from the TFH, hand-carried from the TFH location to each System Toll Zone location; automatically loaded onto the System Toll Zone location; and placed into revenue service whenever the WAN is unavailable.
REQ-168	The TFH shall shut down gracefully when a threshold of the UPS battery power has been reached and such threshold shall be configurable by a RMTA user(s).
REQ-169	After such shutdown, the TFH shall resume all operation without manual intervention when external power to the UPS is restored.

3.6.6.4 Data Backup and Recovery

The TSI shall develop and submit a comprehensive Backup Recovery and Archive Plan during the Design Phase of the Project for RMTA review and approval. This Plan shall address all aspects of the backup, recovery, and archive strategies and processes, including but not limited to:

1. Backup and recovery plan for all application, database, and/or storage subsystems
2. Backup and recovery plan for all roadside subsystems (Zone Controllers and VES data processing units/controllers)
3. Integration with MOMS to include alerts and notifications of the success or failure of backup systems or jobs
4. Details on data archiving: disk to disk, disk to selected media, and rotational schedule of selected media and offsite storage, as well as the frequency of full and incremental data backup for all servers/systems

All hardware, software, and labor required to support this section will be included in the TSI's Price Proposal.

The TSI shall submit the Backup Recovery and Archive Plan in accordance with Appendix J. Project Deliverable Schedule.

Table 31: Data Backup and Recovery Requirements

ID	Requirement
REQ-170	The TSI shall provide an automated capability to back up the TFH daily, without manual intervention using disk libraries, and the archival parameters shall be configurable by RMTA user(s) for each type of data.
REQ-171	This backup process shall include a scheduled process for both full and incremental backups.
REQ-172	The TFH shall log, store and send an alert (see section 3.12.2) to notify a RMTA user(s) of the status of such backup process.
REQ-173	The TFH shall retain the following information, at a minimum online for twenty-four (24) months and then automatically archive it: 1. All Transaction Records 2. All toll rate tables
REQ-174	Archived data shall be available to RMTA within 24 hours of a RMTA request.
REQ-175	The TFH shall provide for viewing the backup data in a user-friendly and readable form.
REQ-176	The TFH shall have sufficient capacity to accommodate the restoration of the archived data and provide for a RMTA user(s) to generate queries from the restored data using the same tools and processes used to do the same with online data.

ID	REQUIREMENT
REQ-177	The TFH shall retain the following information online for ten (10) years and then automatically archive it: 1. The summarized transaction, revenue, and image data shall be retained on the TFH and/or in a data warehouse system for at least ten (10) years to generate performance reports for trend analysis. 2. All MOMS data including but not limited to alarms, work orders, equipment inventory and maintenance activities.
REQ-178	The TFH shall retain the following information online for six (6) months and then automatically archive it: 1. Digital Video Audit video with all transaction overlay data 2. System logs
REQ-179	The TFH shall retain all other information online for eighteen (18) months and then automatically archive it.
REQ-180	The TFH shall automatically archive information onto permanent, long-term storage.
REQ-181	System error and anomaly logs of the network or databases shall be retained until an incident or issue is corrected and closed.
REQ-182	When online disk space utilization reaches a configurable high percent of disk capacity, a message shall be transmitted to the MOMS to log, store, and send an alert.
REQ-183	After successful archival, the TFH shall automatically delete online data that has been archived and cause its MOMS to log, store and send an alert confirming successful archival and deletion.
REQ-184	The TFH shall cause its MOMS function to log, store and send an alert if faults or errors are encountered in such archival or a confirmation of successful archival is not created.
REQ-185	Deleting data that has reached its configured expiration timeframe or has been successfully archived shall be automatic, without the need for user intervention.
REQ-186	Deletion of data that has reached its configured expiration timeframe or has been successfully archived shall generate a message transmitted to the MOMS.
REQ-187	The TFH shall provide for loading and unloading data manually in the event of a catastrophic failure of the RMTA WAN or other similar disaster.

3.7 PROJECT MANAGEMENT

The following sections provide information about Project management. These sections shall address how this methodology will be implemented within the TSI's firm and all subcontractors, suppliers and/or other firms involved in this Project and include a table identifying those reference Projects where this same methodology was implemented and used by the TSI and their associated subcontractors and suppliers.

3.7.1 Project Schedule

The TSI shall prepare and submit a detailed Project Schedule based on a Work Breakdown Structure (WBS) that includes all tasks, activities and milestones related to the requirements gathering, design, development, procurement, installation, testing, training, migration, and deployment of the proposed System. The Project Schedule shall contain all the detailed discrete work packages and planning packages (or lower-level tasks/activities) networked with necessary dependencies to support Project events. The Project Schedule shall be maintained in Microsoft Project format (Microsoft Office MPP or newer) and shall identify all milestones and events starting with the NTP to the end of the Implementation Phase, culminating with Final System Acceptance. The TSI's proposal shall include a preliminary event-driven Project Schedule, which shall be updated, and resource loaded following NTP to baseline the schedule by including unknowns and any changes during negotiation. All subsequent schedule updates shall be made to the revised baseline for the duration of the Project. Any changes to the Project Schedule at any time are contingent upon RMTA approval.

The TSI shall submit the Project Schedule in accordance with Appendix J. Project Deliverable Schedule and shall update and make available to RMTA the Project schedule monthly and submit the updated version as part of the monthly progress report.

The Project Schedule shall include activity start dates and durations, milestones dates, predecessor and successor dependencies, resources by name, and a critical path representing activities without any slack. The Project Schedule shall provide for RMTA completed documentation/deliverable review cycles of no fewer than five (5) business days for most deliverables and no fewer than ten (10) business days for any submittals over 100 pages. Documentation/deliverables are deemed complete at the sole discretion of RMTA.

A Project Schedule of documentation deliverables shall include a spreadsheet updated weekly for submittals in a two (2) week look ahead and in real-time for submittals sent to RMTA or received from RMTA. The Project Schedule shall reflect each document submittal in whole and in sections as agreed upon for RMTA review.

When deliverables are late or milestones are missed, RMTA may issue a Notice to Cure to the TSI for Breach of Contract. The Notice to Cure may include a requirement for the TSI to perform an analysis to ascertain adequate staffing levels are being maintained. The TSI shall provide the analysis results and any other findings, including a proposed cure, within ten (10) business days of the Notice to Cure. Further, the TSI shall implement the proposed cure within ten (10) business days of RMTA Acceptance and approval.

At least monthly, the Project Schedule shall be submitted to RMTA in MS Project format (Microsoft Office MPP or newer) with a PDF file and associated narrative with the following updates:

1. Completion status of all tasks, activities, and milestones (e.g., deliverable submittal, Project review meeting).
2. All task activities shall be resource loaded by name, and resource reports generated to demonstrate staff is not over-allocated across all tasks.

3. Identification of tasks, activities, or milestones that are behind schedule. For example, if the preparation of a deliverable has expended 60% of the scheduled completion time while the completion percentage is only at 50%, then this deliverable is behind schedule. Delays for critical path tasks and activities for which a recovery schedule cannot prevent a Project completion delay shall be included in a risk matrix/register with a mitigation strategy. Near critical path analysis shall be accomplished as well.
4. Project Schedule update files shall be version controlled.

All pre-deployment, deployment, and post-deployment tasks for implementation shall include at a minimum:

1. WBS number
2. WBS name
3. Resources performing the task activity
4. Subsystem affected.
5. Task duration (includes start to finish of activities to complete the task)
6. Planned vs. actual time at the start of the task

3.7.2 Regular Project Meetings

The following sections provide information about the different types of meetings associated with the Project.

3.7.2.1 Post Award Meeting

RMTA will schedule a post-award meeting. Before the meeting, RMTA will distribute a notice of the meeting and an agenda of the subjects to be addressed.

At this meeting, RMTA will:

1. Discuss procedures for meetings, Project correspondence, and points of contact for administrative and technical communications.
2. Discuss procedures for Submittals (see section 3.7.4).
3. Discuss procedures for processing change notices and change orders.
4. Discuss monthly progress reporting.
5. Discuss progress and final payments.

3.7.2.2 Project Status Meetings

Monthly Project Status meetings will follow a defined agenda. The TSI shall submit a progress report and a meeting agenda to RMTA at least three (3) business days prior to the scheduled meeting.

The progress report and agenda shall include but not be limited to the following:

1. Updated Project Schedule showing progress since the previous meeting and including any proposed changes from the latest approved Project Schedule.

2. The current version of each Submittal document or drawing provided to RMTA.
3. Identification of all hardware that the TSI has ordered per RMTA authorization and the delivery status of each item.
4. Completed work description and the percentage complete for each task in progress.
5. Identification of all critical path tasks
6. Risk/Issue matrix changes, including associated recommended mitigation/resolution strategies or contingency plans intended to avoid potential delays.
7. Report on testing activities, including status and overview of defect tracking results (when applicable)
8. Description of any pending and proposed change orders, or any change order work is in progress and the associated work status.
9. Accomplishments during the reporting period
10. Six (6) weeks look ahead work plan for activities to be accomplished on the Project.
11. Updated action items list that provides the status of the open action items, identifying and explaining action items that can be closed, and documenting new action items resulting from the discussion of outstanding issues and concerns.
12. Copy of the approved final minutes of the previous meeting.

The TSI shall develop and maintain an action item list that will indicate resolved items, the person assigned to follow-up for resolution, and the anticipated date for resolution. Said action item list shall include a running list of action items that have been closed, and any updates thereof shall be subject to RMTA approval.

Inquiries, requests for information, and requests for solutions to problems presented during such meetings shall be answered, when possible, during the meeting. Answers provided orally at the meetings shall be recorded in the minutes.

The TSI shall submit the Monthly Progress Report in accordance with Appendix J. Project Deliverable Schedule.

3.7.2.3 Working Meetings

The TSI shall schedule and conduct working meetings on strategic, tactical, and operational issues no less frequently than every week. At the sole discretion of RMTA, the frequency of meetings may be adjusted.

The purpose of the working meeting shall include but is not limited to:

1. Track the status of the work activities.
2. Review comments on submitted documentation.
3. Review the TSI's performance to the contracted service level metrics.
4. Review TSI's invoices for services provided.
5. Report or communicate on all availability of services and the environment directly impacting RMTA services.

6. Resolve disputes.

The TSI shall produce and deliver to RMTA at least 48 hours prior to each working meeting:

1. A meeting agenda identifying potential problems, issues, and concerns to be resolved at the working meeting.
2. Documentation regarding or related to such problems, issues, and concerns.

Working meetings shall include the participation of those RMTA employees and consultants as RMTA may identify from time to time.

3.7.2.4 Records Keeping

The TSI shall maintain quality records and data such as records of design reviews and code walkthroughs, inspections and test results, records pertaining to nonconforming material, change order documentation, audit results and all other records related to the RFP and resulting Contract for no less than five (5) years after the expiration of the Contract. This information shall be made available to RMTA upon request and at the expiration of the Contract.

3.7.3 Online Document Sharing and Document Management System

The TSI shall use a secure, online Project management/collaboration software of their choice to internally manage, share, and distribute Project documents and information (e.g., SharePoint, Dropbox, Sync.com), including copies of all submitted versions of plans, drawings, and documentation.

The TSI shall provide and maintain for the duration of the Contract a secure document management system. This document management system shall identify, categorize, track, and manage all Project plans, manuals, Business Rules, requirements, design documentation, test cases, training materials, As-Built documentation, and other Project documents. All documentation and artifacts in the document management system shall be easily searchable and accessible by authorized users of both RMTA (and others designated by RMTA) and the TSI. The TSI shall provide the required licensing of the product for each user accessing the System. Updated versions of Project documents shall be submitted to RMTA for approval whenever significant revisions are made to Project documentation. All documentation developed by the TSI for the Project, including materials developed to support training and marketing, shall be the property of RMTA.

The TSI shall maintain the document management system that the TSI provides to RMTA as a monthly report showing the current version and date delivered for each submittal document.

The TSI shall provide a Documentation Lead for the duration of the Contract to ensure all documentation revisions are documented and tracked using a system of version control and change control logs. The Documentation Lead shall also ensure all documentation is successfully updated when changes in requirements, change orders, work authorizations, or upgrades or software or equipment changes occur. The Documentation Lead shall ensure all documentation, particularly those related to design (e.g., ICDs, RTM, SDDD), training, user manuals, or procedural items (e.g., maintenance and

disaster recovery), is maintained and remains current, incorporating any System changes or new projects coming online, for the duration of the contract. If necessary, the TSI shall provide RMTA staff training for accessing documents in the document management system.

RMTA may, from time to time, provide the TSI with an updated list of persons authorized to use the secure online document management system, and the TSI shall make the associated changes effective within two (2) business days of receiving each updated list.

All documentation shall be submitted to RMTA for review, comment, and approval. RMTA may require updated versions of draft documentation before providing approval. Draft and final versions of documentation shall be delivered electronically to RMTA using online document sharing. The TSI shall deliver documents in a standard native Microsoft Office application format, which allows for red-lining and tracking changes. All documents are subject to version control; once submitted to RMTA, the TSI shall submit all future revisions of a document in both red-lined and clean versions.

3.7.4 Submittals

The TSI shall maintain a tracking tool, posted in an accessible location to RMTA, for maintaining document submittal and review status. The TSI shall update the tool weekly for document submittals in a two (2) week look ahead and in real-time for submittals sent to RMTA for review and for reviewed documents received from RMTA.

All Project documentation shall conform to the following, at a minimum:

1. The TSI shall provide all the documents in two (2) electronic versions, where one (1) version reflects changes from the previous submittal as markups (“red lines”) and the other version is in clean form.
2. The TSI shall place the RMTA contract name and contract number on all documents and drawings provided as part of a submittal.
3. The TSI shall sequentially number each revision of documents and drawings in a submittal, and all such numbering shall be recorded in the document management system.
4. The TSI shall furnish all documents to RMTA in electronic form consisting of source files in DOCX (compatible with Microsoft Word), XLSX (compatible with Microsoft Excel), or PPTX (compatible with Microsoft PowerPoint).
5. The TSI shall provide drawings in any “native” file format such as MicroStation, Visio, XLSX, and one (1) complete electronic version in PDF format.

The TSI shall submit all deliverables, as outlined in Appendix J. Project Deliverable Schedule.

3.8 Project Documentation

This section provides information on Project documentation.

3.8.1 Project Management Plan (PMP)

The TSI shall develop and submit to RMTA for review and approval a PMP describing the overall management, staffing, and measurable controls that will be used to meet the requirements contained herein.

The TSI's PMP shall be submitted in accordance with Appendix J. Project Deliverable Schedule and shall address the approach to Project management, including how its Project management philosophy and principles are consistent with the latest edition of Project Management Institute's *Project Management Body of Knowledge*. In addition to the PMP requirements in the following sections, the PMP shall include communications management, risk management, requirements/scope management, subcontractor management and shall incorporate the Project Schedule and WBS. The TSI may propose using a comprehensive system that supports Project management, team collaboration, configuration management, and document management and control.

The PMP shall also describe how the TSI plans to document invoice submission; provide invoice backup information; and support the RMTA verification and approval process.

This PMP shall be updated periodically to reflect any changes as approved in writing by RMTA. The TSI shall maintain and keep current all incorporated individual plans, procedures, and processes that comprise the PMP for the duration of the Contract.

3.8.1.1 Project Staffing and Organizational Chart

The PMP shall include an organization chart and resumes listing the key Project personnel and their roles and responsibilities and the percentage of time they will dedicate to the Project. The TSI's key personnel for the Project shall include the following positions:

- Project Manager
- Quality Manager
- Maintenance Manager

The Project Manager shall be assigned to the Project full time from NTP through the Implementation Phase of the Project. The Project Manager shall be the primary point of contact for the Project.

The Project Manager is responsible for executing the work and acts as a single point of contact in all matters on behalf of the TSI.

Detailed resumes, not to exceed two (2) pages, shall be provided for each key personnel resource, and any changes to assigned key personnel shall be submitted to RMTA in writing for approval for the duration of the Contract. Additionally, the TSI shall provide background checks of all key personnel.

TSI shall clearly describe and distinguish categories of work that shall be performed by the TSI's own personnel and those categories that shall be performed by subcontractors, who shall be named in the proposal and included in the Organizational Chart. Any TSI modifications from the proposal that includes

key personnel or responsibilities to be shifted from TSI to a subcontractor and vice versa shall be requested in writing from RMTA.

Table 32 provides information about the TSI's key personnel for the Project.

Table 32: TSI's Key Personnel for Project

KEY POSITION	DESCRIPTION
Project Manager	The Project Manager shall serve as the point of contact for all communications between RMTA and the TSI from NTP until the successful completion of the As-Built review milestone. The Project Manager shall coordinate all work on the Contract, including but not limited to the work of the Maintenance Manager and Quality Manager.
Quality Manager	The Quality Manager shall be responsible for QA/QC on all aspects of the Project. The Quality Manager shall not be the Project Manager.
Maintenance Manager	The Maintenance Manager is responsible for the ongoing maintenance of the System to meet functional and performance requirements. The Maintenance Manager shall not be the Project Manager.

Any change in key personnel shall be subject to RMTA approval.

3.8.1.1.1 TSI PERSONNEL SECURITY

The TSI personnel shall be issued RMTA identification badges and shall always wear such identification badges when performing duties on the Project. Use of such identification badges for purposes other than work associated with the Project may result in employee termination from the Project and possibly other legal or disciplinary action.

The services and work performed under the Contract are considered confidential. Employees of the TSI shall not discuss their work with other unauthorized personnel or any individuals not directly associated with the Project. The TSI shall restrict communication to only RMTA staff and its designees.

The TSI shall ensure the following security requirements, at a minimum:

1. All security requirements specified elsewhere in the Contract are adhered to by all TSI team members.
2. All TSI team members shall follow the conduct in the security program described in the Security Plan (see section 3.8.6).

3. All work under this Contract shall be controlled completely by the TSI according to the security program described in the Security Plan. Such work includes but is not limited to manufacturing, fabrication, assembly, development, integration, testing, installation, and maintenance.
4. The TSI shall conduct comprehensive background checks on all employees and subcontractor personnel working on the Contract.
5. The TSI shall secure and safeguard all System equipment and materials at RMTA ORT and AET toll facilities until they are completely installed in full accordance with the Design Drawings and Design Specifications.
6. The TSI shall provide and manage the security required under this Contract.
7. The TSI shall ensure that all confidentiality requirements specified elsewhere in the Contract are adhered to by all TSI team members.
8. The TSI's Project Manager shall notify RMTA of all security incidents, concerns, and issues within two (2) hours of their occurrence.
9. The TSI's Project Manager shall provide a draft report to RMTA analyzing all security incidents, concerns, and issues within two (2) calendar days of their occurrence. The TSI's Project Manager shall update said report every week until the underlying issue is corrected and RMTA waives further updates.
10. The TSI shall conduct comprehensive security audits on both a scheduled and ad hoc basis as detailed in the Security Plan.

As detailed in the Contract, RMTA reserves the right to the following:

1. Have any TSI employee or subcontractor personnel removed from working on the Project at any time and for any reason.
2. Conduct additional background checks on any TSI employee and subcontractor personnel at any time at RMTA expense.
3. Conduct additional security audits at any time at RMTA expense.

3.8.1.2 Risk Management

The PMP shall describe the risk management method the TSI shall implement to identify, track, and mitigate Project risk areas, including cost. Concerns that shall be tracked throughout the Project include certain events with assigned and described risk probability, impact, and mitigation (e.g., elimination, contingency, reduction). The TSI shall initiate a special risk planning session prior to first site installation to include the following:

1. Identify all high-risk events that could occur as part of transitioning co-located equipment and devices.
2. Produce queries that seek to identify any occurrence of the high-risk items identified in item 1.

3.8.2 Requirements Traceability Matrix (RTM)

The TSI shall prepare and submit a Requirements Traceability Matrix (RTM) per Appendix J. Project Deliverable Schedule. The RTM shall document, at a minimum, the following:

1. All requirements as described herein with a unique ID and unchanging number.
2. The intended primary and secondary (if any) method used to verify the requirement, such as inspection (I), analysis (A), demonstration(D), or test (T).
3. The uniquely identified test procedure or script number used to verify a requirement.
4. The date verified (to be used during testing and verification).

The RTM shall trace verification of all existing production system requirements back to their source (e.g., RFP, or Business Rule, or via discovery) and forward to their design element and eventual test cases.

3.8.3 System Detailed Design Document (SDDD)

The TSI shall submit a System Detailed Design Document (SDDD) that provides the proposed System architecture, design specifications of all equipment, hardware, electrical infrastructure, and communications/networks gear and a description of the software functionality, and associated data flow.

Proposed items and equipment shall meet electrical, communication and environmental requirements and be compatible with expected loads, exposure, and peak usage. Software design shall describe the various modules intended to provide functionality and processing as is required by RMTA.

The SDDD shall present the logical design of the System and TFH, including data flow diagrams for various processing queues, entity relationship diagrams and data dictionaries. Upon completion of design reviews, the TSI shall revise and resubmit the SDDD to RMTA for final review and approval, and as defined in Appendix J. Project Deliverable Schedule.

The SDDD shall include at least the following:

1. The cut sheets and installation details/drawings for all equipment
2. Full description for all COTS software
3. Computer/server sizing and design details
4. The System, subsystem and module-level descriptions and interaction between modules
5. Details of all interfaces
6. Preliminary report samples and formats
7. Description of System diagnostics, status monitoring and error handling
8. Description of redundancy and failover processes
9. Interface Control Documents (ICDs)
10. File and transaction and maintenance message formats
11. User interface design, including menus and screens
12. Database design, including entity relationship modeling and data dictionary
13. Data communications/network diagram highlighting proposed changes and interconnection points
14. Estimated data communication load and existing bandwidth capacity
15. Formal, detailed BOM according to section 3.3.5

The TSI shall provide cut sheets for all equipment provided for the System. Where cut sheets are not available, links to websites with product details, specifications, and requirements shall be provided.

The TSI shall submit the As-Built SDDD, including all changes made during the software development, installation, and testing phases in accordance with Appendix J. Project Deliverable Schedule.

3.8.4 Drawings

The following sections provide information about the detailed design calculations, specifications, and drawings associated with the TFH. Any civil, structural, and electrical drawings provided by the TSI in support of the System shall be stamped by a Professional Engineer (PE) licensed in the state of Virginia.

3.8.4.1 As-Built Drawings

The TSI shall provide one (1) complete electronic set of As-Built Drawings for the System in any "native" file format such as MicroStation, Visio, XLSX, and one (1) complete electronic set in a PDF format on read-only electronic media. The sets shall include System architecture, all schematics, logic diagrams, layouts, wiring diagrams, assembly drawings, parts detail drawings, and installation depictions. The set of As-Built Drawings shall consist of a title sheet, an index sheet, and the various As-Built Drawings. The index sheets shall include a listing of all drawings with headings for Drawing Number, Drawing Title, and the type of drawings, such as assembly, schematic, material list, wiring diagram, wire list, or similar categories. The TSI shall incorporate and re-submit the As-Built Drawings for any design modifications, change orders and field installation changes that occur during the Project. RMTA will review the as-built drawings for content and accept the drawings only when the TSI has complied with the requirements set forth herein.

All As-Built Drawings shall be approved before the beginning of SAT. If at any time during the operations of the System should physical construction or installation be modified for any reason, the TSI shall submit updated As-Built Drawings within two (2) months of completion of said modification. Completion of physical construction or installation shall be determined on a per facility basis, and As-Built Drawings for the facility shall be deemed due two (2) months after completion of physical construction and installation at that facility.

All Project-related drawings and documentation that have been used in the implementation effort will be updated to reflect the delivered System design and configuration per Appendix J. Project Deliverable Schedule.

3.8.5 Disaster Recovery Plan

The TSI shall provide a Disaster Recovery Plan (DRP) for RMTA review, comment, and approval. The DRP shall include at least the following:

1. Architecture and description of redundant subsystems and failover processes
2. Anticipated failover time to DR/redundant site
3. Assessment of the roadside equipment data latency
4. Emergency contact list
5. Personnel roles and responsibilities

6. Details of the procedures/processes used in the event of the complete destruction of a TFH site, including relocation plans

The TSI shall test the DRP as part of SAT and annually thereafter. The TSI shall submit the DRP in accordance with Appendix J. Project Deliverable Schedule.

3.8.6 Security Plan

The TSI shall provide a Security Plan for the Project, which shall be submitted to RMTA for review, comment, and approval. The Security Plan shall describe personnel, facilities, data, and communications security provisions that shall be utilized for the Project(s), including, but not limited to the following:

1. Cabinet, hub, facility, and housing access
2. System software control, including User ID and password protections and System access control
3. Data privacy and encryption
4. Data communications security
5. Virus and spyware protection

The TSI must provide evidence of and maintain SSAE 18 (“audit report”) compliance. The audit report must be current (performed within the previous three (3) years) and have no exceptions. If a current audit report cannot be provided, the TSI must provide evidence that a report is forthcoming or will be provided.

If the selected TSI does not have an audit report at the time of contract execution, an audit readiness assessment will be required within the first nine (9) months of the contract execution with an audit evaluation and report to follow.

The TSI shall submit the Security Plan in accordance with Appendix J. Project Deliverable Schedule.

3.8.7 Safety Plan

The TSI shall develop a comprehensive Safety Plan for the Project, which shall be submitted to RMTA for review, comment, and approval in accordance with the deliverable schedule, Appendix J. Project Deliverable Schedule. The Safety Plan shall describe the procedures that will be instituted both during System implementation/deployment and during System maintenance activities to ensure personnel safety and compliance with all applicable state and federal laws, rules and regulations, and legislation, including but not limited to OSHA, NECA, FHWA.

The TSI shall ensure that all personnel are trained on the safety program prior to entrance to any work area and shall always be responsible for the safety of all TSI personnel.

The Safety Plan shall include the following, at a minimum:

1. Fully describe all TSI procedures for ensuring personnel safety
2. Index to all applicable OSHA, NEC, NFPA, Commonwealth of Virginia standards
3. Provide all health and safety training of the TSI’s employees and subcontractors

The TSI shall notify RMTA immediately when the conditions affecting the Safety Plan change. The TSI shall update the Safety Plan document within two (2) weeks of such change in conditions.

The TSI shall update the Safety Plan annually.

3.8.8 Training Plan

The TSI shall develop a Training Plan for the Project, which shall be submitted to RMTA for review, comment, and approval in accordance with the deliverable schedule, Appendix J. Project Deliverable Schedule. The Training Plan shall provide the following for each training course:

1. The purpose of the course
2. The qualification requirements for the trainer(s) and the intended audience
3. Course content outline/summary
4. Estimated training course duration
5. Training materials to be provided
6. All equipment required for delivery
7. Any logistical requirements, such as if the training is to be conducted in a classroom or roadside

The TSI will deliver the Training Plan per Appendix J. Project Deliverable Schedule.

3.8.9 System User Manuals

The TSI shall deliver System user manual(s) designed to provide RMTA users with the information necessary to perform their work related to the proposed System and associated TFH functionality. The user manual(s) shall provide a logical system-oriented organization and content that incorporates a full range of diagrams, illustrations, graphics, screenshots, tables, and instructions required to perform supported functions. User manual(s) shall be provided in both hard copy and electronic format.

The System user manual(s) shall include the following (at a minimum):

1. Roadside System description and operations
2. TFH functionality and operations
3. Audit functionality
4. DVAS functionality
5. Toll Rate Schedule creation & management
6. MOMS functionality
7. Reporting system

All training course content, training materials, and documentation (user manuals) shall be reviewed and updated as needed to stay current as part of any change orders and as part of the Project documentation maintenance.

The TSI shall submit the System User Manuals in accordance with Appendix J. Project Deliverable Schedule.

3.9 Training Program

This section provides information about the training program associated with the Project.

3.9.1 General Training Requirements

The TSI shall provide training either on-site at RMTA facilities or virtually. This training shall be designed to educate RMTA and RMTA designated representatives in the operation, use and maintenance of the System and all functionality provided by the TFH and associated subsystems (e.g., reporting and MOMS). A training course and materials shall be delivered to support training during the Implementation Phase.

If training sessions are conducted on-site, RMTA will provide a facility for conducting the training session. The TSI shall make reservations for any use of RMTA training rooms two (2) weeks in advance. The training sessions can only be conducted between 9 a.m. to 3 p.m. Monday through Friday. The TSI shall plan the training courses, content, and resources such that up to ten (10) trainees could be trained at once. If training sessions are not required to be virtual, the TSI shall bring their training equipment (e.g., projectors and laptops).

The TSI will deliver all training courses per Appendix J. Project Deliverable Schedule.

3.9.1.1 Training Courses

The Training courses shall provide information on the following:

1. System Operations
2. System Auditing

All training course content, training materials and documentation (user manual) shall be reviewed and updated as needed to stay current as part of any change orders and RTMA maintenance. Any changes or purging of training content shall be pre-approved by RMTA.

3.9.1.1.1 System Operations Course

The System Operations course shall provide training that results in a general understanding of all aspects of the operation of the System.

The TSI shall deliver two (2) sessions of this System Operation course at RMTA ORT toll facilities, or virtually if required, with a class size per session of up to ten (10) people.

This course is targeted for RMTA staff and operations, Maintenance of Traffic personnel and provides an in-depth knowledge of the operations aspects of the System including, but not limited to report generation, transaction flow, file downloads, operations, performance, alarms, and audits. A glossary of all relevant terms shall be provided in training.

3.9.1.1.2 System Auditing Course

The System Auditing Course shall provide training in all aspects of the System audit functions and tools, particularly those related to financial accounting, reconciliation, and management.

The TSI shall deliver two (2) sessions of this System Audit course at RMTA ORT toll facilities or virtually if required with a class size per session of up to ten (10) people.

The intended audience for this System Auditing Course includes RMTA financial management and auditing staff.

3.9.1.2 Training Materials

Draft copies of all training materials shall be subject to RMTA review and approval before final printing of quantities required for training.

RMTA shall have the right to require additional interim drafts at no additional cost should draft training materials submitted not be of adequate quality or have missing or incorrect information. Any determination of adequacy of training materials is at the sole discretion of RMTA.

The training materials include the following:

1. Each course shall include the course agenda, course objective, and detailed lesson plans
2. Student workbooks, which include but are not limited to course agenda, course objectives, schedule of sessions, copies of all electronic presentations and other visuals, lesson outlines, and summaries

Materials such as System User Manuals may be used to supplement the material provided in the student workbook. If such material is used, appropriate cross-references shall be included in the student workbook to identify the complete set of training materials provided to the student.

The TSI shall submit the Training Materials in accordance with Appendix J. Project Deliverable Schedule.

3.10 Testing

The TSI shall systematically and thoroughly test the System for compliance with all Contract requirements.

3.10.1 General Requirements

The TSI shall conduct testing of the System and all associated subsystems, including third-party components, to validate functionality, availability, reliability, accuracy, and compliance to this RFP's requirements and any changes to requirements due to change orders or break/fix activities. This section details the testing requirements, phases, facilities, and support services necessary to test the fully delivered System.

For all formal test phases, The TSI shall document all defects and issues discovered. All issues and defects shall be assigned a resolution date and severity level described by the TSI's Master Test Plan. This issues list shall be provided to RMTA within two (2) days of completing the formal test phase. The TSI shall be responsible for tracking all defects and issues found during all testing phases until a complete resolution is reached with RMTA approval. All defects must be resolved to the satisfaction of RMTA in each formal test phase before moving onto the next testing phase or to final SAT. At the sole discretion of RMTA, minor defects may be scheduled for resolution after completing a formal test phase.

For all on-site testing involving MOTs and/or test vehicles, the TSI shall provide all test vehicles and drivers and shall perform such testing during off-peak hours or as otherwise approved by RMTA.

The TSI's Quality Manager shall oversee all testing.

RMTA approval of any aspect of testing shall not relieve the TSI of the responsibility to meet all Project requirements.

3.10.2 Testing Sequence

This section provides a high-level overview of the testing required for the Project. Details of test phases are included in subsequent sections.

The first RMTA-witnessed testing will be a Factory Acceptance Test (FAT) of the TFH functionality (including mocked-up lane data/images). This TFH FAT will demonstrate the requirements and functionalities delivered by the TFH, including the VDOT interface, and is described in section 3.10.5.

Regarding testing of the ORT ETCS (roadside) functionality, RMTA is requiring an ORT ETCS that has been operating in a production capacity at a similarly sized facility for at least one year, and RMTA has no unique or unusual ORT ETCS requirements. As such, RMTA is willing to waive traditional roadside FAT. In place of a traditional roadside FAT, RMTA requires the TSI to perform a First Site Installation and Integration Test (FSIIT) at the RMTA-selected ORT Toll Zone which will be the first to be transitioned to the TSI's ORT ETCS. Details of the FSIIT are given below in section 3.10.6.

Upon completing the FSIIT, RMTA will approve the TSI to install the remaining two (2) ORT Toll Zones. The proper installation and operation of each will be validated during each Toll Zone's respective Site Installation and Commissioning Test (SICT), which is anticipated to be a subset of the FSIIT.

Once all ORT Toll Zones have been installed and successfully commission tested, the final testing phase is the SAT.

3.10.3 Master Test Plan

The TSI shall submit a Master Test Plan to RMTA for review, comment, and approval. This Master Test Plan shall provide the standards for developing individual test plans and procedures for the different phases of formal testing. These standards shall describe how each formal test shall be conducted, address test procedure format, discrepancy/issue/defect severity level definitions, discrepancy/issue/defect tracking, and Acceptance criteria for each test phase. RMTA must approve

severity level definitions. In addition, the Master Test Plan shall describe the entry criteria that must be met before each formal test can be started and the exit criteria that must be met before each formal test can be considered complete. RMTA must approve entry and exit criteria for all test phases. All functionality delivered by the System shall be demonstrated/tested, and the Master Test Plan shall describe these demonstrations and guidelines for creating test procedures in the individual test plans. The Master Test Plan shall describe the overall testing strategy and test procedure standards, whereas each formal test shall have its own test plan comprised of detailed test cases and procedures.

The Master Test Plan shall include the following, at a minimum:

1. The Quality Manager's responsibilities and authority
2. For the FSIIT and the SICT testing, including controlled test vehicles, a section of the Master Test Plan shall describe the following:
    a. The types of vehicles that the TSI will provide and operate, and the number of each.
    b. The license plate issuing jurisdiction and license plate type of each such vehicle.
    c. The types of Transponders (e.g., E-ZPass, SeGo, 6C, interior standard, Flex, exterior) that the TSI will provide and use, and the number of each.
    d. Where each such Transponder will be mounted (e.g., windshield, front license plate, bus roof).
    e. The documentation provided by the TSI to RMTA showing details of the testing and results.
    f. The method by which test results will be assessed and the associated pass/fail criteria.

It is anticipated that as design and development activities take place, testing strategies and plans may change and require revisions. As such, throughout the Implementation Phase, updated versions of the Master Test Plan and related test documents (individual test plans and final Test Reports) shall be revised or appended to the Master Test Plan and delivered to RMTA for review and approval. In this way, the Master Test Plan will represent a record of all testing performed during the Implementation Phase.

Formal tests shall conform to the standards defined in the Master Test Plan. For formal tests that require test cases (TFH FAT, FSIIT and SICT), such test cases shall include the following elements:

1. Introduction:
    a. Test Purpose
    b. Test Platform (including required equipment, environmental resources, and connectivity)
    c. Requirements to be demonstrated (cross-reference to lowest level requirement)
    d. Time Estimate
    e. Pre-requisites
    f. Set-up and test data preparation needed.
2. Individual Test Conditions/Steps:
    a. Test Condition Identifier (i.e., reference to requirement)
    b. Description of steps to execute the test case.

c. Expected Results
d. Actual Results and the party responsible for executing the test (entered after test execution)
e. Notes

As test cases for specific formal tests are developed, they shall be submitted to RMTA for review, comment, and approval. Once approved, the test cases (and later the results) shall be added to the Master Test Plan as addendums.

The TSI shall submit the Master Test Plan in accordance with Appendix J. Project Deliverable Schedule.

3.10.3.1 Test Reports

The following progress report format shall be submitted daily by the TSI to RMTA during TFH (Host) FAT testing:

1. Total test cases
2. Total test cases closed (% complete)
3. Total defects opened
4. Total defects closed
5. Remaining open defects by priority
6. Total test cases exercised this reporting period
7. Total test cases closed this reporting period
8. Total defects opened this reporting period
9. Total defects closed this reporting period

Following the completion of each formal test, the TSI shall submit a Test Report to RMTA for review and approval. The Test Report shall describe:

1. Results of the test
2. Listing of all defects identified along with the severity level of each defect
3. Plan for resolving open defects
4. Recommendation for retests (if appropriate)

The final approved Test Report for each formal test shall also be added to the Master Test Plan. RMTA reserves the right to withhold approval and any associated payments pending completion of corrective action and any necessary retests.

The TSI shall submit the Test Reports in accordance with Appendix J. Project Deliverable Schedule.

3.10.3.2 Defect Priority Levels

The TSI shall use the following priority levels with associated descriptions for all test phases and describe their approach to handling these priority levels in the Master Test Plan.

1. **Priority One:** A defect that stops the execution of an individual test and causes the execution of related tests not to be executed. This defect class is reserved for problems that require testing to stop and shall be used only for the most critical of defects. These defects include any defect that would result in the loss of revenue or would be customer-facing. Typical characteristics of this class of defect include the following:
    a. The defect is related to a legal or revenue issue that must be resolved before deployment. The System cannot go into production until the defect is fixed.
    b. The defect will result in a customer-facing issue for RMTA.
    c. It will directly impact users or operations in a major, noticeable way.
    d. It occurs (or will occur once the application is released) quite often (e.g., daily) in actual production or simulation.
    e. There is no real workaround.
    f. The defect causes downtime to the point the applicable availability SLAs cannot be met for the SAT period.
2. **Priority Two:** A defect that stops the execution of an individual test but does not affect the execution of other related tests. This may also be a defect that blocks any test or presents an unavoidable problem, preventing a user from completing the required tasks. Typical characteristics of this class of defect include the following:
    a. It directly impacts users or operations in a major, noticeable way.
    b. It occurs (or will occur once the application is released) often (at least once a week) in actual production or simulation.
    c. The problem causes application downtime or blocks test/test sets.
    d. There is no real workaround, or there is only one (1) workaround that requires significant effort from the user.
3. **Priority Three:** A defect for which a workaround is available. The actual results of current tests are not as expected, but the defect does not prevent the continued execution of the tests. Includes defects that impact the System or subsystem, but the System or subsystem can still perform without an immediate fix. Typical characteristics of this class of defect include the following:
    a. It occurs (or will occur once the application is released) less often than weekly in actual production or simulation.
    b. The defect does not cause significant application downtime.
    c. The defect is not functioning as documented or expected.
4. **Priority Four:** A cosmetic defect whose occurrence does not indicate a lack of or deviation from required functionality, but a cosmetic change or enhancement is requested. Workarounds are available so that System users can avoid these defects. Typical characteristics of this class of defect include the following:
    a. It relates to content, documentation, or other "non-application" aspects of the System or subsystem.
    b. If functionally related, the problem seldom occurs (or seldom will occur once the application is released) in actual production or simulation.
    c. Users have not noticed, or are unlikely to notice, that there is a problem.

3.10.4 Formal Test Phases

In addition to any internal testing (QA, unit level, or dry-run testing), the TSI shall demonstrate to RMTA that the System meets functional, technical, operational, performance, reliability, maintainability, and availability requirements by executing the following formal tests, which are further described in the sections that follow:

1. TFH (Host) FAT
2. FSIIT
3. SICT
4. SAT

All formal test phases will be witnessed by RMTA and/or RMTA-Designated Representatives.

3.10.5 TFH (Host) FAT

The TFH FAT demonstrates all required functionality of the TSI-provided TFH. For this FAT, the TFH will be connected to the VDOT E-ZPass CSC System test environment through the VDOT E-ZPass CSC System ICD. All required TFH functionalities will be demonstrated to meet design specifications. The TFH FAT will be run in the TSI-provided test environment or on a TSI-provided test capacity TFH system.

The TSI shall perform all testing necessary to prove that the interface between the System and the VDOT E-ZPass CSC System meets all stated requirements.

3.10.5.1 TFH FAT Plan

The TSI shall develop a TFH FAT Plan, including test cases and procedures designed to demonstrate all functionality and requirements of the fully operational TFH operating in a factory/test environment. The TSI shall submit the TFH FAT Plan and all associated test procedures/scripts/scenarios to RMTA for review, comment, and approval. The TFH FAT Plan shall include a schedule that includes a day-by-day breakdown of the different subsystems, modules, and interfaces to be tested. The TFH FAT Plan shall include the conditions to be tested along with the expected results, a description of test data sets used for both reports and functional testing, and a description of the priority levels used for classifying and recording any defects noted during TFH FAT. Defects discovered during the TFH FAT will be prioritized by the defect priority levels described by the Master Test Plan.

The TSI shall submit the TFH FAT Plan in accordance with Appendix J. Project Deliverable Schedule.

3.10.5.2 TFH FAT Report

Following the TFH FAT, the TSI shall submit a TFH FAT report to RMTA that describes test results, including all issues/defects discovered along with the severity level of each. If RMTA deems the number or effect of the unsuccessful items to be too large or too severe, the TSI may be instructed to resolve the

unsuccessful items, rerun the applicable portion of the TFH FAT, or rerun the entire TFH FAT at the sole discretion of RMTA.

The TSI shall submit the TFH FAT Report in accordance with Appendix J. Project Deliverable Schedule.

3.10.6 First Site Installation and Integration Test (FSIIT)

The FSIIT demonstrates that the first ORT Toll Zone Roadside System components are correctly installed and ready for revenue collection. This FSIIT will require the closure of the ORT Toll Zone, including MOTs, controlled testing with test vehicles, and demonstration that the first ORT Toll Zone Roadside System can create Transaction Records for all vehicles passing through the ORT Toll Zone and that these Transaction Records are created according to System requirements. The FSIIT will demonstrate at least the following:

1. Correct vehicle/Transponder association
2. Correct vehicle/image association
3. Correct vehicle classification for a variety of vehicles (2-axle vehicles, vehicles with trailers, multi-axle vehicles)
4. VES image quality
5. A variety of traffic conditions (e.g., closely following at speed, closely following in stop/go conditions, straddling, lane changing, and vehicles on equipped shoulders)
6. Correct toll rate applied
7. Zone Controller stand-alone mode
8. ORT Toll Zone in degraded mode
9. MOMS alerts for equipment failures
10. DVAS functionality (roadside)

During the FSIIT, the TSI shall demonstrate all ORT Toll Zone functionality and that the first ORT Toll Zone can transmit Transaction Records and images from all lanes to the TSI-provided TFH.

For the FSIIT, the TSI-provided TFH will be connected to VDOT's E-ZPass CSC test environment through the VDOT E-ZPass System ICD as is described above in the TFH (Host) FAT testing. During FSIIT, the TSI shall demonstrate that the first installed ORT Toll Zone can send test Transaction Records and images to the TSI-provided TFH and that the TSI-provided TFH can send Transaction Records and images to the VDOT E-ZPass CSC System.

Once the FSIIT is completed and accepted/approved by RMTA, the TSI-provided TFH will be disconnected from VDOT's E-ZPass CSC System test environment and connected to the VDOT E-ZPass CSC System production environment. These activities will place the first ORT Toll Zone and the TSI-provided TFH into a production environment. RMTA will then use the TFH to operate the first ORT Toll Zone and for all related TFH functionality.

3.10.6.1 FSIIT Plan

The TSI shall develop an FSIIT Plan, including all test cases and procedures/scripts/scenarios required to demonstrate all functionality and requirements of the fully operational ORT Toll Zone operating in a ready-for-production revenue collection environment. The TSI shall submit the FSIIT Plan and all associated test procedures/scripts/scenarios to RMTA for review, comment, and approval.

All hardware, peripheral devices, network equipment, and other infrastructure for the first ORT Toll Zone must be tested and verified as operating as designed and is ready for revenue collection by submission of an FSIIT report. This Test Report shall be submitted to RMTA and shall contain the following (minimum):

1. Test date
2. ORT Toll Zone identifier
3. Test steps/procedures executed with all results (pass/fail)
4. Any special configuration instructions that were required to be completed during testing
5. TSI Quality Manager's name and signature

The TSI shall submit the FSIIT Plan and the FSIIT Report in accordance with Appendix J. Project Deliverable Schedule.

3.10.7 Site Installation and Commission Testing (SICT)

Commission Testing demonstrates that all ORT Toll Zone Roadside System components are correctly installed and ready for revenue collection. This testing includes communications infrastructure, networking, and connectivity to the TFH.

Commission Tests of the two (2) ORT Toll Zones not previously tested under FSIIT will resemble the FSIIT in that they will include ORT Toll Zone closures with MOTs, controlled testing with test vehicles, and demonstration that the ORT Toll Zone Roadside Systems can create Transaction Records for all vehicles passing through the ORT Toll Zone, and that these Transaction Records are created according to RMTA requirements. Despite being like the FSIIT, in contrast with FSIIT requirements (which more closely resemble a typical Factory Acceptance Test than Commission Testing), Commission Testing is expected to be consistent with industry-standard Toll Zone commission testing with less exhaustive test scripts required.

Commission Testing will demonstrate at least the following:

1. Correct vehicle/Transponder association
2. Correct vehicle/image association
3. Correct vehicle classification for a variety of vehicles (2-axle vehicles, vehicles with trailers, multi-axle vehicles)
4. VES image quality
5. A variety of traffic conditions (e.g., closely following at speed, closely following in stop/go conditions, straddling, lane changing, and vehicles on equipped shoulders)

6. Correct toll rate applied
7. Zone Controller stand-alone mode
8. ORT Toll Zone in degraded mode
9. MOMS alerts for equipment failures
10. DVAS functionality (roadside)

During SICT, the TSI shall demonstrate all ORT Toll Zone functionality and that the ORT Toll Zone can transmit Transaction Records and images from all lanes to the TSI-provided TFH. As each ORT Toll Zone is accepted/approved by RMTA, it will be transitioned into a production capacity with other ORT Toll Zones already in production.

All hardware, peripheral devices, network equipment, and other infrastructure for each ORT Toll Zone must be tested and verified to be operating as designed and ready for revenue collection by submitting an installation and Commission Test report. This SICT report shall be submitted to RMTA and shall contain the following (minimum):

1. Test date
2. ORT Toll Zone identifier
3. Test steps/procedures executed with all results (pass/fail)
4. Any special configuration instructions that were required to be completed during testing
5. TSI Quality Manager's name and signature

3.10.7.1 SICT PLAN

The TSI shall develop an SICT Plan, including all test cases and procedures/scripts/scenarios required to demonstrate all functionality and requirements of all ORT Toll Zone Roadside System components are correctly installed and ready for revenue collection. The TSI shall submit the SICT Plan and all associated test procedures/scripts/scenarios to RMTA for review, comment, and approval.

All hardware, peripheral devices, network equipment, and other infrastructure for all ORT Toll Zone Roadside System components must be tested and verified as operating as designed and are ready for revenue collection by submission of an SICT report. This Test Report shall be submitted to RMTA and shall contain the following (minimum):

1. Test date
2. ORT Toll Zone identifier
3. Test steps/procedures executed with all results (pass/fail)
4. Any special configuration instructions that were required to be completed during testing
5. TSI Quality Manager's name and signature

The TSI shall submit the SICT Plan and the SICT Report in accordance with Appendix J. Project Deliverable Schedule.

3.10.8 System Acceptance Test

SAT shall be conducted over a period of sixty (60) consecutive days with the fully implemented ORT ETCS utilized by RMTA for all ORT facilities. SAT shall demonstrate all required availability, accuracy, performance, and System response requirements are met by the System. An entry criterion to SAT is that the System is meeting or exceeding all functionality requirements as demonstrated during the TFH FAT, the FSIIT and all SICTs and that all SLAs are being met. During SAT, the TSI shall demonstrate all SLAs are being met by way of the SLA reporting requirements described in Appendix E. Service Level Agreement (SLA) Requirements. RMTA shall have access to all data sets and reports used by the TSI to demonstrate compliance with the SLAs during SAT.

The TSI is solely responsible for executing SAT and recording the results to include weekly status reports. However, at its discretion, RMTA may observe and report defects during SAT.

If any portion of SAT requires repeated restarts due to no fault of RMTA, the TSI may be held accountable for any costs incurred by RMTA to support any additional SAT period(s).

SAT approval is dependent on successful demonstration of the complete System as functionally compliant with all requirements, all SLAs have been met for the 60-day period, and as meeting the exit criteria identified in the Master Test Plan.

The TSI will be given System Acceptance for the System upon the successful completion and RMTA approval of SAT, closure of all priority 1 and priority 2 defects as defined in section 3.10.3.2, punch-list items, completion and submission of all required documents including As-Built Drawings and updates to manuals, and the meeting of other conditions as specified in the Contract. System Acceptance is required prior to the Project entering the Maintenance Phase.

The SAT includes the following, at a minimum:

1. The only RMTA role in SAT shall be to observe.
2. The SAT shall confirm the System functions over the test period with limited manual intervention in live operations.
3. The TSI shall keep a detailed record of all SAT results and measured SLA values.
4. The TSI shall develop and provide a weekly report to RMTA from the start of SAT until the SAT is successfully completed.
5. These reports shall document the SLA measurements for the previous week, any/all proposed corrective action and shall also identify testing not yet attempted. The proposed corrective action shall be subject to written RMTA approval.
6. The SAT shall validate all screen/GUI navigation and results, and reports for accuracy performance. Test activities shall include traffic observation and the generation of System queries to validate file transmissions.
7. Failure of the System to meet any SLA requirement may result in the restart of that test period until such time the accuracy requirements are met. Restart of SAT is at the sole discretion of RMTA.

8. The SAT shall clearly demonstrate that all functional elements of the System and components provided by the TSI are in conformance with RMTA technical and operational requirements.

3.10.8.1 System Acceptance Test Plan

The TSI shall provide a SAT Plan which includes the specific procedures that will be used to demonstrate that the implemented System meets all SLAs. The SAT Plan shall:

1. Describe all entry and exit criteria.
2. Include sample reports that may be used to demonstrate System availability, accuracy, and performance.
3. Describe procedures for halting and re-starting SAT including the triage, testing and full resolution of any high severity defects.
4. Describe the process for correcting all defects/issues found during SAT, and the regression testing required to implement the corrections.

The TSI shall submit the SAT Plan in accordance with Appendix J. Project Deliverable Schedule.

3.10.8.2 System Acceptance Test Report

Following the SAT, the TSI shall submit a SAT report to RMTA describing the test results including all issues/defects found along with the severity level of each.

The TSI shall submit the SAT Report in accordance with Appendix J. Project Deliverable Schedule.

3.11 Maintenance

The TSI shall provide all necessary maintenance services to support all hardware, software, and network equipment comprising the System. RMTA staff members will be available during installation and testing of the System to gain knowledge of the operation of the System.

The TSI shall be required to have on-site personnel until formal System Acceptance. During this period, the on-site TSI staff shall perform all maintenance issues that arise. After System Acceptance, the TSI will not be required to have continuous on-site presence but will be responsible for administering the maintenance program.

Additionally, during the Maintenance Phase, the TSI shall provide:

1. Annual SSAE attestation
2. Yearly security assessments and reports
3. Testing and applying all applicable COTS patches

3.11.1 General Requirements

The TSI shall maintain all aspects the System, and associated systems provided by the TSI pursuant to this procurement. This includes all hardware and software associated with the TFH, Roadside Systems, network connectivity, and cabinets including HVAC.

The TSI shall provide maintenance services in accordance with the Maintenance Response and Repair Times described in Appendix E. Service Level Agreement (SLA) Requirements for the duration of the Warranty and Maintenance Phases. On-site and off-site services shall be provided. The TSI shall provide full time remote Help Desk support services to assist in troubleshooting, and incident/case management for identified software and System issues.

TSI shall conduct a monthly status meeting with RMTA to review the monthly MOMS report, the previous month's work, anticipated work for the next month, spare parts inventory, and any operational problems that have arisen or are expected. During the monthly status meetings, the TSI shall identify and communicate to RMTA all issues affecting the operations or performance of the System. TSI shall complete root cause analysis and after-action reporting. TSI shall present how issues arose, were identified, and resolved.

RMTA will make available space to house spare parts (this space was noted during the mandatory site visits). This shall serve as the primary location for warehouse/storage of any spare parts, consumables, tools, test equipment, repair parts, documentation and personnel needed to manage and support the System. Should the TSI require additional space than what is provided, the TSI shall provide that space at no additional cost to RMTA.

TSI shall provide adequate safeguards against theft, damage, or loss of RMTA spare parts in TSI possession. TSI shall be responsible for maintaining insurance against loss or damage to the spare parts due to mishandling, improper storage, theft, etc.

The Warranty Phase shall commence upon Go-Live (the beginning of revenue collection) and shall include all maintenance and production support for the System. The Warranty Phase shall conclude either after twelve (12) months or upon successful completion of the SAT as described in section 3.10.8.1 of this RFP, whichever occurs later. The Maintenance Phase shall begin at the completion of the Warranty Phase. The TSI shall ensure that the costs for the warranty and subsequent years of maintenance and production support are separated into individual pricing components in the Pricing Forms in Appendix D. Price Proposal.

The Warranty Phase shall include all maintenance and production support for the first year of operation. During the Warranty Phase, the replenishment of all spent spare parts will be done at no cost to the RMTA (i.e., unlike the maintenance periods, during warranty the TSI is responsible for the cost of spares). For clarity, if the TSI elects to utilize the initial spares inventory during the Warranty Phase, the TSI shall be responsible for funding the replenishment of the inventory levels to their original quantities until the completion of the Warranty Phase at no additional cost to RMTA.

3.11.2 Maintenance Plan

The Maintenance Plan shall include all processes and procedures used to successfully manage, staff and conduct System maintenance in accordance with all the requirements set forth in this RFP. The Maintenance Plan shall describe how the functionality of the MOMS is used to identify, dispatch, respond, restore, and record an incident or service event. Maintenance response times shall be as specified by the response and repair times, as defined in Appendix E. Service Level Agreement (SLA) Requirements, and the Plan shall communicate the TSI's processes to meet these response times. Spare parts inventory management shall be addressed. The Plan shall address the following, at a minimum:

1. A description of the maintenance methodology and approach
2. The responsibilities and authority of the Maintenance Manager, and Quality Manager related to operations and maintenance
3. Maintenance organizational chart and staffing schedules
4. Maintenance regions (if they exist) and staff assignments
5. A description of the MOMS and any other methods that shall be used to monitor the System, including priority levels for response to alarms, alert protocols, and sample reports and screens
6. A schedule and description of corrective, predictive, and preventive maintenance activities for all System components. The preventative maintenance schedule shall include the following:
    a. List all preventive maintenance to be performed on each element of the System
    b. Specify the frequency and duration of all ORT Toll Zone closures required each month to perform these activities
    c. Specify the frequency and duration of all TFH outages required each year to perform these activities
7. Detail how to access the preventive maintenance schedule via the System MOMS, review alerts, review pending tasks, update tasks in process and mark tasks complete
8. Contracted maintenance relationships
9. Maintenance support groups
10. Personnel contact information
11. Staff locations
12. Maintenance facilities/workshops
13. Procedures to be used for planning and implementing lane closures
14. Description of maintenance activities that may need to be executed during peak traffic periods, including how this will affect response time and how traffic management will be performed
15. Maintenance record keeping, including retaining all proof of purchase and payment in the form of dated invoice, shipping bills and payment receipts and furnish un-redacted copies of same to RMTA upon request. The Project Manager shall report any of the items listed above that are missing prior to requesting the associated payment from RMTA
16. Failure tracking
17. Reliability and maintainability analysis and calculations. For the period commencing at the start of revenue service and continuing through the end of the Maintenance Contract, information on the following:
    a. Notification/communications procedures

b. Fault monitoring procedures
c. Remote diagnostic processes/procedures
d. Maintenance of Traffic procedures
e. Spare parts inventory procedures

18. Maintenance activity reports
19. Describe all on-going System testing and certification related activities and who will perform them
20. Description of the process to maintain the versioning and maintenance of all COTS products, including information the planning and testing required
21. A checklist that verifies all COTS products are the current version. This checklist should include information about any extended service contracts.
22. Identify the section(s) of the System User Manuals that describe how to access and use the System functions that track and record the performance of the work above

TSI shall update the Maintenance Plan on a yearly basis to reflect any new operational practices and newly installed hardware/software that may affect TSI's maintenance activities.

The TSI shall submit the Maintenance Plan in accordance with Appendix J. Project Deliverable Schedule.

3.11.3 Monthly Maintenance Report

Beginning at the end of the first full month after Go-Live, TSI shall submit a Monthly Maintenance Report (MMR) for RMTA review. MMRs shall include, but are not limited to the following data:

1. Monthly Performance Measurements for all measured SLAs
2. Mean time to respond and repair (MTTRR) calculations, including exceptions and justifications
3. Access to all reports/data used by the TSI in support of the MMR
4. Preventive and predictive maintenance activities performed each month
5. Work orders, including the assigned technicians and associated repair times
6. Work plan for the following month
8. Status of spare parts inventory

RMTA must approve format and content of the MMR prior to first submittal. The TSI shall submit the Monthly Maintenance Report in accordance with Appendix J. Project Deliverable Schedule.

3.11.4 Maintenance Methodology and Procedures

The following sections provide information about the maintenance methodology and procedures.

3.11.4.1 Corrective Maintenance

TSI shall perform maintenance activities on a priority basis to detect, isolate and rectify a fault or substantial degradation in functionality of a System to restore it to its normal operable state.

Corrective maintenance support shall be provided on a 24-hour, seven (7) days a week, 365 days per year basis.

TSI shall prioritize all System maintenance events based on the potential impact to System performance, operations, and the ability to collect revenue.

If any problem is determined by RMTA to be a pervasive defect, the TSI shall replace and repair the problem equipment or software at no additional charge to RMTA.

3.11.4.2 Preventive Maintenance

TSI's preventive maintenance efforts and activities shall be carried out proactively on a scheduled basis (daily, weekly, monthly, quarterly, and annually) to ensure that the System is being maintained to meet the System performance and availability metrics by inspecting, adjusting, cleaning, tuning, and maintaining the System components (hardware and software) to aid in preventing failures.

As part of the Maintenance Plan and on an on-going basis, the TSI shall develop a preventive maintenance schedule (to be approved by RMTA), which represents the levels of effort, activities, resources, schedules, etc. required to fulfill the TSI's preventive maintenance responsibilities.

The TSI shall continually evaluate the preventive maintenance schedule based on operational experience gained during the Contract, consult routinely with RMTA via reporting and regular meetings, and submit any recommended changes to RMTA for approval. In addition, RMTA may request a revised preventive maintenance schedule to ensure that System components continue to function properly. PMs shall be scheduled such that the work will not interfere with peak travel times.

TSI shall enter proposed routine and preventive maintenance work activities in the MOMS, which shall automatically generate alert/alarm messages and work orders tracked by the MOMS.

Preventive maintenance that will impact System functionality or RMTA customers shall be preapproved prior to work starting.

3.11.4.3 Warranty Maintenance

TSI shall utilize MOMS to maintain warranty information (e.g., start date, duration, expiration date, responsibilities, and obligations of the parties). The MOMS shall generate automated messages when warranties are nearing expiration or when maintenance service is required as a condition of a warranty remaining in effect.

3.11.5 Help Desk

TSI shall provide help desk staffing during the hours of 7 a.m. to 7 p.m. Monday thru Friday in support of RMTA hours of operation (M - F 7:00 a.m. – 7:00 p.m.). In addition, the TSI shall provide after-hours on-call telephone number and email address support for resolution of issues noted by RMTA staff. The help desk is intended to act as a central point of contact for all technical support, including hardware and

software support, installation of updated versions of software, networking, network connection requests, and troubleshooting.

3.11.6 Spares and Asset Management

The TSI shall purchase and maintain the spare parts and consumables inventory as agreed to and approved by RMTA. The TSI shall recommend quantities for all spare parts supplied for the Project. The spare parts list shall also be included in the Maintenance Plan. The initial spare parts inventory for the Project(s) shall be furnished by the TSI to be used during the Maintenance Phase. All items in the spare inventory shall have unit prices provided in the Price Proposal even if the TSI does not need to procure items for the initial spare inventory. If the TSI elects to utilize the initial spares inventory during the Warranty Phase, the TSI shall be responsible for funding the replenishment of the inventory levels to their original quantities until the completion of the Warranty Phase at no additional cost to RMTA. All spare parts purchased for the Project during the Maintenance Phase (but not including Warranty Phase) shall be procured by the TSI and expensed on the monthly maintenance invoice. The TSI shall obtain RMTA approval prior to purchasing needed spares. All spares procured shall become the property of RMTA and shall be labeled as RMTA property and identified with a bar code or other inventory management process approved by RMTA. The TSI shall use RMTA equipment nomenclature when entering spare part information into the MOMS.

Each of the existing plaza buildings has space that the TSI may use for storage of spares. If the TSI requires additional space over and above what is currently available in the plaza buildings, then the TSI shall provide for this space at no additional cost to RMTA. Any TSI provided space for storage of spares will be secure, and will be subject to RMTA approval. TSI may view and measure if need the available storage space in each of the plaza buildings during the mandatory site visits as described in section 2.4 above. The TSI shall provide adequate inventory of miscellaneous maintenance and repair items and consumables.

TSI shall perform a full physical inventory audit annually to verify consistency between MOMS inventory management system and the actual count.

TSI shall be responsible for the proper disposal of the any parts and equipment removed from service in accordance with RMTA requirements. TSI shall obtain approval from RMTA prior to the disposal of any parts or equipment owned by RMTA. TSI shall coordinate and document any equipment disposals with RMTA.

RMTA reserves the right to independently purchase spare parts and transfer to TSI subject to TSI's inspection and acceptance of the spare parts.

3.12 Maintenance Online Management System

The TSI shall provide a MOMS application that allows for monitoring roadside and TFH equipment, tracking and reporting of work orders, alarm messages, equipment inventory (spares) and equipment health.

The MOMS shall have the ability to support alarm priorities, as well as maintenance personnel tracking, notifications, and assignments. The MOMS system shall provide for the following:

1. Reporting and tracking alarm/alert messages
2. Notifications to TSI and RMTA staff
3. Logging alarms and acknowledgments
4. Generation of and tracking of work orders
5. Maintain Preventive Maintenance schedules
6. Generation of repair histories.
7. Maintenance of spare parts inventory.
8. Tracking of System Availability
9. Rapid detection of poor performing cameras.

The MOMS shall be an integral part of all maintenance activities including routine preventive, warranty, and corrective maintenance.

3.12.1 MOMS Technical Requirements

At a minimum, MOMS shall be capable of providing the following functionality:

Table 33: MOMS General Technical Requirements

ID	Requirement
REQ-188	MOMS shall support the assignment of maintenance priority levels on a facility, day, and time, location (lane), and equipment status basis.
REQ-189	MOMS shall provide all screens and tools for RMTA users to identify issues/problems (traffic or equipment); access and view related issues/problems automatically identified by the System; log or provide additional detail on each issue/problem and transmit a notification of same to maintenance personnel and other MOMS users.
REQ-190	MOMS shall monitor, log, and report on communication between the System and the VDOT E-ZPass CSC System, including successful file and transaction transmissions; periodic file transmissions that are overdue or occurring too often; serialized file transmissions with missing or out of sequence data; file contents indicating network communication or data generation issues; and other communications faults and anomalies.
REQ-191	MOMS shall track Mean Time Between Failures (MTBF) for all System equipment.
REQ-192	MOMS shall track System operational status and availability.
REQ-193	MOMS shall track TFH operational status and availability.
REQ-194	MOMS shall allow user access via portable devices (i.e., cell phones, tablets).
REQ-195	MOMS shall provide failure, malfunction, and or degradation status on a facility, day, and time location (lane), and equipment status basis.

ID	REQUIREMENT
REQ-196	MOMS shall provide a description of all failures, malfunctions and or degradations in all work orders and tickets.
REQ-197	MOMS shall support spare parts and inventory entry, tracking (usage and reorder points) and control.
REQ-198	MOMS shall record and track all repair activities, and the details of the repair and the disposition of the part, including parts retired.
REQ-199	MOMS shall provide detailed part and equipment descriptions (including part/model number, serial number, vendor contact information, and date entered).
REQ-200	MOMS shall provide equipment maintenance activity and repair histories for all TSI provided equipment.
REQ-201	MOMS shall automatically generate and track work orders for preventive and corrective maintenance.
REQ-202	MOMS shall automatically notify support personnel to restore a failed, malfunctioning, or degraded equipment or component item.
REQ-203	All MOMS generated work orders shall contain the following: 1. Unique work order number 2. Priority level 3. Response and repair time, date, and lane/location 4. Model and serial/part number of equipment or software version 5. Status updates with time, date, location, component, and activity records 6. Error and event codes associated with the incident or failure event. 7. Description of work performed (e.g., corrective actions, reconfiguration) and services rendered (e.g., warranty service) 8. Name of the maintenance technician(s) who performed the work. 9. Disposition of the hardware and equipment problem (e.g., repaired, replaced, or returned to supplier/manufacturer) 10. Work order closure pending specific follow-up actions (e.g., root cause analysis)
REQ-204	MOMS shall log, store, and send an alert each time an equipment enclosure is opened or closed in the TFH and the ORT Toll Zone Subsystem
REQ-205	MOMS shall provide configurable temperature and humidity thresholds for each equipment enclosure.
REQ-206	MOMS shall track component failure rates (e.g., failures/operating hours) or MTBF continuously.
REQ-207	MOMS shall provide monthly reports showing measured average failure rates and manufacturer advertised or claimed MTBF (as applicable).
REQ-208	Access to MOMS information shall require the entry of the user's identification and password from which the subsystem shall retrieve the user's assigned role(s).
REQ-209	MOMS shall allow technicians to enter actual arrival time and time of work completion.
REQ-210	MOMS shall issue alerts at configurable timeframes before the expiration of any Warranty Phase that is tracked.

ID	Requirement
REQ-211	MOMS reporting functionality shall support the generation of reports in PDF, CSV, XLSX, and other formats.

3.12.2 Equipment Status Monitoring and Diagnostics

Table 34: Equipment Status Monitoring Technical Requirements

ID	Requirement
REQ-212	MOMS shall monitor and report on the status of all ORT Toll Zone and TFH equipment in near real-time.
REQ-213	MOMS shall generate alerts, alarms, and notifications to be sent to a configurable group of recipients via email, and/or SMS/text.
REQ-214	MOMS shall be capable of identifying state changes in equipment with resulting generation of work orders and shall notify a technician in a timeframe consistent with the assigned priority level.
REQ-215	MOMS shall provide monitoring and notifications for all System equipment including software elements; processes; interfaces; and data including but not limited to the following: 1. Low storage space for all subsystems 2. CPU utilization 3. CPU load 4. Job/workflow/queue exceptions 5. Availability

3.12.3 Work Order Tracking

Table 35: Work Order Tracking Technical Requirements

ID	Requirement
REQ-216	MOMS shall provide for the tracking of and disposition of all work orders.
REQ-217	MOMS shall have the ability to calculate and report on acknowledgment times, response times, and repair times.
REQ-218	MOMS shall escalate work orders not acknowledged within a configurable time of the initial notification.
REQ-219	After work is performed, MOMS shall update the status of work orders including information entered by technicians describing the event, work performed, and materials used.
REQ-220	MOMS shall not place any work orders into a hold status unless RMTA approves.
REQ-221	Work order generation shall automatically update spare parts inventory based on the usage of asset tracked equipment.

3.12.4 Spare Parts Inventory Control

Table 36: Spare Parts Inventory Control System Technical Requirements

ID	Requirement
REQ-222	MOMS shall include spare parts inventory control that provides for entering, tracking, and controlling the movement of spare parts and equipment used to maintain the System.
REQ-223	Entered information shall include part/model number, serial number, primary vendor contact information, alternative vendor contact information, last invoice price for the item, last order lead time (e.g., order to delivery), and the date the user entered the information into the System.
REQ-224	The management of spare parts inventory within MOMS shall integrate with the work order process to track the usage of equipment.
REQ-225	MOMS shall contain the functionality to calculate and track the value of the spare parts inventory.
REQ-226	MOMS shall have the option to move or transfer asset items between RMTA locations and TSI maintenance staff.
REQ-227	MOMS shall track the complete chain of custody for each inventory item, which includes the following: 1. Initial purchase to storage at TSI facility 2. Dispensing inventory to staff 3. Installation in field 4. Operation 5. Removal 6. Final disposal
REQ-228	MOMS shall generate purchase order requests based on configurable low inventory thresholds.
REQ-229	MOMS shall contain the functionality to collect and analyze the System component usage data to forecast equipment requirements and replacement cycles, as well as forecast purchases for the succeeding eighteen (18) months. MOMS shall also contain functionality to maintain vendor lists for all System equipment.

The TSI shall apply a unique bar code on all asset tracked equipment. The bar code shall be placed in a readily accessible and similar location for all similar equipment. The TSI shall provide enough barcode scanners (three (3) at a minimum) for use by maintenance personnel for direct entry into MOMS of all assets (operational units, spare inventory, test equipment, etc.). Records shall include part numbers, part descriptions, serial numbers, times, and dates of changes to location, warranty information, RMTA nomenclature, and a brief description of the part itself. The following procedures shall be followed during maintenance activities:

1. When equipment is replaced and determined to be in warranty, the part shall be returned to the manufacturer.

2. When a part is replaced and determined to be out of warranty, the part shall be repaired or replaced (whichever is most cost effective) and returned to inventory.
3. When a part is not repairable or not serviceable, it shall be recorded in the MOMS inventory as retired. Disposition of retired parts shall be coordinated with RMTA.

For all repair activities, the details of the repair and the parts disposition, including parts retired, shall be recorded, and tracked in the MOMS.

3.13 AET Conversion

At the sole discretion of RMTA, the TSI will design, develop, install, test, commission, and maintain an AET ETCS at a designated location along the Powhite Parkway, as represented in Figure 5. See Appendix F. Reference Drawings for drawings of the preliminary proposed Powhite Parkway AET solution.

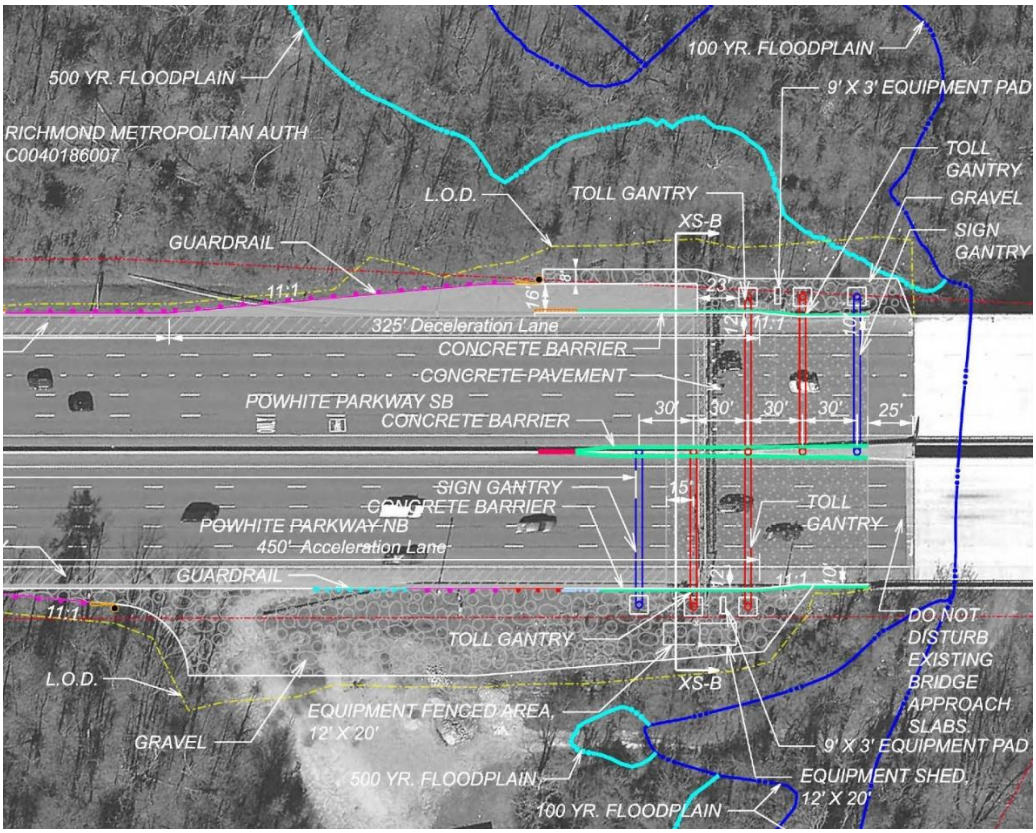


Figure 5: Powhite Parkway (NB/SB) Roadway View

The Powhite Parkway AET Toll Zone is located south of the James River and contains two (2) gantries in each direction (northbound and southbound). Each direction consists of five (5) lanes and two (2) shoulders. Each lane is 11'-wide for both northbound and southbound, as shown in Figure 6.

On the Powhite Parkway southbound, the shoulders are 6'-wide (nearest the center column) and 12'-wide (nearest the left column). On the Powhite Parkway northbound, the shoulders are 5'-wide (nearest the center column) and 12'-wide (nearest the right column).

All dimensions quoted above are approximate and subject to change.

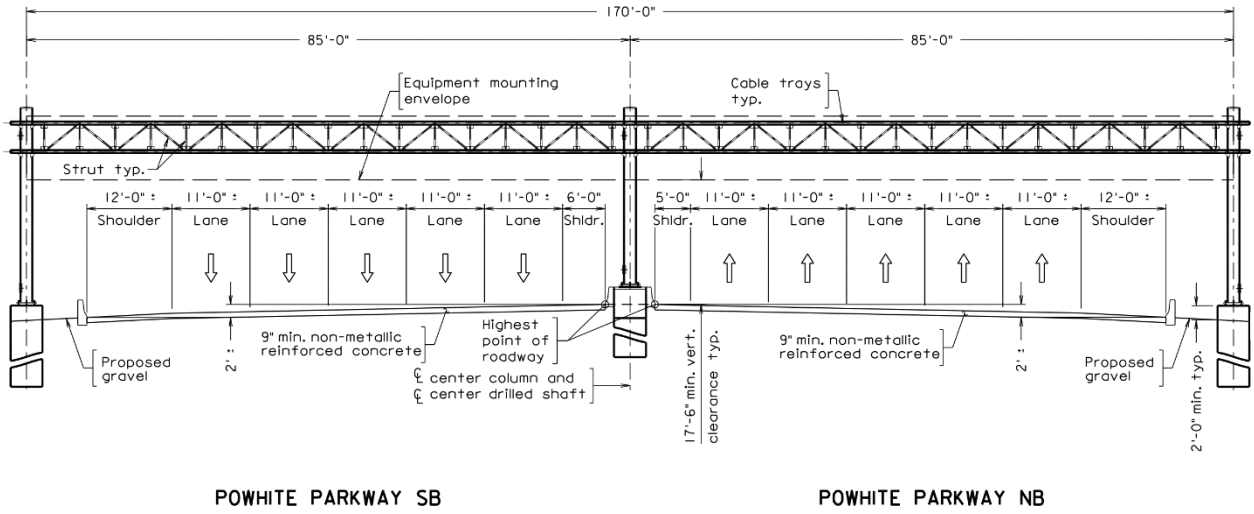


Figure 6: Powhite Parkway (NB/SB) Elevation View

Also, at the sole discretion of RMTA, the TSI will perform a similar AET Conversion near the Downtown Expressway. Details of this installation have not yet been finalized and this scope of work will be the subject of a future Contract amendment once relevant details have been determined.

A civil contractor, determined by RMTA, shall be responsible for the provisioning of the gantries, the fiber backbone plant (the fiber conduit/cable and patch panels but not electronics, which shall be provided by the TSI), all signage, roadside cabinets with HVAC, generator(s), Toll Zone pavement, roadway striping, site power service, and gantry structure grounding and lightning protection. The TSI shall be responsible for closely coordinating with RMTA, RMTA representatives, and civil contractor representatives with respect to these items.

The TFH infrastructure provided during the ORT portion of this Project will support the AET Conversion.

All scope of work and System requirements described elsewhere in this RFP are applicable to the AET Conversion, except for the AET-specific deviations described below in this section 3.13.

3.13.1 AET System Installation

During the AET Conversion there will be a series of meetings between the TSI, RMTA and the civil contractor to finalize the design, installation and System transition requirements, test plans, schedules, roles, contingency plans and all other details required for the successful conversion to AET. The TSI shall attend civil contractor coordination/design meetings and provide the necessary support as requested. TSI coordination items with the civil contractor require written approval from RMTA. The TSI shall not

provide direction to the civil contractor. Rather, the TSI will make RMTA aware of any issues requiring direction to the civil contractor, and RMTA will ensure the direction is communicated if appropriate. The TSI shall not act upon any direction from the civil contractor or any other party without written approval from RMTA.

RMTA will provide all MOT for the AET Conversion. For activities that require lane closures, the TSI shall communicate all lane closure requests at least two (2) weeks in advance of the anticipated closure to RMTA for approval. TSI shall not close any AET Toll Zone, in whole or in part, without prior RMTA approval. TSI shall not anticipate closing any AET Toll Zone in its entirety. One lane in each AET Toll Zone must be open at all times during AET Conversion.

3.13.2 AET Roadside System Requirements

All Roadside System requirements for the AET Conversion will be as described in this RFP in section 3.5 and all subsections above with the following exception:

1. VES cameras will be provided and installed to capture images of both front and rear license plates.

3.13.3 AET System Project Management

The TSI shall appoint a Project Manager to oversee all aspects and phases of the AET conversion. If this is a different individual than the Project Manager for the ORT ETCS Project, the TSI shall submit their resume for RMTA review and approval.

3.13.4 AET System Project Documentation

The TSI shall maintain a deliverables tracking tool for all deliverables/documentation associated with the AET conversion project. This deliverables tracking tool will be stored in a location accessible to RMTA. The TSI shall update the tool weekly for document submittals in a two (2) week look ahead and in real-time for submittals sent to RMTA for review and for reviewed documents received from RMTA. Deliverables and project documentation related to the AET conversion shall meet all the requirements of section 3.7.4 above.

The TSI shall use the secure document management system that is required by section 3.7.3 above for storage of all AET conversion related documents.

The project documentation required for the AET Conversion shall meet all the requirements of section 3.8, in addition to providing all requirements specific to the AET Conversion. The project documentation required for the AET Conversion consists of the following:

1. AET Conversion Schedule
2. AET Conversion Installation Plan
3. AET Conversion Transition Plan
4. AET Conversion RTM

5. Updated SDDD (to include AET Conversion information)
6. AET Conversion As-Built Deliverables
    a. AET Conversion As-Built Drawings
    b. Updated As-Built SDDD (to include AET Conversion information)
7. Updated Maintenance Plan (to include AET Conversion information)
8. Updated Master Test Plan (to include AET Conversion information)
9. AET Conversion FAT Plan
10. AET Conversion SICT Plan
11. AET Conversion SAT Test Plan
12. AET Conversion Test Reports

The TSI shall submit this documentation in accordance with Appendix J. Project Deliverable Schedule.

3.13.4.1 AET Conversion Schedule

The TSI shall prepare and submit for RMTA review and approval a Project Schedule specifically for the AET Conversion. This AET Conversion schedule shall meet all of the requirements described in section 3.7.1 above. During the AET conversion, the TSI shall conduct regular project meetings as are required by Sections 3.7.2.2 and 3.7.2.3 above.

The TSI shall submit the AET Conversion Schedule in accordance with Appendix J. Project Deliverable Schedule.

3.13.4.2 AET Conversion Installation Plan

The TSI shall prepare and submit for RMTA review and approval a AET Installation Plan, Checklist, and Drawings for review and approval. The AET Installation Plan shall include the following, at a minimum:

1. A checklist that includes a detailed component list and description of how each device/item is installed, as related to the AET Conversion
2. A description of the responsibilities of the Installation Manager, the Test Manager, and the Quality Manager, as related to the AET Conversion
3. Information about the construction, installation, testing, training, and transition tasks for all elements of the AET Conversion

The TSI shall submit the AET Conversion Installation Plan in accordance with Appendix J. Project Deliverable Schedule.

3.13.4.3 AET Conversion Transition Plan

The TSI shall prepare and submit for RMTA review and approval an AET Conversion Transition Plan shall describe the methodology, process, and testing required to conversion from ORT to AET.

The TSI shall submit the AET Conversion Installation Plan in accordance with Appendix J. Project Deliverable Schedule. Refer to section 3.13.7 for information about the AET Transition Plan.

3.13.4.4 AET Conversion Requirements Traceability Matrix

During the design of the AET ETCS, the TSI shall prepare and submit for RMTA review and approval a Requirements Traceability Matrix. This RTM shall meet all of the requirements of section 3.8.2 above and shall document all of the requirements that are specific to the AET Conversion. This RTM shall be delivered to RMTA for review and approval before the TSI can perform any installation activities for the AET Conversion.

The TSI shall submit the AET Conversion RTM in accordance with Appendix J. Project Deliverable Schedule.

3.13.4.5 Updated System Detailed Design Document

The TSI shall prepare and submit for RMTA review and approval an updated System Detailed Design Document (SDDD), with additional information specifically for the AET Conversion. This updated SDDD shall describe the proposed System architecture, communicate all design specifications for all equipment, hardware, electrical infrastructure, and communications/networks gear and a description of all software functionality, with associated data flow. The updated SDDD for the AET Conversion shall meet all requirements described in section 3.8.3 above and shall be delivered to RMTA for review and approval before any installation activities can begin for the AET Conversion.

The TSI shall submit the updated SDDD in accordance with Appendix J. Project Deliverable Schedule. Refer to section 3.13.7 for information about the AET Transition Plan.

3.13.4.6 AET Conversion As-Built Drawings

The TSI shall prepare and submit for RMTA review and approval one (1) complete electronic set of drawings for the AET Conversion in any “native” file format such as MicroStation, Visio, XLSX, and one (1) complete electronic set in a PDF format. The drawings shall include AET ETCS architecture, all schematics, logic diagrams, layouts, wiring diagrams, assembly drawings, parts detail drawings, installation depictions, and other such drawings. All such drawings shall be included with or referenced by the SDDD for the AET Conversion. The TSI shall incorporate and re-submit these drawings as “As-Built” Drawings for any design modifications, change orders and field installation changes that occur during the AET Conversion. All As-Built Drawings shall be approved by RMTA before the beginning of the SAT for the AET Conversion.

The TSI shall submit the AET Conversion As-Built Drawings in accordance with Appendix J. Project Deliverable Schedule.

3.13.4.7 Updated As-Built System Detailed Design Document

The TSI shall prepare and submit for RMTA review and approval an updated as-built SDDD, which shall include all changes made during the software development, installation, and testing phases of the AET Conversion.

The TSI shall submit the updated as-built SDDD in accordance with Appendix J. Project Deliverable Schedule.

3.13.4.8 Updated Maintenance Plan

The TSI shall prepare and submit for RMTA review and approval an updated Maintenance Plan which shall include all processes and procedures used to successfully manage, staff and conduct System maintenance, as related to the AET Conversion.

The TSI shall submit the updated Maintenance Plan in accordance with Appendix J. Project Deliverable Schedule.

3.13.4.9 Updated Master Test Plan

The TSI shall prepare and submit for RMTA review and approval an updated Master Test Plan to RMTA for review, comment, and approval. This Master Test Plan shall provide the standards for developing individual test plans and procedures for the different phases of formal testing, as related to AET Conversion.

The TSI shall submit the updated Master Test Plan in accordance with Appendix J. Project Deliverable Schedule. Refer to section 3.13.5.1 for information about the updated Master Test Plan.

3.13.4.10 AET Conversion FAT Plan

The TSI shall prepare and submit for RMTA review and approval the AET Conversion FAT Plan, including test cases and procedures designed to demonstrate all functionality and requirements of the fully operational TFH operating in a factory/test environment, as related to the AET Conversion.

The TSI shall submit the AET Conversion FAT Plan in accordance with Appendix J. Project Deliverable Schedule. Refer to section 3.13.5.2 for information about the AET Conversion FAT.

3.13.4.11 AET Conversion SICT Plan

The TSI shall prepare and submit for RMTA review and approval the AET Conversion SICT Plan, including all test cases and procedures/scripts/scenarios required to demonstrate all functionality to requirements of the AET Conversion.

The TSI shall submit the AET Conversion SICT Plan in accordance with Appendix J. Project Deliverable Schedule. Refer to 3.13.5.3 for information about the AET Conversion SICT.

3.13.4.12 AET Conversion SAT Plan

The TSI shall prepare and submit for RMTA review and approval the AET Conversion SAT Plan. The AET Conversion SAT Plan shall provide information about the procedures used to demonstrate that the implemented AET Conversion meets all SLAs.

The TSI shall submit the AET Conversion SAT Plan in accordance with Appendix J. Project Deliverable Schedule. Refer to section 3.13.5.4 for information about the AET Conversion SAT.

3.13.4.13 AET Conversion Test Reports

Following each AET Conversion test, the TSI shall submit a AET Conversion Test Report to RMTA. These AET Conversion Test Reports shall describe the test results, as related to the AET Conversion. These AET Conversion Test Reports provide information about all issues/defects found along with the severity level of each.

The TSI shall submit the AET Conversion Test Reports in accordance with Appendix J. Project Deliverable Schedule.

3.13.5 AET Conversion Testing

The TSI shall conduct testing of the AET ETCS and all associated subsystems, including third-party components, to validate functionality, availability, reliability, accuracy, and compliance to this RFP's requirements and any changes to requirements due to change orders or break/fix activities.

For all formal test phases, The TSI shall document all defects and issues discovered. All issues and defects shall be assigned a resolution date and severity level described by the TSI's Master Test Plan as described in section 3.10.3.

3.13.5.1 Updated Master Test Plan

The TSI shall update the Master Test Plan described in section 3.10.3 to include AET ETCS testing and submit this updated plan to RMTA for review, comment, and approval. The update shall provide all components as stated in section 3.10.3 specifically for the AET ETCS.

The TSI shall submit the updated Master Test Plan in accordance with Appendix J. Project Deliverable Schedule.

3.13.5.2 AET FAT

At RMTA's sole discretion, the TSI shall conduct an AET ETCS FAT to demonstrate that all requirements and functionality have been incorporated into the AET ETCS. If RMTA lane closures are not feasible, AET ETCS FAT may be performed at a TSI provided test facility with infrastructure and equipment representative of the final configuration and installation expected on RMTA roadways. The test facility must be located within the continental USA and must accommodate speeds ranging from stop-and-go up to 80 mph.

The AET ETCS FAT shall demonstrate to RMTA the full functionality of the AET ETCS operating in a test environment with hardware and software representative of the final System. RMTA will observe the formal FAT on-site. RMTA and RMTA-designated representatives shall have access to all FAT test sites and data generated during this testing.

All AET ETCS functionality including roadside, connection to existing TFH, capacity/performance, interfaces, ease of use (GUIs), and reports shall be tested/demonstrated during FAT. Internal and external interfaces shall be observed and verified against requirements and for data accuracy.

AET ETCS FAT shall also include test procedures for stress testing to verify the System can handle the estimated transactional volumes exchanged via the VDOT System interface. Normal and exception scenarios/transactions shall be demonstrated. Twice the daily production load for each internal or external interface shall be successfully demonstrated.

3.13.5.3 AET SICT

The TSI must perform a SICT in accordance with section 3.10.6 that demonstrates that the AET ETCS components are correctly installed and ready for revenue collection. RMTA does not expect the entire roadway to be closed for testing, therefore, the AET ETCS SICT must include provisions for controlled testing in portions of the zone. The SICT must demonstrate that the AET ETCS can create Transaction Records for all vehicles passing through the AET Toll Zone and that these Transaction Records are created according to System requirements.

During SICT, the TSI shall demonstrate that the AET Toll Zone can transmit Transaction Records and images from all lanes to the TSI-provided TFH.

3.13.5.4 AET SAT

An AET SAT shall be conducted over a period of thirty (30) consecutive days with the fully implemented AET ETCS utilized by RMTA. The AET SAT shall demonstrate all required availability, accuracy, performance, and System response requirements are met by the AET ETCS in accordance with section 3.10.8. This AET SAT will only include the portion of the System changed during AET ETCS implementation.

3.13.6 AET System Maintenance

The TSI shall maintain all aspects the AET SETCS. This includes all hardware and software associated with the AET Conversion, Roadside Systems, network connectivity, and civil contractor provided cabinets including HVAC. All maintenance provided by the TSI as related to the AET System(s) shall meet all of the requirements as described by section 3.11 above. All roadside devices provided with the AET conversion shall be connected to the MOMS system as required by the ORT ETCS, and as described in section 3.12 above.

3.13.7 ORT to AET Transition

For ORT to AET conversion, RMTA anticipates the install of new overhead gantries and associated equipment and infrastructure, along with new toll collection equipment. It is anticipated that any gantry construction, roadway reconstruction, electrical and communications infrastructure, and other civil elements will be completed through separate contracts of RMTA outside this Contract. The TSI shall be

responsible for installing and testing equipment for the new AET Toll Zones, integrating the new AET Toll Zones into the overall System, removing and/or storing the existing tolling equipment from the ORT Toll Zones at RMTA's discretion. Upon RMTA approval, TSI may utilize decommissioned equipment as spares for operational ORT Toll Zones.

The TSI shall submit for RMTA review and approval an AET Transition Plan. This AET Transition Plan shall describe the methodology, process, and testing required to transition from ORT to AET. The AET Transition Plan shall describe how stability of operations and revenue collection shall be maintained during this transition.

Interruptions to the processing of tolls, data transmittal and storage, System reporting, System access, toll facility use, and auditing during the transition of ORT to AET shall be minimized to the greatest extent possible. Any anticipated interruptions shall be thoroughly documented in the AET Transition Plan.

This AET Transition Plan shall meet all the requirements of section 3.4.1, in addition to providing all the requirements that are specific to the AET Conversion.

This AET Transition Plan shall be delivered in accordance with Appendix J. Project Deliverable Schedule.

3.14 Succession Plan

The TSI shall provide a Succession Plan that the TSI will execute at the end of the Contract under this Scope of Work or should the Contract end prematurely. The Plan shall define the TSI's activities and deliverables to turn over all Systems, Project assets, and artifacts to RMTA or a designated third party. This Plan will be designed to be executed with the objective of minimal service interruption. Should the TSI provide operational services to RMTA, the smooth handoff of all operational resources (including designated personnel by position type) and business processes and procedures shall be included in the Plan. The Plan shall be presented to RMTA by the TSI on an annual basis to include all System and operational updates from the previous year, to be reviewed and approved by RMTA.

The TSI shall submit the Succession Plan in accordance with Appendix J. Project Deliverable Schedule.

Appendix A. Glossary

Term	Definition
Acceptance	The written approval by RMTA or RMTA-Designated Representative of a stage of the Project or the full Project as defined in the Contract.
Acceptance Testing	Includes each level of testing defined in the Contract to verify that all requirements of the Contract as defined in the Scope of Work have been met.
AET Conversion	All aspects of the Work the TSI must provide to successfully convert ORT Toll Zones to AET Toll Zones.
AET ETCS	Individually and collectively, all AET tolling components to be provided by the TSI and shall include all equipment and cabinetry to be installed by TSI, including, but not limited to, the following: overhead and in-lane equipment in the Toll Zone, lane-side equipment mounted in the Toll Zone, roadside equipment cabinets, and backup power procured under this RFP that meet the specifications and any performance requirements.
As-Built Drawings	The documents and drawings associated with the Scope of Work.
AVI Equipment	All AVI readers and antennas.
Business Rules	A set of rules approved by RMTA that define how RMTA Systems shall respond to various situations that occur during the toll collection process based on business case and policy decisions made by RMTA.
Contract	The binding agreement between RMTA and the TSI for RMTA Electronic Toll Collection System RFP Scope of Work.
Design Phase	The period in the Project in which the SDDD is developed and submitted to RMTA for review and approval.
Final System Acceptance	The written acceptance by RMTA that the TSI has provided a System that complies with all requirements and operates to the satisfaction of RMTA.
Go-Live	The process, phase, or date at which time the new System begins operation.
Implementation Phase	The phase of the Project involving construction, both physical and software, when the components of the Project become visible to others outside the development and construction staff.

Term	Definition
Installation/Commission Test	A test period to install and evaluate the Toll Collection System software and hardware to ensure performance meets the functionality, availability, accuracy, and performance requirements.
Liquidated Damage	The amount the TSI is required to pay to RMTA pursuant to Appendix E. Service Level Agreement (SLA) Requirements.
Maintenance Online Management System	A software application or suite of applications that automates the tracking and reporting of work orders, alarm messages, equipment inventory, equipment health, and interface status.
Maintenance Phase	The phase of the Project involving necessary maintenance services to support all hardware, software, and network equipment comprising the ORT ETCS.
ORT ETCS	Individually and collectively, all ORT tolling components to be provided by the TSI and shall include all equipment and cabinetry to be installed by TSI, including, but not limited to, the following: overhead and in-lane equipment in the Toll Zone, lane-side equipment mounted in the Toll Zone, roadside equipment cabinets, and backup power procured under this RFP that meet the specifications and any performance requirements.
ORT Implementation	All the Work associated with the installation and maintenance of the ORT ETCS.
RMTA-Designated Representative(s)	Person or persons authorized by RMTA to represent RMTA in all dealings with the TSI.
Project	The total Work defined in Contract.
Project Management Body of Knowledge	A reference to the contents of the Project Management Institute guide titled *A Guide to the Project Management Body of Knowledge*, which provides standards, guidelines, rules, and characteristics for project management.
Project Manager	A professional in the field of project management tasked with the responsibility of the planning, execution and closing the Project.
Project Schedule	A schedule of Project activities based on a WBS that includes all tasks, activities and milestones related to the requirements gathering, design, development, procurement, installation, testing, training, migration, and deployment of the proposed System

Term	Definition
Readable Images	Images produced by the VES in which both license plate number and license plate issuing jurisdiction can be reliably read and the vehicle characteristics can be identified electronically or by the human eye.
Roadside System	The Roadside System includes the following subsystems: Zone Controller, AVI (RFID), VES, AVDC, UPS, and DVAS. Refer to section 3.5 of this RFP for additional detail on the Roadside System.
RMTA Evaluation Team	All RMTA stakeholders who will jointly review, assess, and score documents submitted to RMTA in response to this RFP.
System	All hardware and software and communication infrastructure to be provided or maintained by the TSI pursuant to this RFP. Includes Roadside Systems and all other hardware and software utilized by both systems (e.g., TFH) in the ORT ETCS and AET ETCS.
System Acceptance	RMTA acceptance of the System after the completion of the Project as defined in the Contract.
System Acceptance Test	The SAT is a consecutive thirty (30) day operational test period to evaluate and ensure that the Toll Collection System software and hardware performance meets the functionality, availability, accuracy, and performance requirements.
System Detailed Design Document	Milestone deliverable describing the Project and ORT ETCS hardware, software and communications design that shall be developed by the TSI and delivered to RMTA during the Design Phase of the Project for RMTA review and approval.
Technical Evaluation Team	All RMTA stakeholders who will jointly determine the technical suitability of the equipment, material, product, process, or Systems to best meet or exceed the intended objectives.
Test Report	A document which details the results of a test or testing process, including, all discovered defects, the severity of the defect, and the plan to resolve/correct the defect.
Toll Systems Integrator (TSI)	The single legal entity (and their selected subcontractors) that enters a contract with a client for delivering Services under a defined scope of work responsible for implementation of the Scope of Work for the Project.
Toll Zone	The area on the roadway where the ORT ETCS collects data to build a Transaction Record. This includes marked travel lanes and shoulders covered by the ORT ETCS. Multiple toll gantries may be included in a single Toll Zone.

Term	Definition
Transaction Record	The record created by the ORT ETCS representing one, and only one vehicle passage.
Transponder	A radio transmitter-receiver mounted in/on a vehicle used to communicate with a roadside reader for communicating a unique serial number and other information.
Warranty Phase	The phase of the Project involving all maintenance and production support for the first year of operation.
Work	The total of productive and operative efforts used to generate the results specified, indicated, or implied in all technical and professional services, provisions of deliverables, and delivery of the System as outlined in the Contract, this RFP, the SLAs, and the TSI's proposal response.
Zone Controller	The System (including hardware and software) that provides functionality to create, store, and transmit Transaction Records utilizing data generated by and received from roadside sensors.

Appendix B. Contract

Provided as a separate PDF Document.

Appendix C. RMTA Technical Response Guide

Provided as a separate Microsoft Word Document.

Appendix D. Price Proposal

Provided as a separate Microsoft XLSX Document.

Appendix E. Service Level Agreement (SLA) Requirements

Provided as a separate PDF Document.

Appendix F. Reference Drawings

Provided as a separate PDF Portfolio Document.

Reference Drawings are provided solely for the Proposer's reference and are without representation or warranty by RMTA, except where specifically stated otherwise. Proposer shall be solely responsible for the Project design and RMTA shall have no liability or obligation as a result of the design work contained in this document. This document is subject to change without notice.

Appendix G. ORT Pavement and Gantry Statement

Provided as a separate PDF Document.

Appendix H. Proposal Forms

1. Acknowledgment of Addenda
2. Non-Collusion Affidavit
3. Terms of Discussion Form
4. SWaM-DBE Participation Form
5. Performance Surety

Provided as separate documents.

Appendix I. RMTA Data Retention Guidelines

Provided as a separate PDF Document.

Appendix J. Project Deliverable Schedule

Provided as a separate PDF Document.

Appendix K. VDOT ICDs

Provided as a separate PDF Document.

The VDOT ICD documents are provided solely for the Proposer's reference and are without representation or warranty by RMTA, except where specifically stated otherwise. Proposer shall be solely responsible for the Project design and RMTA shall have no liability or obligation as a result of the design work contained in this document. This document is subject to change without notice.

Appendix B. Contract

Provided as a separate PDF Document.

CONTRACT FOR OPEN-ROAD TOLLING
ELECTRONIC TOLL COLLECTION SYSTEM

between

RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY

and

Dated as of _____, 2021

Contents

ATTACHMENTS:

CONTRACT FOR OPEN-ROAD TOLLING
ELECTRONIC TOLL COLLECTION SYSTEM

THIS CONTRACT FOR OPEN-ROAD TOLLING ELECTRONIC TOLL COLLECTION SYSTEM (this "*Contract*") is made and entered into as of the ____ day of _____, 2021 (the "*Effective Date*"), between the **RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY**, a political subdivision of the Commonwealth of Virginia (the *"Authority"* or "*RMTA*"), and **_____,** duly qualified to do business in the Commonwealth of Virginia (the "*Contractor*"). In this Contract, either RMTA or Contractor may be referred to individually as a "*Party*" or collectively as the "*Parties*."

WHEREAS, RMTA desires to engage a qualified and experienced contractor to provide certain goods and services as more particularly described in RMTA's Request for Proposal No. _____ and all appendices, exhibits, attachments, schedules and any addenda thereto and any documents referenced therein (collectively, the "*RFP*");

WHEREAS, Contractor has represented to RMTA that it is experienced, qualified and willing to provide such goods and services;

WHEREAS, RMTA has relied upon such representations to select Contractor for providing such goods and services;

NOW, THEREFORE, in consideration of the mutual promises and covenants contained herein, the receipt and sufficiency of which are hereby acknowledged, the parties hereto, intending to be legally bound, agree as follows:

1. **Recitals**. The recitals set forth above are true and correct and are incorporated into this Contract.

2. **Definitions**. Certain terms used in this Contract are defined above, while other capitalized terms not specifically defined in this Contract shall have the same meaning assigned in the RFP to that term and the following words and phrases shall have the following meanings in this Contract:

   Amendment shall mean any mutual agreement of the Parties, expressly captioned "Amendment," provided that before any Amendment shall be operative or valid it shall have been reduced to writing and signed by the Parties.

   Business Day(s) or *business days* shall mean any day other than (i) a Saturday or Sunday, (ii) a day on which the Authority or commercial banks in the Commonwealth of Virginia are authorized by law to close, or (iii) such other days as the Authority may designate to Contractor.

   Commonwealth or *State* shall mean the Commonwealth of Virginia.

   Days or *days* shall mean calendar days unless otherwise specified in this Contract.

Service Level Agreements (SLAs) are the performance requirements described in **Appendix E. to the RFP**.

Pervasive Defect is defined in **Section 6.16**.

Open Road Tolling Electronic Toll Collection System or *Project* or *Project Services* shall mean the Base Work and Maintenance Work described in **Section 4** below.

System shall mean those elements of the RMTA toll collection system where Contractor has integrated, installed or provided hardware or software, all as the case may be, as provided under this Contract and as set forth in the Contract Documents.

3. **Incorporation/Inclusion and Priority of Documents.** The RFP, which is incorporated herein by reference as **Attachment A**, and Contractor's Proposal (and any documents referenced therein) submitted in response thereto, which is incorporated herein by reference as **Attachment B** (collectively, the "*Contractor's Proposal*"), are integral parts of this Contract. The RFP, Contractor's Proposal, this Contract (including all amendments, documents, attachments and exhibits referenced in this Contract) and, if required, Contractor's Best and Final Offer dated _____, shall be collectively referred to as the "*Contract Documents*" or the "*Contract*" or this "*Contract*" and shall govern the contractual relationship between Contractor and RMTA. Each of the Contract Documents is an essential part of the Contract between Contractor and RMTA, and a requirement occurring in one is as binding as though occurring in all. The parties intend for the Contract Documents to be complementary, to describe and provide for a complete agreement, and to be interpreted as if there is no conflict between them. Only in the event of a conflict among the Contract Documents, the Contract Documents shall control one over another in the following descending order of precedence:

   A. Any formally executed Amendment to this Contract;
   B. This Contract, including all exhibits, attachments and documents or agreements incorporated by reference;
   C. The RFP, including all appendices, addenda, exhibits and attachments; and
   D. Contractor's Proposal.

4. **Scope of Project**.

   4.1 Base Work. Contractor agrees to design, implement, and maintain an Electronic Toll Collection System (ETCS) for the RMTA Open Road Tolling (ORT) system. The services will include a roadside system and a Toll Facility Host (TFH) design, development, installation, integration, provisioning, testing, training, and commissioning, as described in the RFP. Contractor agrees to furnish the hardware, software, other network equipment, and documentation as described therein (collectively, the "*Base Work*"*)*. All hardware, software, other network equipment, and documentation so furnished shall be free and clear of all liens and encumbrances, and not violate any Intellectual Property (as defined in **Section 9.1.3**) rights of any third party.

All Base Work shall be completed by Contractor within the periods specified in the **Project Deliverable Schedule set forth in Attachment C** (**Appendix J. to the RFP)** and in full cooperation with RMTA and specified third parties as identified in **Section 6.6** below. Timely completion of each period specified in the Project Deliverable Schedule- Attachment C is critical to successful completion of the Project. Any changes to the Project Deliverable Schedule must be approved in writing by the Authority.

4.2 Maintenance Work. Contractor agrees to provide maintenance, support and other services and perform other work as described in the RFP and agrees to furnish the hardware, software, other network equipment and documentation as described therein (collectively, the "*Maintenance Work*"*)*. All Maintenance Work shall be completed by Contractor so as to meet or exceed the SLAs specified in the RFP in full cooperation with RMTA and specified third parties as identified in **Section 6.6** below.

4.3 Optional All Electronic Tolling (AET) Work. The Authority reserves the right to convert the ORT ETCS to AET ETCS as an optional service provided by the TSI upon RMTA's direction at a future date ("Optional Work"), as set forth in Section 3.13 of the RFP. Changes in this Contract or the work required as a result of the Authority's undertaking and implementation of Optional Work, in accordance with the RFP, may be accomplished after execution of this Contract, and without invalidating this Contract, by change order, construction change directive or subsequent agreement.

4.4 Extra Work. "Extra Work" shall mean the design, undertaking, training, installation, testing, equipping and servicing of toll system equipment in and about the RMTA Expressway System as the Parties may agree to from time to time and that is not included in the Base Work, Maintenance Work, or Optional Work referred to above. Changes in this Contract or the work required as a result of the Authority's undertaking and implementation of "Extra Work" may be accomplished after execution of this Contract, and without invalidating this Contract, by change order, construction change directive or order for a minor change in this Contract, as provided below. Extra Work shall be performed under applicable provisions of this Contract, and Contractor shall proceed promptly therewith, unless otherwise provided in the change order, construction change directive or order for a minor change in the System. If the unit prices are stated in this Contract or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed change order or construction change directive that application of such unit prices to quantities of work on the System proposed will cause substantial inequity to the Authority or Contractor, the applicable unit prices shall be equitably adjusted.

4.5 Change Orders. A change order is a written instrument entered into between the Authority and Contractor stating their agreement upon items including but not limited to the following:

(1) a change in the Project;
(2) the exercise of the options of the Authority described in **Section 4.3** above;
(3) the amount of any adjustment in amounts due hereunder, as contemplated in **Attachment D (Price Proposal**), with the understanding that pricing adjustments for items or pricing matters not contemplated under **Attachment D (Price Proposal)** may include those methods described under **Section 4.6**;
(4) the extent of the adjustment in the **Project Deliverable Schedule (Attachment C**), if any, and
(5) Any changes resulting from a change in applicable law as provided under **Section 4.8**.

4.6 Construction Change Directives. A construction change directive is a written order signed by the Authority directing a change in the Project and stating a proposed basis for adjustment, if any, in the **Price Proposal (Attachment D)** or the **Project Deliverable Schedule (Attachment C**), or both. The Authority may by construction change directive, without invalidating this Contract, order changes in the Project within the general scope of this Contract consisting of additions, deletions or other revisions of or to, the **Price Proposal (Attachment D)** or the **Project Deliverable Schedule (Attachment C**) being adjusted accordingly. A construction change directive shall be used in the absence of total agreement on the terms of a change order. If the construction change directive provides for an adjustment to the **Price Proposal (Attachment D)**, the adjustment shall be based on one of the following methods:

(1) mutual acceptance of a lump sum properly itemized and supported by sufficient data to permit evaluation;
(2) unit prices stated in this Contract, RFP or subsequently agreed upon;
(3) cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed fee.

Upon receipt of a construction change directive, Contractor shall promptly proceed with the change involved and advise the Authority of Contractor's agreement or disagreement with the method, if any, provided in the construction change directive for determining the proposed adjustment in the **Price Proposal (Attachment D)** or the **Project Deliverable Schedule (Attachment C**). A construction change directive signed by Contractor indicates the agreement of Contractor therewith, including adjustment in the **Price Proposal (Attachment D)** or the **Project Deliverable Schedule (Attachment C**) or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a change order. If Contractor does not respond promptly or disagrees with the method, the adjustment shall be determined by the Authority on the basis of reasonable expenditures and savings of those performing the work on the Project attributable to the change, including, in case of an increase in the **Price Proposal (Attachment D),** a reasonable allowance for overhead and profit. In such case, Contractor shall

keep and present, in such form as the Authority may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in this Contract cost shall be limited to the following:

(1) cost of labor, including social security, unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
(2) costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
(3) rental costs of machinery and equipment, exclusive of hand tools, whether rented from Contractor or others;
(4) costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the work; and
(5) additional costs of supervision and field office personnel directly attributable to the change.

Pending final determination of cost to the Authority, amounts not in dispute may be included in applications for payment. The amount of credit to be allowed by Contractor to the Authority for a deletion or change which results in a net decrease in the **Price Proposal (Attachment D)** shall be actual net cost as confirmed by the Authority. When both additions and credits covering related work on the System, System maintenance or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

If the Authority and Contractor do not agree with the adjustment in **Attachment C (Project Deliverable Schedule)** or the method for determining it, the adjustment or the method shall be referred to the CEO of the Authority for determination. When the Authority and Contractor ultimately reach agreement with any adjustments in the **Price Proposal (Attachment D)** or date of completion of the Project extension of **Project Deliverable Schedule (Attachment C**), such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate change order.

4.7 Minor Change In The Work. The Authority will have authority to order minor changes in the Project not involving any adjustment in the **Price Proposal (Attachment D)** or date of completion of the Project or extension of the **Project Deliverable Schedule (Attachment C**) and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Authority and Contractor. Contractor shall carry out such written orders promptly.

4.8 Change in Applicable Law. Any final and unappealable change in federal or Virginia law, or court decisions which constitute binding precedent in Virginia, and which significantly alter Contractor's required activities or any change in the availability of funds, shall warrant good faith renegotiation of the compensation

paid by or due to Contractor from the Authority and of such other provisions of this Contract that are affected.

If any other changes to this Contract become necessary, a formal contract change order will be negotiated by the Authority and Contractor in each case, to address any changes to the terms and conditions, including the costs of work included under this Contract. An approved contract change order must be in writing with proper date and executed by a duly authorized representative of the Authority and placed in the U.S. Mail postage prepaid or delivered by other appropriate means to Contractor prior to the effective date of the contract amendment contemplated by the change order. An approved contract change order is required whenever the change materially (as determined in good faith by the Authority) affects:

(a) the payment provisions;
(b) the scope of the Project ;
(c) date of completion of the Project or any portion thereof; or
(d) a change in the date for any deliverables; or a like provision.

Such changes may be necessitated by new and amended Federal and State regulations and requirements. As soon as possible after receipt of a written change request from the Authority, but in no event more than thirty (30) days thereafter, Contractor shall determine if there is an impact on price with the change requested and provide the Authority a written statement identifying any price, schedule and/or performance impacts on this Contract or to state that there is no impact. In the event that price will be impacted by the change, Contractor shall provide a description of the price increase or decrease involved in implementing the requested change. No change shall be implemented by Contractor until such time as Contractor receives an approved written change order from the Authority.

5. **Contract Term and Renewal**. This Contract shall begin on the Effective Date and shall continue until successful completion of the System Acceptance Test and for an initial period of six (6) years from such successful completion (the "*Initial Term*"). The parties shall agree on what dates constitute the successful acceptance and therefore the dates and period comprising the Initial Term. RMTA has the sole option, in its discretion, to renew this Contract for up to two (2) additional two (2) year periods (the "Renewal Term"). The Initial Term includes implementation, a one-year Warranty Phase to commence upon Project Acceptance, and a maintenance period to commence upon the end of the Warranty Phase. Unless RMTA notifies Contractor of its intention not to renew this Contract, by written notice given at least ninety (90) days prior to the expiration of the Initial Term or any Renewal Term hereunder, this Contract shall automatically renew upon the terms and conditions set forth herein.

6. **Contractor Responsibilities**.

6.1 Contractor Personnel. Contractor shall provide sufficient professional personnel and staffing on the Project. All persons assigned to perform under this Contract

shall be employees or authorized subcontractors of Contractor and shall be fully qualified to perform the Project. Contractor and its personnel (and any approved subcontractors and their personnel) shall comply with the confidentiality provisions of **Section 18 (Confidentiality)**. The key personnel that Contractor identifies in its response must be contractually committed to the Project in the roles identified. Any substitution or replacement of key personnel identified in the response shall be subject to the Authority's prior written consent, not unreasonably withheld.

6.2 Contractor Project Manager. As provided in the RFP, throughout the Initial Term and each Renewal Term, Contractor shall assign a project manager who shall provide the primary point of contact with the Authority and any other third party vendor of the Authority.

6.3 Permits, Licenses. As provided in the RFP, throughout the Initial Term and each Renewal Term, Contractor shall procure and maintain, at its expense, all permits and licenses that may be required in connection with the Project by Contractor and as otherwise required in the Contract Documents. Contractor shall furnish copies of the permits and licenses upon the Authority's request.

6.4 No Discrimination. During the performance of this Contract, Contractor agrees as follows:

6.4.1 Contractor will not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin, except where religion, sex, or national origin is a bona fide occupational qualification reasonably necessary to the normal operation of Contractor. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause, including the names of all contracting agencies with which Contractor has contracts of over $10,000.

6.4.2 Contractor will, in all solicitations or advertisements for employees placed by or on behalf of Contractor, state that Contractor is an equal opportunity employer. However, notices, advertisements and solicitations placed in accordance with federal law, rule or regulation shall be deemed sufficient for the purpose of meeting the requirements of this provision.

6.4.3 If Contractor employs more than five employees, Contractor shall (i) provide annual training on Contractor's sexual harassment policy to all supervisors and employees providing services in the Commonwealth, except such supervisors or employees that are required to complete sexual harassment training provided by the Department of Human Resource Management, and (ii) post Contractor's sexual harassment policy in (a) a conspicuous public place in each building located in the Commonwealth

that Contractor owns or leases for business purposes and (b) Contractor's employee handbook.

6.5 Drug-Free Workplace. At all times during the performance of this Contract, Contractor agrees to:

Contractor agrees to (i) provide a drug-free workplace for Contractor's employees; (ii) post in conspicuous places, available to employees and applicants for employment, a statement notifying employees that the unlawful manufacture, sale, distribution, dispensation, possession, or use of a controlled substance or marijuana is prohibited in Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition; (iii) state in all solicitations or advertisements for employees placed by or on behalf of Contractor that the contractor maintains a drug-free workplace; and (iv) include the provisions of the foregoing clauses in every subcontract or purchase order of over $10,000, so that the provisions will be binding upon each subcontractor or vendor.

6.6 Cooperation.

With Authority. RMTA shall be entitled to full and prompt cooperation of Contractor in all aspects of the Project. Contractor shall also fully and promptly cooperate with all third party contractors/vendors providing services to or on behalf of RMTA. In the event Contractor deems that any of RMTA's contractors/vendors are delaying or not performing their work or otherwise interfering with the Project, Contractor shall immediately notify RMTA in writing of such matter, including a detailed explanation of such delay so that RMTA may investigate the issue and assist with a resolution. Contractor's failure to furnish a detailed written notification within seven (7) days after any of RMTA's contractors/vendors first failed to cooperate with Contractor or otherwise improperly performed work, shall result in RMTA's denial of any future claim by Contractor that any of RMTA's contractors/vendors, as applicable, failed to properly perform their work or failed to cooperate with Contractor and Contractor shall be deemed to have waived such claim and Contractor shall be held to any applicable requirement under the Contact Documents that Contractor alleges is affected thereby.

With certain Third Parties. Contractor shall cooperate with, and coordinate Project Services with other Project contractors, including applicable transition work with existing RMTA contractors on RMTA toll system matters, so to provide for orderly and safe work at Project sites and to achieve efficiencies in completion of the Project.

Contractor shall also at all times cooperate with the Virginia Department of Transportation ("VDOT") and any third party servicer or agent of VDOT's customer service center, violations processing facility, or replacement facility or system, in connection with the handling and processing of electronic toll collection and violations processing matters, as the Authority may reasonably direct.

6.7 Meetings. RMTA and Contractor shall conduct meetings as provided in the RFP and as deemed needed by RMTA to review, discuss and resolve matters relating to the Project.

6.8 Material Change in Contractor's Financial Condition. Contractor shall immediately notify RMTA of any material adverse change since the Effective Date in Contractor's financial condition, business, prospects, affairs or operations or of any change of any partner or of such change of any shareholder holding greater than a 10% interest in Contractor, or of the existence of any material impairment of rights or ability of Contractor to carry on as its business and operations are currently conducted.

6.9 Contractor-owned Facilities. Contractor shall have sole responsibility for risk of loss to Contractor-owned facilities, equipment and other goods.

6.10 Registration. All contractors and subcontractors must comply with any and all registration requirements of Title 54, Chapter 11, Code of Virginia (1950), as amended. To the extent required, all non-resident contractors and subcontractors engaged on the Project shall register with the Department of Labor and Industry under the provisions of Section 40.1-30 of the Code of Virginia (1950), as amended.

This Contract, and all other contracts and subcontracts are subject to the provisions of Article 3, Chapter 4, Title 40.1, Code of Virginia (1950), as amended, relating to labor unions and the "right to work" and all contractors, or subcontractors, whether residents or non-residents of the Commonwealth of Virginia who perform any work related to the Project shall comply with all of the such provisions.

6.11 Standard of Care**.** Contractor, in performing any Project Services or undertakings under this Contract, shall perform in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing under similar conditions and in similar locations in the electronic toll collection industry.

6.12 Source of Supply and Quality Requirements. Contractor shall not use in performance under this Contract or in procurement of the goods, services and work, any supplier or material person, hereinafter referred to simply as supplier, debarred by VDOT. It shall be the responsibility of Contractor to determine from the Department's listings which suppliers are debarred as of any particular date. Such listings will be posted in the office of the VDOT Engineer, 1401 E. Broad Street, Richmond, Virginia and in each District Office. The Authority will not approve for use any material furnished by a supplier debarred by VDOT. If subsequent to the Effective Date, a previously debarred supplier is reinstated to eligibility, the Authority may approve the use of that supplier hereunder when requested by Contractor and after consideration of all relevant factors.

6.13 Barricades and Warning Signs. Contractor shall comply with VDOT's Virginia Work Area Protection Manual throughout the Project and under this Contract, as

well as comply with the applicable provisions in the Contract Documents concerning maintenance and management of traffic.

6.14 Bucket Truck; Traffic Management. When Contractor is working on the Project site, RMTA will provide to Contractor bucket trucks and traffic management as and to the extent available, and upon Contractor's successful completion of any training or certification required by the Authority.

6.15 Surety and Other Performance Guarantees. Contractor shall provide a performance bond, or, alternatively, letters of credit in equivalent amounts as described below. Upon the occurrence of an Event of Default, as defined in Section 27 below, and without waiving or releasing the Contractor from any obligations, RMTA shall be entitled to make demand upon and enforce any bond, and make demand upon, draw on and enforce and collect any letter of credit, guaranty or other performance security available to RMTA under this Contract with respect to the Event of Default in question. Where access to a bond, letter of credit or other performance security is to satisfy damages owing, RMTA shall be entitled to make demand, draw, enforce, and collect, regardless of whether the Event of Default subsequently is cured. RMTA will apply the proceeds of any such action to the satisfaction of Contractor's obligations under this Contract, including payment of amounts due RMTA. The foregoing does not limit or affect RMTA's right to give notice to or make demand upon and enforce any bond, and make demand upon, draw on and enforce and collect any letter of credit, guaranty, or other performance security, immediately after RMTA is entitled to do so under the bond, letter of credit, guaranty or other performance security.

Contract (Performance) Bonds. Concurrently with the final execution and delivery of this Contract, Contractor shall provide security to RMTA for its obligations hereunder in the form of a guaranty or contract (performance) bond, substantially in the form of **Attachment E-1**, in the amount of $_____. Such bond shall be issued by a surety listed in the U.S. Dept. of the Treasury Listing of Approved Sureties (Treasury Circular 570) and shall remain in full force during the Initial Term of this Contract or until full completion of the Project, whichever is later. Such bond shall serve as additional security for the performance of Contractor's obligations during such period, and in no event shall the existence of any such bond or security or the stated amount thereof be construed to cap, liquidate or otherwise modify or limit the amount of damages payable by Contractor hereunder based on the occurrence of a Contractor event of default or other liability assumed or incurred by Contractor under this Contract.

The contract (performance) bond referenced above shall remain in full force and effect until full completion of the Project and satisfaction of all contractual obligations in connection therewith. At such time and upon delivery by Contractor of a contract (performance) bond to be in effect during the Maintenance Work, as provided below, RMTA will return the initial contract (performance) bond to Contractor.

During the Maintenance Work phases of the Project, Contractor shall provide security to RMTA for its obligations hereunder in the form of a guaranty or contract (performance) bond, substantially in the form of **Attachment E-2**. The initial amount of such bond shall be $_____. Such bond shall be renewable annually, with the amount of such bond declining by 20% each year from its initial amount, effective on the anniversary date of the commencement of the Maintenance Work, with the first 20% reduction commencing on the first such anniversary. Such bond shall be issued by a surety listed in the U.S. Dept. of the Treasury Listing of Approved Sureties (Treasury Circular 570) and shall remain in full force during the renewal term of this Contract or until full completion of the Maintenance Work, whichever is later; provided, however, that Contractor need no longer maintain such bond when the required value amount has declined to zero ($0.00). Such bond shall serve as additional security for the performance of Contractor's obligations during such period, and in no event shall the existence of any such bond or security or the stated amount thereof be construed to cap, liquidate or otherwise modify or limit the amount of damages payable by Contractor hereunder based on the occurrence of a Contractor event of default or other liability assumed or incurred by Contractor under this Contract. Contractor shall provide RMTA with notice of extension or renewal of such bond, or a similar equivalent security, not later than thirty (30) days prior to its termination.

Letter of Credit. Concurrently with the final execution and delivery of this Contract, Contractor shall provide security to RMTA in the form of an irrevocable letter of credit, substantially in the form of **Attachment E-3**, that is payable on demand. This letter of credit will be procured at the expense of the Contractor, naming RMTA as the beneficiary, in the amount of $_____. The letter of credit shall state that the only condition precedent to the issuer's disbursement of all or any portion of the letter of credit proceeds as requested by RMTA shall be the issuer's receipt of a certification from a RMTA representative to the issuer stating that, "RMTA is hereby entitled to make a draw in the amount of $_____ pursuant to the terms of the Contract for Open-Road Tolling Electronic Collection System, dated _____, 2021, between Richmond Metropolitan Transportation Authority and _____.

6.16 Pervasive Defects. Contractor agrees to promptly remedy, at no cost to RMTA any "Pervasive Defect (as defined below). Contractor shall be required to investigate, develop, fix, implement and deploy, at no additional expense to RMTA, all required component or performance improvements to remediate a Pervasive Defect.

"Pervasive Defect" shall mean, as determined by RMTA in the exercise of its reasonable discretion, any defect, condition or combination thereof, in or pertaining to any equipment, component, sub-component or software that is experiencing continued, persistent or repetitive failure or below specification performance such that frequent or recurrent service, replacement or repair is required.

A resolution plan shall be produced by Contractor and submitted to RMTA within seven (7) days of notification of the Pervasive Defect. The plan shall include the investigation results, remediation steps performed to-date, and a plan and schedule to complete resolution of the Pervasive Defect. The status shall be updated and briefed in periodic meetings until complete resolution.

The obligations set forth in this Section shall be in addition to any warranty obligations set forth in this Contract. The provisions of this Section shall survive the expiration or earlier termination of this Contract.

7. **Pricing and Payment**.

7.1 Payment Amounts. Subject to the applicable provisions of this Contract, RMTA hereby agrees to compensate Contractor in accordance with the prices or on the milestone basis set forth in **Attachment D (Price Proposal**).

As to Base Work, such prices or basis will not be subject to any increase after the Authority has issued a Notice to Proceed for the applicable element of the Project and will be considered firm for the duration of the work on the Project.

As to Maintenance Work, prices quoted by Contractor in its Proposal or as set forth in the **Price Proposal (Attachment D),** will not be subject to any increase for the Initial Term. The price for any Renewal Term thereafter shall be adjusted in accordance with the U.S. government's Consumer Price Index ("*CPI")* applicable to the Richmond, Virginia metropolitan area (presently, the United States Department of Labor Bureau of Labor Statistics, Consumer Price Index CPI-U South Urban, or succeeding or replacement index) not exceed more than 3%, regardless of the change in the CPI for the date ninety (90) days prior to the date of commencement of the current Renewal Term (or with respect to pricing for the initial Renewal Term, if any, the date ninety (90) days prior to Project acceptance), and the date ninety (90) days prior to commencement of the succeeding (new) Renewal Term.

Only price changes due to an Authority-approved change order shall be allowed under this Contract. The Authority shall have the right to purchase additional quantities of hardware, software, other network equipment, installation services, testing services, and other Project related services. Contractor grants the Authority the right to make such purchases at any time during the life of this Contract at the prices quoted in its Proposal or as set forth in **Attachment D (Price Proposal)**. The Authority will issue a change order for each such additional purchase. The price of each such purchase(s) shall be equal to that in Contractor's Proposal adjusted for the change in the CPI which occurred between the applicable notice to proceed and the month prior to issuance of the change order, provided however, CPI will not be applied if there is not a current price in this Contract for additional purchase items. Reference is hereby made to **Sections 4.3 through 4.7** for terms, conditions and pricing of optional and additional system work where pricing is not provided or not comprehensive.

All payments made by RMTA to Contractor related to the Project under the Contract Documents shall be used by Contractor solely to pay Contractor's employees, agents, assigns, subcontractors, suppliers and any other labor who provided any part of the Toll Work.

7.2 Payment Schedule. Invoicing for Base Work shall be in accordance with the timely completion of milestones provided under **Attachment D (Price Proposal)**, prior to successful completion of the System Acceptance Test. No payment shall be due and owing to Contractor with respect to any such milestone unless and until Contractor has satisfied all conditions and requirements with respect to such milestone and RMTA has accepted and approved same.

Following successful completion of the System Acceptance Test, invoicing for Maintenance Work shall be based on a fixed monthly fee as provided in **Attachment D (Price Proposal)**.

7.3 Overpayment. In the event an overpayment is made to Contractor under this Contract, Contractor shall immediately refund to RMTA the full amount of any such erroneous payment or overpayment following RMTA's written notice of such erroneous payment or overpayment. If Contractor fails to refund the erroneous payment or overpayment within thirty (30) days after RMTA's demand therefore, RMTA shall be entitled to interest at one (1%) percent per month, compounded, on the amount not repaid from the date of overpayment. If applicable, RMTA may deduct the amount of overpayment from any subsequent payment owed by RMTA to Contractor.

7.4 Withholding Payments. RMTA reserves the right to withhold payment or payments in whole or in part, and to continue to withhold any such payments for services not completed or not completed in accordance with the Contract Documents. Any and all such payment(s) previously withheld shall be released and paid to Contractor promptly when such portion of the Project is subsequently performed in accordance with the requirements of the Contract Documents.

7.5 Payment not Acceptance. Payment or use of the Project or portions thereof by RMTA shall not constitute an acceptance of any services not performed in accordance with the Contract Documents.

7.6 Liquidated Damages/Price Adjustments. If Liquidated Damages or Price Adjustments are assessed against Contractor pursuant to **Section 17 (Liquidated Damages; Price Adjustments)**, RMTA shall deduct the same from any payment owing by RMTA to Contractor subsequent to the time any Liquidated Damages or Price Adjustments are assessed. If final payment has been made to Contractor, then Contractor shall reimburse the assessed amount of unpaid Liquidated Damages or Price Adjustments to RMTA within thirty (30) business days of written demand therefore by RMTA.

7.7 Net 30 Days. RMTA agrees to pay Contractor in accordance with its normal processes and procedures for all undisputed amounts within thirty (30) days of receipt of an undisputed, valid Invoice (defined in **Section 7.8/Invoicing**) and supporting documentation.

7.8 Invoicing. Contractor shall deliver to the attention of RMTA and its designated representatives an itemized invoice (each an "*Invoice*") requesting payment hereunder.

As to Base Work, prior to the successful completion of the Service Acceptance Test (to include any final punch list items and final retainage amounts), Contractor will submit an Invoice, providing an itemized billing, identifying the milestone(s) completed, the status of any on-going work, a detailed account or description of work performed during the time period or milestone period in question to further or complete a milestone. Along with each invoice, Contractor will provide any necessary backup documentation, certifications and test results, as required in the Contract Documents or otherwise reasonably requested by RMTA or its designated representative. An authorized representative of Contractor must sign each Invoice.

As to any Maintenance Work, Contractor will submit an Invoice on or before the fifteenth (15^{th}) day of each month, providing an itemized billing identifying the month thereof and detailing the Maintenance Work provided and such other information as RMTA or its designated representative may reasonably request. An authorized representative of Contractor must sign each Invoice.

As to any equipment procured for the Project under the Contract, Contractor shall not order any hardware, software, or network equipment that will be owned by RMTA at Project Acceptance (including hosted or cloud-based solutions) without prior RMTA approval. RMTA reserves the right to physically inspect equipment prior to invoice payment.

7.9 Invoice Submittals. Contractor shall submit an Invoice not more frequently than monthly, unless RMTA agrees otherwise.

7.10 Right of Set Off. RMTA may retain or set off any amount owed to it by Contractor under this Contract, including as provided in **Section 7.6**.

7.11 Full Compensation. Performance of the Project shall be paid as set forth above, which shall constitute full compensation for all Project related expenses, including, but not limited to: (a) the cost of all insurance, shipping and handling, job site and other overhead, and profit relating to Contractor's performance of its obligations under this Contract; (b) the cost of performance of each and every portion of the Project (including all costs of the Project provided by subcontractors and suppliers); (c) the cost of obtaining all governmental approvals and all costs of compliance

with and maintenance of such governmental approvals; (d) all risk of inflation, currency risk, interest and other costs of funds associated with the progress payment schedule for the Project as provided herein; (e) payment of any taxes, duties, permits, licenses, and other fees and/or royalties imposed with respect to the Project and any equipment, materials, supplies, documentation, labor or services included therein; and (f) any and all travel and expenses related thereto.

7.12 Disputed Invoices. RMTA and its designated representatives will review each Invoice and respond with a written request for additional information or documentation, changes or corrections no later than twenty (20) days of RMTA's receipt of any applicable Invoice. Contractor shall have seven (7) days within which to respond to RMTA's request. Based on RMTA's response, Contractor shall submit a new Invoice ("*New Invoice*") incorporating any changes or corrections made by RMTA, together with any additional requested information or documentation. If RMTA agrees with all requests for compensation in the New Invoice, RMTA will pay the entire sum found due within thirty (30) days of its receipt of the New Invoice. If RMTA disputes any amounts submitted for compensation, RMTA shall pay Contractor amounts not in dispute and notify Contractor within seven (7) days of its receipt of the New Invoice, identifying those items in the New Invoice that RMTA disputes, along with a written explanation of the basis of the dispute. The provisions of **Section 7.7 (Net 30 days)** shall not apply to the provisions of this **Section 7.12** and/or any New Invoice. Under no circumstances whatsoever, shall Project performance or completion of the Project by Contractor be withheld, disrupted or delayed due to non-payment by RMTA pursuant to this **Section 7.12**.

7.13 No Late Fees or Interest. Contractor expressly waives any entitlement to late fees, collection fees, attorney's fees, or other fees incurred by Contractor as it relates to the Project. Contractor expressly waives any entitlement to interest in accordance with Virginia Code § 2.2-4355 and agrees that Contractor is not entitled to interest under the terms of this Contract.

7.14 Contractor Not to Withhold. Contractor may not withhold or disrupt any goods or Project Services to be provided by Contractor hereunder due to non-payment by RMTA hereunder, including pursuant to **Section 7.4** or the default provisions hereof.

7.15 Payments to Subcontractor. Contractor shall:

a. Pay subcontractors within seven (7) days of Contractor's receipt of payment from RMTA for the proportionate share of the payment received for work performed by the subcontractor under the contract; or

b. Notify RMTA and the subcontractor, in writing, of Contractor's intention to withhold payment and the reason. Contractor is obligated to pay the subcontractor interest at the rate of one percent per month (unless otherwise provided under the terms of the contract) on all amounts owed by Contractor

that remain unpaid seven (7) days following receipt of payment from RMTA, except for amounts withheld as stated above. The date of mailing of any payment by U.S. Mail is deemed to be payment to the addressee. These provisions apply to each sub-tier contractor performing under this Contract. Contractor's obligation to pay an interest charge to a subcontractor may not be construed to be an obligation of RMTA.

7.16 Retainage. Except as RMTA may agree otherwise, payments of Invoices for Installation Work shall not include applicable retainage. Retainage in the amount of five percent (5%) of any such invoiced amount shall be withheld by the Authority from each payment that the Authority makes to Contractor under this Contract. Retainage associated with Base Work will be delivered to Contractor after successful completion of the System Acceptance Test and final close-out work for the Base Work, provided that the Authority may withhold at its discretion from the release of the retainage an amount the Authority reasonably determines is necessary to complete or repair any incomplete or non-conforming items at the time of successful completion of the Service Acceptance Test. Payment of the final retainage shall be made in accordance with the provisions of **Sections 7.8** and **7.17.**

7.17 Final Payment. As a prerequisite to the issuance of final payment, Contractor will be required to furnish the Authority with an executed final release of liability (which may be on the Authority's standard form) certifying that all bills, charges and salaries for labor, services, materials and rental of equipment, arising out of the prosecution of work under this Contract have been fully paid or arrangements satisfactory to the Authority therefore have been made and all other just demands and liens relating to the Project fully satisfied or released, as applicable, or arrangements to the Authority therefore have been made, and releasing the Authority and its representatives from all claims, demands and liability of whatsoever nature from anything done or furnished under this Contract, except to the extent only as to such matters for which unresolved claims have been submitted by Contractor in accordance with the provisions of this Contract.

8. **Subcontracting and Assignment**.

8.1 Subcontracting or Assignment. It is the intent of RMTA that Contractor shall perform, within its own organization, contract work amounting to at least fifty-one percent (51%) of the Project, unless RMTA agrees otherwise. Accordingly, other than as specifically specified in the RFP or Contractor's Proposal, Contractor shall not assign, subcontract, delegate, sublet or transfer this Contract or any rights under or interest in this Contract or otherwise dispose of its right, title or interest therein or any part thereof to any person, or otherwise permit anyone other than Contractor's personnel to provide services under this Contract, without obtaining the prior written consent of RMTA, which RMTA may grant, deny or condition in its sole discretion or for any reason. For purposes of this provision, a sale or transfer of the ownership interests or all, or substantially all, of the assets of Contractor (or Contractor's parent company), a merger (by operation of law or otherwise),

consolidation, exchange, a change of control or other business combination involving Contractor or Contractor's parent company shall be deemed an assignment, regardless of whether such transaction results in Contractor (or its parent, as applicable) being the surviving or disappearing corporation. A change of control shall mean if any other person or entity acquires, at a minimum, a fifty percent (50%) direct or indirect ownership interest in, or control over, Contractor and/or Contractor's parent company. Consent by RMTA to any transfer, assignment or subcontract of this Contract shall not be deemed to relieve Contractor of its obligations under this Contract. Any attempted transfer, subcontracting or assignment without such prior written consent shall be void and of no force and effect. Contractor warrants that it shall make timely payments for work performed to any subcontractor or supplier hereunder and Contractor shall indemnify and hold harmless RMTA for any breach of this warranty.

8.2 Subcontractor Assignments and Changes in Control. Contractor shall cause the provisions of Section 8.1 hereof to be set forth, *mutatis mutandis*, in all material subcontracts, or as may be required by RMTA, with the consent rights running in favor of RMTA.

8.3 Contractor Remains Responsible. If Contractor properly subcontracts performance of the Project under this Contract, Contractor shall remain as fully responsible to RMTA for the acts, errors, or omissions of Contractor's subcontractor and/or supplier and of the persons employed by them as Contractor is for the acts and omissions of persons directly employed by Contractor. Contractor shall be obligated to assist RMTA in the enforcement of any rights against Contractor's subcontractor that RMTA has against Contractor. Notwithstanding any subcontract or agreement with any subcontractor or third party, Contractor shall be fully responsible for performance of the Project.

8.4 Failure to Comply. Any assignments or subcontracts made in violation of **Sections 8.1 (Subcontracting or Assignment) and/or 8.2 (Subcontractor Assignments and Changes in Control)** shall be null and void.

9. **Warranties**. In addition to any express or implied warranties provided by law, Contractor hereby expressly represents and warrants:

9.1 Express Warranties.

9.1.1 *Work.* Contractor represents and warrants that all Base Work and all Maintenance Work shall (i) conform to the performance, capabilities, accuracy, completeness, characteristics, specifications, configurations, standards, and functions required by the Contract Documents, and (ii) be performed on time as required in the Contract Documents, and in a workmanlike manner, consistent with the highest level of care and skill exercised by other providers of similar work under similar circumstances at the time the work is performed.

Contractor shall, at its sole cost, repair or replace, at its option, any item of hardware, equipment, support services, software or firmware or any construction item whose non-performance is discovered or which is defective either in material or workmanship and made known to Contractor in writing by the Authority during the Warranty Phase which is one year from the date of "warranty commencement," which is deemed to commence upon Go-Live, revenue collection.

Except as set forth herein or with regard to any express or implied warranties provided by law, the express warranties are the sole and exclusive warranties provided by Contractor, and Contractor specifically disclaims any other warranties, express or implied including but not limited to warranties of merchantability or fitness for a particular purpose, as well as any warranties alleged to have arisen from custom, usage or past dealings between the parties.

9.1.2 *Cooperation*. Contractor represents and warrants that Contractor shall fully cooperate with RMTA, RMTA's other contractors and vendors, and any other governing authority, in performing all Base Work and all Maintenance Work required by the Contract Documents.

9.1.3 *Intellectual Property.* As used in this Contract, "*Intellectual Property*" shall mean any and all works, know-how, inventions, patents, copyrights, models, designs, trademarks, trade dress, trade secrets, discoveries, regulatory filings, or other information (whether or not patentable and whether or not in tangible or intangible form), information and data; formulas, procedures and processes; designs, drawings, sketches and models; computer programs (in both source code and object code); documentation, notes and specifications; derivative developments, improvements and inventions, and any other industrial or proprietary rights, and any documentation relating thereto, and any and all applications for any of the forgoing, whether or not registered or the subject of an application to register with any federal or state government entity as of the Effective Date or at any later date.

9.1.4.1 Contractor represents and warrants that RMTA will have, upon completion of the Base Work and shall additionally receive without restriction thereafter, all necessary assignments or licenses to practice or us any patent, copyright, and any other necessary intellectual property rights to all Base Work furnished by Contractor under this Contract and that all Base Work and Maintenance Work, as a whole and each of its components shall not infringe any third party patent, copyright, trademark, trade secret or other intellectual property right.

9.1.4.2 Contractor represents and warrants that it is the lawful owner or licensee of all software, firmware, hardware, methods, methodologies and any Intellectual Property used in the Base Work and Maintenance Work and Contractor has the right to convey to, or permit RMTA access to or use of, such software, firmware, hardware, methods, methodologies and Intellectual Property;

9.1.4.3 Contractor represents and warrants that RMTA's use of the Intellectual Property for, in, on and in respect of the Base Work and Maintenance Work in accordance with the Contract Documents will not infringe any patent, copyright, trade secret, confidential information, or any other proprietary right or Intellectual Property right of any third party.

9.1.5 *Compliance with Laws, Rules and Regulations*. Contractor represents and warrants that (a) the Base Work and Maintenance Work will not be in violation of any applicable law, rule or regulation, and Contractor will obtain all permits and licenses required to comply with such laws and regulations, (b) Contractor is registered with all applicable state and local authorities and is authorized to perform the Base Work and Maintenance Work in the Commonwealth of Virginia, and (c) Contractor will comply in all respects with all other laws, rules, regulations, ordinances of any governing authority that impact or relate in any way to the Base Work and Maintenance Work.

9.1.6 *Good Title.* Contractor will convey good and marketable title to all goods and services, including but not limited to software and subject to the terms of any applicable software license agreement, provided under this Contract upon RMTA's receipt of such goods and services, and all goods and services shall be delivered to RMTA free from all security interests or other liens or encumbrances. Contractor also agrees to defend RMTA's title against all persons claiming ownership or other interest in the whole or part of any goods and services supplied to RMTA under this Contract;

9.1.7 *Software*. All proprietary or custom software and firmware provided hereunder and any update or revision to any of such software and firmware will be maintained up to date as provided in the Contract Documents and free from defects, and will meet all specifications set forth in this Contract and the Contract Documents. Contractor will, without charge to RMTA, correct any defects and make any fixes, additions, modifications or adjustments to any of such software or any update or revision to such software as may be necessary to keep the software in operating order in accordance with specifications set forth in RFP and this Contract at all times throughout the term of this Contract.

9.1.8 Contractor hereby irrevocably assigns and transfers to RMTA all worldwide

right, title, and interest (including without limitation all copyright, patent, trademark and trade secrets rights) in and to the Intellectual Property created, made, conceived, reduced to practice, or authored by Contractor (including by any employee and permitted subcontractor of Contractor), either solely or jointly with others, pursuant to this Contract or with the use of information, materials, or facilities of RMTA received by Contractor during the term of this Contract (the "*Developed Intellectual Property*"). Except as otherwise provided in Section 9.1.9 hereof, any contribution by Contractor or its employees to the creation of Developed Intellectual Property shall be considered works made for hire by Contractor for RMTA and that such Developed Intellectual Property shall, upon their creation, be owned exclusively by RMTA. To the extent that any Developed Intellectual Property may not be considered works made for hire for RMTA under applicable law, Contractor agrees to assign and, upon their creation, automatically assigns to RMTA the ownership of such Developed Intellectual Property, without the necessity of any further consideration. Upon preparation or receipt of Developed Intellectual Property by RMTA, RMTA shall receive ownership of the property rights (except for copyrights in Pre-Existing Software as defined in **Section 9.1.9** below) in any such Developed Intellectual Property. RMTA may use, reproduce and make derivative works from the Developed Intellectual Property, and Contractor grants RMTA any permissions or licenses to effectuate this grant of permission.

In furtherance of the foregoing, RMTA shall have the sole right to determine the treatment of any Developed Intellectual Property, including the right to keep Developed Intellectual Property as trade secrets, to file and execute patent applications on Developed Intellectual Property, to use and disclose Developed Intellectual Property without prior patent application, to file registrations for copyright or trademark on Developed Intellectual Property in its own name, or to follow any other procedure that RMTA deems appropriate. Contractor shall promptly disclose to RMTA all Intellectual Property created by Contractor or on its behalf (including by any employee and permitted subcontractor of Contractor) during the term of this Contract. Contractor shall cooperate with and assist RMTA to apply for, and to execute or cause to be executed, all documents (including all applications and/or assignments) and perform such acts as may be necessary, useful or convenient to secure for RMTA statutory protection throughout the world for all Developed Intellectual Property assigned to RMTA pursuant to this Section 9.1.8. Contractor represents and warrants that all employees and permitted subcontractors performing Project Services pursuant to this Contract have agreed in writing to assign all Developed Intellectual Property to RMTA as required by this Section 9.1.8.

RMTA hereby grants Contractor a worldwide, nonexclusive, royalty-free license to the Developed Intellectual Property.

When and if, from time to time, Contractor provides RMTA with a revision, enhancement, modification or update to any software that is Developed Intellectual Property, Contractor shall within ten (10) business days thereafter deliver the corresponding updated Source Code to the Software Escrow Agent as provided in Section 15.

"*Source Code*" means a complete copy, expressed in high-level (*i.e.*, human readable; not machine language or object code) computer language, of the software which, when assembled or compiled, becomes the executable object code of the software. Source Code shall include all material including but not limited to design documentation, software documentation, reference manuals and documentation, libraries for the software, and interface software (patch or whole programs), in any form (printed, electronic, or magnetic) and any other information necessary that a reasonably skilled programmer or analyst can understand and maintain the software.

9.1.9 Contractor's software license agreement [in Attachment F] sets forth a list of the "Pre-Existing Software," which shall include Contractor's own software that it owns or has developed as of the date of this Contract that it intends to use in connection with the Project. To the extent that Pre-Existing Software is included in the Project, Contractor grants RMTA (as an exception to the transfer and assignment provided in Section 9.1.8), an irrevocable, nonexclusive, world-wide, royalty-free right and license to use, execute, reproduce, display, perform, and distribute internally copies of, and prepare derivative works based upon, the Pre-Existing Software, and the right to authorize third parties to do any of the foregoing, subject to the terms of this Contract. The foregoing licenses and rights shall be used solely as needed to operate, maintain and support the Project and at any RMTA property or facilities as contemplated pursuant to this Contract. The rights and licenses granted in this Section 9.1.9 shall survive expiration or termination of this Contract.

RMTA's interest in and obligations with respect to any commercial off-the-shelf software ("COTS Software") incorporated into the Project shall be determined in accordance with the standard license terms applicable to such COTS Software; provided, however, that Contractor shall be solely responsible for all costs associated with such software and its licensing.

Contractor shall place all Source Code for Pre-Existing Software used in connection with the Project in the Software Escrow as provided in Section 15. When and if, from time to time, Contractor provides RMTA with a revision, enhancement, modification or update to the Pre-Existing Software in furtherance of this Contract, Contractor shall within ten (10) business days thereafter deliver updated Source Code to the Software Escrow Agent

as provided in Section 15.

9.2 Third Party Warranties. Contractor shall assign to RMTA the manufacturers' or other third party warranties for software, equipment and other hardware furnished to RMTA.

9.3 No Waiver. Neither any provision of this Contract nor any decision of RMTA shall relieve Contractor of responsibility for faulty materials, faulty workmanship, or omission of any software, equipment and other hardware.

9.4 Contractor Duty to Remedy. Contractor shall, within fifteen (15) days of Contractor's receipt of notice of a defective item of Base Work or Maintenance Work, correct, remedy, replace, re-execute, supply omitted or defective software, equipment and other hardware and pay for any damage to other work resulting therefrom, without expense to RMTA and ensure RMTA's receipt of a replacement at a location specified by RMTA. Correction of defective Base Work or Maintenance Work or supplying of omitted Base Work or Maintenance Work whether or not covered by warranty of a manufacturer, subcontractor or supplier of Contractor, remains the primary, direct responsibility of Contractor. Contractor agrees to receive and accept any shipments of defective equipment sent to Contractor by RMTA.

Subject to the warranty set forth in **Section 9.1** hereof, neither approval of work, nor final payment shall relieve Contractor of legal responsibility for faulty materials or workmanship, subject to the warranty provision herein, and Contractor shall promptly remedy any defects due thereto and pay for any damage to other work resulting therefrom, provided that RMTA can reasonably demonstrate that any such defect, damage or work is attributable to Contractor's work.

9.5 RMTA Cure. If Contractor does not remove, make good the deficiency, correct, or remedy defective Base Work or Maintenance Work, or supply any omitted Base Work or Maintenance Work within the time periods set forth under this Contract, then RMTA may, in addition to all other remedies available to RMTA under this Contract, at law or in equity, after ten (10) business days written notice to Contractor, remove the Base Work or Maintenance Work, correct the Base Work or Maintenance Work, remedy the Base Work or Maintenance Work or supply omitted Base Work or Maintenance Work at the expense of Contractor. If RMTA has not yet made payment to Contractor, then RMTA may deduct the cost thereof from any payment then or thereafter due and owing Contractor. If final payment has been made to Contractor, then Contractor shall reimburse the cost to RMTA within five (5) business days of written demand therefore by RMTA. In case of emergency involving health, safety of property, or safety of life, RMTA may proceed at once and without notice to Contractor and Contractor shall remain responsible for the cost thereof.

9.6 Remedies Not Exclusive. The remedies stated in this **Section 9** are in addition to the remedies otherwise available to RMTA, do not exclude such other remedies, and are without prejudice to any other remedies.

10. **Relationship of the Parties**. Each Party, in the performance of this Contract, shall be acting in its individual capacity and not as an agent, employee, partner, joint venturer, or associate of the other Party. The employees, agents, partners or contractors of one Party shall not be deemed or construed to be the employees, agents, partners or contractors of the other Party for any purposes. Neither Party shall assume any liability of any type on behalf of the other Party or any of such other Party's employees, agents, partners or contractors. The parties expressly understand and agree that Contractor is an independent contractor of RMTA in all manner and respects. Contractor shall be solely responsible for all payments to its subcontractors, agents, consultants, suppliers, employees, partners or any other parties with which it does business including, but not limited to, paying all benefits, taxes and insurance, including workmen's compensation insurance, for its employees. Except as RMTA may otherwise specify in writing, Contractor shall have no authority, express or implied, to act on behalf of RMTA in any capacity whatsoever, as an agent or otherwise, and shall have no authority, express or implied, to bind RMTA or its members, agents or employees, to any obligation whatsoever, unless expressly provided in this Contract.

11. **Proprietary Information**. Except as may specifically be set forth in this Contract, ownership of all materials, drawings, manuals, training materials and documentation originated and prepared for the Authority pursuant to the RFP and under this Contract, together with all updates, supplements and amendments thereto, shall belong exclusively to the Authority. Contractor is hereby advised that such material is subject to public inspection and disclosure in accordance with the Virginia Freedom of Information Act.

Trade secrets or proprietary information may not be subject to public disclosure as and to the extent provided under the Virginia Freedom of Information Act, provided that Contractor has properly invoked the protections of Section 2.2-4342.F of the Virginia Public Procurement Act of the Code of Virginia, in writing, either before or at the time the data is submitted or disclosed. The written notice must specifically identify the data or materials to be protected and state the reasons why protection is necessary. The proprietary or trade secret material submitted must be identified by some distinct method such as highlighting or underlining and must indicate only the specific words, figures, or paragraphs that constitute trade secret or proprietary information. The classification of any entire document, line item prices or prices as proprietary or trade secret is not acceptable.

12. **Title and Delivery**.

12.1 Title. Title to the equipment components provided pursuant to this Contract shall pass to the Authority only upon successful completion of the System Acceptance Test, notwithstanding receipt of payment associated with such equipment from the Authority in accordance with **Attachment D (Price Proposal)**. Contractor represents and warrants that it will have absolute and good title to the equipment

components, free and clear of all liens, encumbrances or any claims of any kind whatsoever at the date of the transfer of title and it will transfer same to the Authority. Title acceptance is contingent upon full system acceptance by the Authority, accordingly, in the event the system is not fully accepted by the Authority as contemplated by this Contract, it shall have the right, at is election, to reject title to any or all components comprising all or any part of the system, and thereupon receive a refund in full within ten (10) days of demand thereof, from Contractor for any amounts paid for such rejected items.

12.2 Shipping. Contractor shall confirm receipt of all shipping orders and manifests with the Authority in writing. No terms or conditions, preprinted or otherwise, on Contractor's confirmation or any other documentation supplied by Contractor shall be effective or otherwise govern any transactions between RMTA and Contractor and all such preprinted terms are hereby declared null and void. Contractor shall be responsible for all transportation charges to the FOB Destination Point, Freight Prepaid, with such point being RMTA's designated delivery location(s) specified in each P.O. This point shall also be the point at which RMTA takes title to the delivered equipment in accordance with **Section**s **9.1.6 (Good Title) and 12.1 (Title)**.

12.3 Delivery. All deliveries made must be complete unless otherwise agreed to in writing by RMTA. All packages must contain a packing slip that identifies all items included with the shipment and RMTA's contract, work or purchase order number. Acceptance of the delivery occurs after delivery to the specified location(s) and RMTA or their designated representative inspects the shipment and acknowledges in writing that the contents appear to conform to the Contract Documents. Equipment ordered shall be delivered in accordance with the Project Deliverable Schedule set forth in **Attachment C** and the RFP (unless a shorter time period is included in Contractor's Proposal, in which case such shorter time period shall control). Delivery of equipment, inspection and any acceptance thereof does not constitute system acceptance following completion of System Acceptance Test, the point in which RMTA takes title to the delivered equipment in accordance with Sections 9.1.6 (Good Title) and 12.1 (Title).

12.4 Risk of Loss. Regardless of the FOB point, Contractor shall assume the risk of loss for all equipment until the transfer of Title as contemplated in **Section 12.1**.

12.5 Storage of Material and Equipment. Contractor shall be responsible for proper security of all storage areas under its control and shall take all reasonable precautions and provide protection to prevent damage, injury or loss to the materials and equipment provided for under the Contract.

13. **Support Services.** Contractor understands and agrees that:

13.1 Personnel. Contractor may be required to assign personnel, as needed, who are highly experienced with toll system equipment to positively and actively engage

with the Authority and its third party vendors to answer questions concerning the installation of equipment, to troubleshoot any problem that may arise during the installation of the equipment; and to do all other things necessary, desirable or appropriate to perform the Base Work and Maintenance Work.

13.2 RMTA's Right to Remove. RMTA shall have the absolute right to require Contractor to remove an individual from performing under this Contract for any or no reason. In the event of such removal, Contractor will replace such individual within the time specified by RMTA.

14. **Inspection**. As to the testing or approval of any equipment provided pursuant to this ContractContractor shall give RMTA timely notice in writing of its readiness for inspection and testing, and if the inspection is by any third party other than RMTA, of the date fixed for such inspection. Contractor assumes the responsibility of furnishing all test items in accordance with this Contract. No provisions of this **Section 14** nor any inspection by RMTA, representatives of RMTA, or any other third party shall in any way diminish, relieve, or alter the responsibility and undertaking of Contractor; nor shall the omission of any of the foregoing to discover or to bring to the attention of Contractor the existence of any equipment that is not in accordance with the Contract Documents in any way diminishes, relieves, or alters the obligations of Contractor nor shall the aforesaid omission diminish or alter the rights or remedies of RMTA as set forth in this Contract.

15. **Delivery of Software.** Prior to First Site Installation and Integration Test (FSIIT), (as specified in **Project Deliverable Schedule - Attachment C**), Contractor shall deposit, or cause the deposit of, all System software and its related documentation, Source Code (as defined in Section 9.1.8) and object code ((*i.e.*, machine readable) in a format that is commonly used in the industry in an escrow (the "Software Escrow") with an escrow company designated by Contractor that is engaged in the business of receiving and maintaining escrows of software source code, related documentation and other technology (the "Software Escrow Agent"), subject to the reasonable approval of RMTA. All terms and conditions of such agreement (the "Software Escrow Agreement") shall be a part of, and by this reference are incorporated in, this Contract, and any breach thereof by Contractor shall be a breach of this Contract. Contractor's failure to execute the Software Escrow Agreement and any breach by Contractor of such Software Escrow Agreement shall be deemed a default under Section 27.1.12 hereof. In connection with the foregoing, RMTA shall pay the reasonable charges assessed by the Software Escrow Agent.

Each of the following shall constitute a **"**Release Event**"** for purposes of this Contract and the Software Escrow Agreement:

a. presentation to the Software Escrow Agent of an endorsed file copy of a voluntary petition in bankruptcy naming Contractor as debtor;

b. notification by Contractor to RMTA that the Software Escrow materials, including the Source Code, will no longer be supported, including applications support;

c. Contractor otherwise goes out of business or no longer offers support for the Software Escrow materials, including the Source Code;

d. RMTA presents to the Software Escrow Agent a final, unappealable order of court in an action to which Contractor is a named party allowing access to the Software Escrow materials, including the Source Code; or

e. any proceeding seeking involuntary reorganization, arrangement, bankruptcy, readjustment, liquidation, dissolution, or similar relief as filed against Contractor under any present or future statute, law, or regulation which is admitted or not dismissed within sixty (60) days or if any trustee, receiver or liquidator of all or a substantial part of its business, assets or properties is appointed with or without Contractor's consent or acquiescence in such appointment and is not vacated within sixty (60) days.

In the event that Contractor transfers or assigns its interests in the Software Escrow materials, including the Source Code, to a third party, the aforementioned conditions shall continue to apply to the third party to which the Software Escrow materials, including the Source Code, is transferred or assigned.

16. **Delay and Extensions of Time**. If Contractor is delayed in the progress by any act, failure to act, or neglect of RMTA (including RMTA's contractors, vendors, suppliers or consultants, assuming notification provided to RMTA in accordance with **Sections 6.6 and 13.2**), or by an event listed in **Section 35.3**, then the time of completion set forth in the Schedule shall be extended for such reasonable time as RMTA may decide in its sole discretion after consultation with Contractor, and the associated contract price may be adjusted as RMTA and Contractor mutually agree. No such extension shall be made unless notification is made in writing to RMTA within ten (10) days of the delay, expressly providing the amount of additional time claimed and any request for a change in the associated contract price, which shall be accompanied by full justification to support such requested change.

17. **Liquidated Damages; Price Adjustments**.

17.1 Liquidated Damages. Contractor agrees that liquidated damages shall be imposed by this Contract. The terms below shall in no way be considered exclusive and shall not limit the Authority or Authority's right to pursue any other additional remedy which the Authority may be entitled to pursue.

Contractor shall pay to the Authority liquidated damages as follows:

Requirement	**Associated Liquidated Damages**

Contractor shall successfully complete in accordance with the terms of this Contract the Site Installation and Commission Testing for all material parts of the Base Work by _____	Where Contractor does not successfully complete Site Installation and Commission Testing of all material parts of the Base Work in accordance with the terms of this Contract by _____ Contractor shall _____ for each day of delay or portion thereof [This amount to be completed in accordance with VDOT's 2020 Road and Bridge Specifications]

The total amount of such liquidated damages shall not exceed the total amount authorized by the Notice to Proceed and any Contract Change Orders subsequently approved by the Authority.

17.2 Difficulty of Ascertaining Certain Damages. The amount of liquidated damages as set forth or referenced in **Section 17.1** is fixed and agreed to by and between Contractor and RMTA because both Parties agree and acknowledge the impracticability and extreme difficulty of fixing and ascertaining the true value of the damages which RMTA will sustain by failure of Contractor to meet certain performance criteria, such as loss of revenue, RMTA's being found in breach of third party contracts, service charges, interest charges, harm and inconvenience to the public, delays caused to other activities of RMTA by failure to perform this Contract, and other damages, some of which are indefinite and not susceptible of easy proof, such amounts were actively negotiated between the Parties, and are in each instance agreed by both Parties to be a reasonable estimate of the amount of damages which RMTA will sustain in each instance and such amount shall be deducted from any monies due or that may become due to Contractor. Liquidated damages as specified or referenced in **Section 17.1** will be deducted from any money due Contractor, not as a penalty, but as a reasonable estimate of RMTA's damages; provided however, that due consideration shall be taken of any adjustment of the time for performance granted under the provisions of **Section 16 (Delays and Extension of Time)**.

17.3 Price Adjustments. Contractor is responsible for Contractor's Base Work, the Maintenance Work and the Project meeting all of the requirements set forth in this Contract and the RFP during all phases (including all installation phases, all maintenance phases before successful completion of a System Acceptance Test, and all subsequent maintenance phases) and for the life of this Contract, including the Renewal Term, if any. The Authority intends to focus on the outcomes of these responsibilities using the metrics described in the Service Level Agreements or SLAs below. The Authority has selected SLAs to provide a high confidence in system performance and reflect the minimum tolerable performance expected of Contractor to avoid unnecessary impact to the Authority, the general public, the VDOT customer service center and other third parties, including but not limited to

other electronic toll collection and violations processing vendors. The final amount that the Authority pays to Contractor for Maintenance Work will be based on Contractor's ability to continually meet the SLAs. Price Adjustments shall not be made for events or circumstances attributable to Force Majeure or any other event or circumstance beyond the reasonable control of Contractor.

Appendix E of the RFP identifies the SLAs and the measurement method for each. Contractor shall use commercially reasonable best efforts to minimize the impacts that result from failure to meet each SLA, regardless of whether invoice adjustments are made. Furthermore, Contractor shall take corrective action to immediately remedy any failures and provide a Corrective Action Plan (CAP) to the Authority that documents the corrective action taken to prevent future reoccurrence of the problem associated with the non-compliance. All CAPs shall be subject to the Authority's approval.

17.3.1 SLA Reporting. As part of the monthly invoice for Maintenance Work, Contractor shall provide a SLA compliance report listing areas of compliance and detailing failures that resulted in non-compliance. Regardless of how often a SLA is measured, Contractor shall provide reporting for all SLAs monthly. Contractor shall use SLA measurement and reporting methods developed collaboratively with the Authority to produce this report. All such measurement and reporting methods shall be subject to the Authority's approval.

17.3.2 Non-Compliance Price Adjustments. A price adjustment will be made to the monthly invoice for each month that Contractor fails to comply with Appendix E (Service Level Agreement (SLA) Requirements), and Contractor acknowledges and agrees that the Authority shall have the right to withhold payment of the monthly fee in respect of Maintenance Work for the subsequent month in which the event occurred (without incurring any interest charges) until such time as Contractor corrects or otherwise rectifies the non-compliance as provided herein. The parties acknowledge and agree that damages for such improper performance on the part of Contractor will be difficult to determine and that the amounts specified in Appendix E (Service Level Agreement (SLA) Requirements) have been agreed to by the parties as a reasonable estimate of the Authority's economic loss and will be deducted from any money due the Contractor, not as a penalty, but as a reasonable estimate of the Authority's damages. In all cases, Contractor shall identify the failure condition; take immediate action to remedy the condition; ensure that corrective action is taken to prevent future reoccurrence of the failure condition; and provide comprehensive documentation of all these aspects as part of a corrective action plan.

17.4 No Waiver; Reservation of Rights; Corrective Actions. Permitting Contractor to continue and finish the Project or any part of the Project after the expiration of the time allowed for completion or after any extension of time, shall not operate as a waiver of the rights of RMTA under this **Section 17** or any other provision of the

Contract Documents. Failure to meet a SLA does not relieve Contractor of the requirement to complete all activities associated with the SLA.

Nothing contained in this Section 17 shall be construed as limiting the rights of RMTA to additionally recover from Contractor any or all payments which become due to RMTA for reasons other than untimely performance, such as improper performance, failure to perform or breach of contract in any other respect, including but not limited to defective workmanship, equipment or materials.

18. **Confidentiality**.

18.1 Confidential Information.

The parties acknowledge that in order to perform the Base Work and Maintenance Work called for in this Contract, it may be necessary for RMTA to disclose to Contractor certain proprietary and/or confidential information such as toll data, toll or system records, security schemes or the like (collectively "*Confidential Information*"). Contractor will use any such Confidential Information solely for the Authority's benefit under this Contract. Contractor shall use its best efforts to hold the Confidential Information in strictest confidence and will not disclose at any time, nor permit its officers or employees to disclose at any time (either during their respective employment by Contractor or thereafter), nor appropriate or use on its own behalf or on the behalf of others, any Confidential Information, without in each and every instance first obtaining the Authority's written consent thereto. Contractor shall restrict disclosure solely to those officers and/or employees of Contractor having a need to know and who have executed written confidentiality agreements with Contractor with provisions at least as restrictive as those expressed in this Contract and which provisions clearly include the Confidential Information. Contractor shall not discuss nor disclose Confidential Information to any third Party, including but not limited to the Authority's consultants, contractors or vendors unless allowed to do so in writing by the Authority. Contractor shall not make or permit to be made by its officers and employees, copies, abstracts or summaries of any Confidential Information, including, but not limited to pictures, plans, data, notes and reports embodying any Confidential Information, except as required to perform the Project under this Contract. Upon the Authority's request, Contractor shall either return to the Authority or certify the destruction thereof, the Confidential Information and all such documents or other embodiments of any such Confidential Information.

18.2 Exclusions. Confidential Information shall not include (a) information which was known to Contractor prior to the time of disclosure by the Authority, provided Contractor was not otherwise under obligation of confidentiality at the time of such other disclosure; (b) information that is disclosed to Contractor by a third party without violation of any rights of the Authority or the rights of any third party; (c) information which was publicly available at the time of disclosure by the Authority; and (d) information which becomes publicly available through no fault of

Contractor. Contractor may disclose the Confidential Information if and to the extent that such disclosure is required by law or by court order, provided that Contractor provides the Authority a reasonable opportunity to review the disclosure before it is made and to interpose its own objection to the disclosure.

18.3 Use Restriction. Contractor and its representatives shall use the confidential information solely for the benefit of the Authority in performing the Base Work and Maintenance Work and shall not in any way use the Confidential Information to the detriment of RMTA.

18.4 Length of Confidentiality. Contractor's confidentiality obligations herein shall extend for a period of ten (10) years after the date each disclosure of Confidential Information is first made. However, if a court of competent jurisdiction determines that the maintenance of confidentiality for this period of time is not enforceable, then Contractor shall agree to maintain the confidentiality of the Confidential Information for the greatest amount of time as set forth in an applicable court order. The provisions of this Section 18.4 shall survive the termination of this Contract.

18.5 Return of Confidential Information. Contractor shall return to RMTA any Confidential Information immediately on request but no later than upon the termination for whatever reason of this Contract.

19. **Indemnification**.

19.1 General Indemnification. Contractor hereby agrees to indemnify, protect and save harmless RMTA, and its officers, employees, representatives and members of the board (hereinafter collectively referred to as "*Indemnitees*"), of and from any and all claims, demands, liabilities, losses, costs or expenses for any loss or damage (including but not limited to reasonable attorney's fees and expert's fees) growing out of, or otherwise happening in connection with this Contract, (i) due to any act or omission on the part of Contractor, its agents, employees, Subcontractors, or others working at the direction of Contractor or on its behalf, unless specifically directed in writing by RMTA to perform such act or omission; or (ii) due to any breach of this Contract by Contractor; or (iii) due to the application or violation of any pertinent Federal, State or local law, rule or regulation by Contractor, its agents, employees, subcontractors, or others working at the direction of Contractor or on its behalf. The foregoing shall not apply in the situation giving rise to the claim results solely from the act or omission of the Indemnitees.

This indemnification extends to the successors and assigns of Contractor, and this indemnification and release survives the duration of this Contract, the termination of this Contract and the dissolution or, to the extent allowed by law, the bankruptcy of Contractor.

Without restricting the authority of counsel to RMTA, Contractor shall, at its expense, be entitled to participate to the fullest extent allowed by law and shall have

the duty to participate in the defense of any suit against the Indemnitees. Neither Contractor nor its insurer shall be permitted to settle or compromise any claim, loss or damage asserted against the Indemnitees without the express approval of the Indemnitees, where required.

Any claim by RMTA against Contractor under this Section, other than in warranty, shall be made in writing to Contractor within two (2) years after RMTA has actual knowledge of the event, condition, omission or situation giving rise to such claim. A claim under warranty shall be made within the time specified in the applicable warranty clause.

19.2 Intellectual Property Indemnification. Contractor shall, at its cost and expense, indemnify and hold harmless RMTA from and against any third party claims, allegations or causes of action that any equipment or Project service supplied under the Contract Documents, or RMTA's use of the equipment or Project service pursuant to the terms of the Contract Documents infringes any patent, copyright, trade secret, confidential information, or any other proprietary right or Intellectual Property right of any third party. Contractor shall pay all costs of such defense, settlement, and any penalties, costs, damages and experts' and attorneys' fees awarded by a court or otherwise incurred by RMTA, provided that (a) RMTA promptly notifies Contractor of the claim but RMTA's failure to provide timely notice shall only relieve Contractor from its indemnification obligations if and to the extent such late notice prejudiced the defense or resulted in an actual increase in expense or loss to Contractor, and (b) Contractor notifies and agrees to request RMTA to grant Contractor sole control of the defense and all related settlement negotiations, the Parties agreeing that RMTA is under no obligation to grant such request.

19.2.1 If such claim has occurred, or in Contractor's opinion is likely to occur, RMTA agrees to permit Contractor, at its option, cost and expense, either to procure for RMTA the right to continue using equipment or Project service or to replace or modify the same so that they no longer infringe but meet the Contract Documents.

19.2.2 In case any equipment or Project service is held to constitute an infringement of the patent rights or copyrights or other Intellectual Property rights of a third party and its use is enjoined (temporarily or permanently), Contractor, at Contractor's cost and expense, shall promptly (a) secure for RMTA and RMTA's representatives, agents, and designees the right to continue using the infringing item by suspension or removal of the injunction, or by procuring a perpetual, non-revocable, paid-up, royalty-free, assignable, non-exclusive license(s) to reproduce, publish, or otherwise use for RMTA's direct purposes; or (b) replace the infringing item with a non-infringing substitute that meets or exceeds the requirements of the Contract Documents; or (c) modify the infringing item so that it becomes non-infringing provided the resulting Equipment meets or exceeds

the requirements of the Contract Documents. If the amount of time necessary to proceed with one of these options is deemed excessive by RMTA, RMTA may direct Contractor to select another option or risk default. Nothing in this provision shall be deemed to limit or condition RMTA's rights otherwise set forth in this Contract, including termination. This intellectual property infringement provision shall not apply to any infringement or alleged infringement arising solely from RMTA (a) modifying or altering equipment, except as consented to by Contractor, or (b) using equipment in any way not permitted by the Contract Documents or otherwise as permitted by Contractor, unless such infringement or alleged infringement arose against the equipment wholly independent of the above two exceptions.

19.3 General. Contractor's obligations under this **Section 19** are in addition to Contractor's insurance obligations.

20. **Limitation of Liability**. In no event shall either Contractor or RMTA be liable to the other for any special, indirect, incidental or consequential damages (including, but not limited to lost revenues, loss of transactions, profits, and lost business opportunity), regardless of the legal theory under which such damages are sought, and even if the parties have been advised of the possibility of such damages. Contractor's total liability to RMTA and its officers, employees, representatives, and members of RMTA's board for any and all liabilities arising out of or related to this Contract, from any cause or causes, and regardless of the legal theory, including breach of contract, warranty, negligence, strict liability, statutory liability, or any indemnification obligations, shall not in the aggregate exceed two times the value of this Contract, provided, however, that such limitation shall not be inclusive of any amount assessed against or paid by Contractor for liquidated damages or price adjustments under Section 17.

21. **Insurance**.

21.1 Insurance Certificates. Contractor shall procure the insurance coverages identified below at Contractor's expense and shall furnish RMTA an insurance certificate listing RMTA as the certificate holder and an endorsement listing RMTA as an additional insured. Evidence of insurance coverages shall be provided on the form acceptable to RMTA. The insurance certificate must provide the following:

21.1.1 Name and address of authorized agent
21.1.2 Name and address of insured
21.1.3 Name of insurance company(ies)
21.1.4 Description of policies
21.1.5 Policy Number(s)
21.1.6 Policy Period(s)
21.1.7 Limits of liability
21.1.8 Name and address of RMTA as certificate holder
21.1.9 Project Name and Number
21.1.10 Signature of authorized agent

21.1.11 Telephone number of authorized agent

21.1.12 Mandatory thirty Day notice of cancellation or non-renewal (except ten (10) Days for nonpayment).

21.2 Insurer Qualifications, Insurance Requirements. Each of the insurance coverages required below (i) shall be issued by a company licensed by the Insurance Commissioner to transact the business of insurance in the Commonwealth of Virginia for the applicable line of insurance, and (ii) shall be an insurer (or, for qualified self-insureds or group self-insureds, a specific excess insurer providing statutory limits) with an A.M. Best Policyholders Rating of "A-" or better and with a financial size rating of Class V or larger. Each such policy shall contain the following provisions:

21.2.1 The insurance company agrees that the policy shall not be canceled or allowed to lapse or allowed to expire until thirty (30) days after RMTA has received written notice thereof, or until such time as other insurance coverage providing protection equal to protection called for in this Contract shall have been received, accepted and acknowledged by RMTA. Such notice shall be valid only as to the Project as shall have been designated by Project Number and Name in such notice. Contractor shall provide written notice of any changes to the policy to RMTA within three (3) Business Days of Contractor's receipt of notice of any changes or proposed changes from the insurance company.

21.2.2 The policy shall not be subject to invalidation as to any insured by reason of any act or omission of another insured or any of its officers, employees, agents or other representatives ("*Separation of Insureds*").

21.2.3 All deductibles shall be paid for by Contractor.

21.2.4 Self-insured retention, except for qualified self-insurers or group self-insurers, in any policy shall not exceed $250,000.00.

21.3 Required Insurance Coverages. Contractor also agrees to purchase insurance and have the authorized agent state on the insurance certificate that Contractor has purchased the following types of insurance coverages, consistent with the policies and requirements of applicable Virginia law. The minimum required coverages and liability limits are as follows:

21.3.1 Workers' Compensation Insurance. Contractor agrees to provide at a minimum Workers' Compensation coverage in accordance with statutory limits. A group insurer must submit a certificate of authority from the Insurance Commissioner approving the group insurance plan. A self-insurer must submit a certificate from the Virginia Workers' Compensation Commission stating Contractor qualifies to pay its own workers' compensation claims. Contractor shall require all

subcontractors performing work under this Contract to obtain an insurance certificate showing proof of Workers' Compensation Coverage and shall submit a certificate on the letterhead of Contractor in the following language:

This is to certify that all subcontractors performing work on this Project are covered by their own workers' compensation insurance or are covered by Contractor's workers' compensation insurance.

21.3.2 Employers' Liability Insurance. Contractor shall also maintain Employer's Liability Insurance Coverage with limits of at least:

Coverage	Limits
Bodily Injury by Accident	$1,000,000 each accident; and
Bodily Injury by Disease	$1,000,000 each employee.

Contractor shall require all subcontractors performing work under this Contract to obtain an insurance certificate showing proof of Employers Liability Insurance Coverage and shall submit a certificate on the letterhead of Contractor in the following language:

This is to certify that all subcontractors performing work on this Project are covered by their own Employers Liability Insurance Coverage or are covered by Contractor's Employers Liability Insurance Coverage.

21.3.3 Commercial General Liability Insurance. Contractor shall provide Commercial General Liability Insurance that shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, personal injury liability, contractual liability, blasting and explosion, collapse of structures, and against damage to existing underground and overhead pipes, cables, ducts and other such facilities, whether or not such facilities appear on available plans and whether or not accurately located on such plans.

The CGL policy must include separate aggregate limits per Project and shall provide at a minimum the following limits:

Coverage	Limit
Premises and Operations	$ 1,000,000.00 per Occurrence
Products and Completed Operations	$ 1,000,000.00 per Occurrence
Personal Injury	$ 1,000,000.00 per Occurrence
Contractual	$ 1,000,000.00 per Occurrence
General Aggregate	$ 2,000,000.00 per Project

Additional Requirements for Commercial General Liability Insurance are shown below.

21.3.4 Commercial Business Automobile Liability Insurance. Contractor shall provide Commercial Business Automobile Liability Insurance that shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned, or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than $1,000,000 Combined Single Limits for each occurrence.

21.3.5 Commercial Umbrella Liability Insurance. Contractor shall provide a Commercial Umbrella Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employers' Liability to satisfy the minimum limits set forth herein. The umbrella coverage shall follow form with the Umbrella limits required as follows:

$2,000,000 per Occurrence/$10,000,000 Aggregate

21.3.6 The insurance provided in **Sections 21.3.3, 21.3.4, and 21.3.5** shall also meet the following additional requirements:

21.3.6.1 The policy shall include as additional insureds the officers, members, and employees of RMTA with respect to liability arising out of services performed hereunder.

21.3.6.2 The policy must be on an "occurrence" basis.

21.3.7 Disposition of Insurance Documents. One original certificate of insurance with all endorsements attached must be deposited with RMTA for each insurance policy required.

21.4 Termination of Obligation to Insure. Unless otherwise expressly provided to the contrary, the obligation to insure as provided herein shall not terminate until the expiration or other termination of this Contract.

21.5 Failure of Insurers. Contractor is responsible for any delay resulting from the failure of his insurance carriers to furnish proof of proper coverage in the prescribed form.

21.6 Ongoing Coverage. Contractor is responsible for tracking insurance coverages for itself and its subcontractors, for ensuring that coverages remain in force throughout the duration of this Contract, and for demonstrating to RMTA ongoing compliance with this **Section 21**.

21.7 General. Contractor's obligations under this **Section 21** are in addition to Contractor's obligations under **Section 19 (Indemnification)**.

22. **Non-exclusivity**. This Contract is entered into solely for the convenience of RMTA, and in no way precludes RMTA from obtaining like goods or services from other suppliers. Further, RMTA, at its discretion, may order Base Work or Maintenance Work as it deems necessary as provided herein and in conformity with **Attachment D (Price Proposal)** for any quantity desired. This Contract is an optional-use contract that neither financially binds RMTA nor otherwise obligates RMTA to purchase any Base Work or Maintenance Work hereunder.

23. **Spare Parts**. Contractor shall develop and submit an Initial Spare Stock Listing ("ISSL") to provide an adequate level of spares parts during the implementation and initial Warranty Phase of the Project delivery requirements of the Contract. During the Warranty Phase, the replenishment of all spent spare parts will be done at no cost to the RMTA. If Contractor elects to utilize the initial spares inventory during the Warranty Phase, the Contractor shall be responsible for funding the replenishment of the inventory levels to their original quantities until the completion of the Warranty Phase at no additional cost to RMTA. Contractor shall be responsible for the maintenance of an adequate spare parts inventory during the term of this Contract to maintain the required performance. Contractor's failure to purchase or replenish the spare parts or consumables to levels necessary to meet the performance requirements for the System can constitute an event of default and will not relieve Contractor from meeting all required performance requirements or any associated liquidated or actual damages resulting from the nonperformance.

All of the additional work parts inventory shall be maintained by Contractor free and clear of all liens and encumbrances of any kind whatsoever at locations to be agreed upon between RMTA and Contractor, which shall provide safeguards against theft, damage, or loss of the spare parts. The Authority shall have the right to inspect the additional work parts inventory at any time and shall give Contractor written notice any time RMTA removes any item from the additional work parts inventory.

General. The Contractor shall be responsible for providing all miscellaneous repair parts and materials costing less than $15.00 per item, at its own expense, which shall include, but not be limited to, fuses, touch-up paint, screws and nuts, wire, connectors, cables, labels, and insulating tape, as required, to comply with the requirements of these specifications. Contractor will provide normal shop consumables (e.g., solder, lubricants, cleaning rags, etc.) and spares costing less than $15 per item, excluding toll system consumables (e.g., magnetic media, batteries, receipt printer paper, light bulbs, etc.), at no additional cost to RMTA.

24. **RESERVED**.

25. **Dispute Resolution**. In the event of any dispute whatsoever arising out of or relating to the Contract Documents or the Project, the disputing Party must furnish a written notice to the other Party, setting forth in detail the dispute. Such notice must be addressed to

RMTA's Director of Operations or Contractor's Project Manager, as applicable. Within five (5) Days after the receipt of the notice by the receiving Party, the Director of Operations and the Project Manager shall meet in RMTA's offices to attempt to resolve the dispute. If the Director of Operations and the Project Manager cannot resolve the dispute then, within five (5) Days after the date of written notice by either individual to the CEO of RMTA and Executive Vice President of Contractor, the CEO of RMTA and the Executive Vice President shall meet in RMTA's offices to attempt to resolve the dispute. If the CEO of RMTA and the Executive Vice President cannot resolve the dispute or otherwise agree to extend the time within which to attempt to resolve the dispute, only then may either Party pursue those remedies only as allowed under this Contract.

26. **Adequate Assurances**. If RMTA become insecure about the prospect of Contractor being able to comply with the terms of this Contract or that the completion of the Project as proposed by Contractor under this Contract will not perform as set forth in the Contract Documents, then where there are reasonable grounds for such insecurity, RMTA shall have a right to demand and receive from Contractor adequate assurance of performance. In such an event, Contractor shall respond to RMTA's demand for adequate assurances no later than five (5) business days from Contractor's receipt of RMTA's demand.

27. **Event of Default; Damages/Remedies**.

27.1 Event of Default. The following shall constitute an Event of Default on the part of Contractor:

27.1.1 Contractor withheld, disrupted or delayed Project Services due to non-payment by RMTA, as a result of the procedure set forth in **Section 7.12 (Disputed Invoices)** and the continuance thereof for a period of two (2) business days after notice is given to Contractor by RMTA;

27.1.2 Contractor has failed to deliver the Project or a component thereof on a timely basis, except to the extent of an excusable delay in accordance with **Section 16 (Delays and Extension of Time)** and the continuance thereof for a period of five (5) days after notice is given to Contractor by RMTA;

27.1.3 The Project or any component thereof has failed to meet the criteria set forth in the Contract Documents and the continuance thereof for a period of five (5) days after notice is given to Contractor by RMTA;

27.1.4 Contractor failed to remedy the Project or any component thereof non-compliant with the RFP and/or the terms of the Contract Documents and the continuance thereof for a period of five (5) business days after notice is given to Contractor by RMTA, or the failure to remedy a "Pervasive Defect" in accordance with the resolution plan as provided in Section 6.16 hereof for a period of five (5) business days after notice is given to Contractor by RMTA;

27.1.5 The Project or any component thereof does not meet the requirements isted in the RFP, and the performance measurement will be based upon controlled test vehicles as determined by RMTA in a live lane environment so that the confidence level meets or exceeds the confidence level indicated by the results of the testing required in the RFP, and the continuance thereof for a period of fifteen (15) days after written notice to Contractor;

27.1.6 Contractor has failed to maintain the surety and other performance guarantees, as required by **Section 6.15**, and insurance policies and coverages or fails to provide proof of insurance or copies of insurance policies, as required by **Section 21 (Insurance)** and the continuance thereof for a period of ten (10) business days after notice is given to Contractor by RMTA;

27.1.7 Contractor becomes insolvent, or has assigned the proceeds of this Contract for the benefit of Contractor's creditors (except any assignment of proceeds as collateral for any loan), or Contractor has taken advantage of any insolvency statute or debtor/creditor law or Contractor's property or affairs have voluntarily been put in the hands of a receiver; or any case, proceeding or other action against Contractor is commenced in bankruptcy, or seeking reorganization, liquidation or any relief under any bankruptcy, insolvency, reorganization, liquidation, dissolution or other similar act or law of any jurisdiction, which case, proceeding or other action remains undismissed, undischarged or unbonded for a period of thirty (30) Days;

27.1.8 Contractor failed to provide "adequate assurances" within five (5) business days of RMTA's notice, when, in the opinion of RMTA, reasonable grounds for uncertainty exist or a material adverse change or effect has occurred with respect to Contractor's ability to perform any of its obligations under this Contract;

27.1.9 The suspension or revocation of any license, permit, or registration necessary for the performance of Contractor's obligations under this Contract and the continuance thereof for a period of ten (10) days after notice is given to Contractor by RMTA;

27.1.10 Contractor suspended or failed to proceed with the Project or any component thereof and the continuance thereof for a period of seven (7) days after notice is given to Contractor by RMTA;

27.1.11 Contractor fails to meet the service levels as set forth in Appendix E (Service Level Agreements) in the same category for more than three

(3) consecutive months or more than six (6) times in any rolling twelve (12) month period.

27.1.12 The default in the performance or observance of any of Contractor's other obligations under this Contract or the Contract Documents and the continuance thereof for a period of ten (10) days after notice is given to Contractor by RMTA;

27.1.13 Contractor shall have made any material misrepresentation or omission in any written materials furnished in connection with any of the Contract Documents, including but not limited to its Proposal, acceptance of or agreement with RFP or contract requirements, best and final offer, or its performance hereunder.

27.2 RMTA Damages/Remedies. Upon the occurrence of an Event of Default, RMTA may, in addition to and without prejudice to all other contractual remedies and/or remedies allowed at law or in equity, proceed to take any or all of the following actions:

27.2.1 Withhold any money then due and/or thereafter due to Contractor;

27.2.2 Perform or cause to be performed for the account of Contractor any contractual covenant in the performance of which Contractor is in default or make any payment for which Contractor is in default. Contractor shall pay to RMTA upon demand any amount paid or incurred by RMTA in the performance of such covenant. Any amounts which have been paid or incurred by reason of failure of Contractor to comply with any covenant or provision of this Contract shall bear interest at the Default Rate, which shall be defined as the Prime Rate plus five (5) percent (but in no case higher than the highest rate permitted by law) from the date of payment by RMTA until such amount is fully paid by Contractor;

27.2.3 RMTA shall have the right to immediately find Contractor in default and/or take any other action contemplated in **Section 29.2 (Transition)**, and/or procure Project Services from third parties and charge Contractor for and Contractor shall be liable to RMTA for the expense of such procurement, Project services, and any other costs and expenses incurred by RMTA as a result of the termination; and

27.2.4 Obtain the Project Services or a portion thereof, from a third party under substantially similar terms of this Contract, and recover from Contractor all additional costs and expenses paid or incurred by RMTA as a result of the Event of Default, plus all additional costs paid or incurred by

RMTA to obtain the replacement of Project Services as set forth in this Section.

27.2.5 Exercise any other rights and remedies available to RMTA under this Contract, including the attachments hereto, or the Contract Documents, or available to RMTA at law or in equity, based on any applicable theory, including but not limited to the exercise of any rights as an intended third party beneficiary and the recovery of any and all damages of any kind to the extent provided or permitted by applicable law.

28. **Cover**. If Contractor fails to timely perform any or all of its obligations under this Contract, RMTA may, in addition to all other contractual, legal or equitable remedies proceed to take either or both of the following actions after five days written notice to Contractor:

28.1 Withhold Payment. Withhold any money then due and/or thereafter due to Contractor; and

28.2 Replacements. Obtain replacements identical or substantially similar to the base and/or Maintenance Work and support services, or a portion of either thereof, under substantially similar terms of this Contract, from a third party, and recover from Contractor all additional costs and expenses paid or incurred by RMTA as a direct result of Contractor's failure to perform under this Contract, plus all additional costs paid or incurred by RMTA to obtain the replacements as set forth in this **Section 28.2**.

29. **Cooperation, Transition of Equipment, and End of Contract Responsibilities**.

29.1 Cooperation. In the event that RMTA enters into any agreement at any time with any other vendor(s) for additional work related to the Project, Contractor agrees to cooperate fully with such other vendors in order to facilitate the performance of work and/or provision of deliverables by such other vendors and to refrain from any activity which would interfere with performance of work and/or provision of deliverables by such other vendor.

29.2 Transition. Upon expiration or earlier termination of this Contract or any Project Services provided hereunder, Contractor shall accomplish a complete transition of the Project from Contractor to RMTA, or to any replacement provider designated by RMTA, without any interruption of, or adverse impact on the Project or any other work provided by third parties. Contractor shall cooperate fully with RMTA or such replacement provider and promptly take all reasonable steps required to assist in effecting a complete transition. All Equipment related to such transition shall be performed at no additional cost beyond what would be paid for the Project hereunder.

29.3 End of Contract. Contractor shall perform the end of Contract responsibilities as specified in the Contract Documents or as otherwise specified by RMTA upon the expiration or earlier termination of this Contract.

29.4 Contractor Obligations. Contractor shall, without limiting its obligations pursuant to any other clause or condition in this Contract:

(i) subject to the terms of any third-party contracts, procure at no charge to RMTA any third-party authorizations necessary to grant RMTA the use and benefit of any third-party contracts between Contractor and third-party contractors used to provide Project Services, pending their assignment to RMTA.

(ii) convey to RMTA all RMTA assets needed for system maintenance in Contractor's possession. If applicable, at the election of RMTA, Contractor shall convey to RMTA from among those assets then held by Contractor for the provision of Project Services to RMTA such assets as RMTA may select, at a price consisting of the net book value. Contractor shall promptly remove from RMTA premises any Contractor asset that RMTA, or its designee, chooses not to purchase.

(iii) at its expense, shall convey or assign to RMTA or its designee such leases, licenses and other contracts used by Contractor, RMTA, or any other person in connection with the Project , as RMTA may select. Contractor's obligation described herein, shall include Contractor's performance of all obligations under such leases, licenses and other contracts to be performed by it with respect to periods prior to the date of conveyance or assignment and Contractor shall indemnity, defend and hold harmless RMTA for any losses or liability resulting from any claim that Contractor did not perform any such obligations.

(iv) deliver to RMTA or its designee, at RMTA's request, all documentation and data related to RMTA, including RMTA's data, held by Contractor, and upon approval by RMTA, Contractor shall destroy all copies thereof not turned over to RMTA, all at no charge to RMTA. Notwithstanding the foregoing, Contractor may retain one (1) copy of the documentation and data, excluding RMTA data, for archival purposes or warranty support.

29.5 Failure to Comply. The Parties acknowledge and understand that Contractor's failure to comply with the terms and conditions as stated hereinabove shall adversely affect RMTA and result in monetary loss to RMTA. RMTA shall assess, audit, and certify to Contractor monetary losses resulting from Contractor's failure to comply with the provisions of this **Section 29**. RMTA's determination as to the amount of the monetary loss suffered shall be conclusive and Contractor shall compensate RMTA for such loss within thirty (30) days of such a determination.

30. **Termination**.

30.1 Termination for Cause. Upon an Event of Default, RMTA may, in its sole discretion, terminate this Contract in whole or in part. Termination shall take effect on the date set forth in RMTA's notice to Contractor. Upon such termination, RMTA will have the right to appropriate or use any or all materials as RMTA determines. Upon such termination RMTA shall not be required to pay Contractor any amounts for Project Services performed prior to the date of termination for which payment may be due and owing but not yet paid ("*Remaining Payment*"). In the event RMTA's expenses incurred or anticipated to be incurred as a result of Contractor's breach are less than the Remaining Payment, RMTA shall remit such differential to Contractor. In the event RMTA's expenses incurred or anticipated to be incurred as a result of Contractor's breach exceed the Remaining Payment, including any costs of RMTA incurred by any delay (or from any reason attributable to the delay, including the payment of any penalties by RMTA to any third party under separate agreement) then Contractor shall within five (5) days written notice from RMTA, make payment of the differential to RMTA. In addition to the rights and remedies in this **Section 30.1**, RMTA shall have all other rights and remedies against Contractor which are available at law or in equity. Contractor acknowledges that the remedy set forth in this **Section 30.1** is Contractor's sole and exclusive remedy against RMTA for termination for cause and Contractor hereby waives all other rights and remedies it may have against RMTA under the Contract Documents, at law or in equity.

30.2 Termination for Convenience. RMTA may terminate this Contract upon sixty (60) calendar days written notice, which shall commence upon the date of such notice. In the event of a termination for convenience, RMTA shall only pay Contractor for Project Services performed through the termination date. As used in the previous sentence, "performed" shall mean work that has been approved for payment, including with respect to any milestone basis for payment. RMTA shall not be responsible for any other costs, fees and expenses of any nature whatsoever, including but not limited to administrative fees, legal fees, costs to set up or shut down operations at the project site, salary, or any other cost or expense, whether direct or indirect, whether foreseen or unforeseen. Contractor acknowledges that the remedy set forth in this **Section 30.2** is Contractor's sole and exclusive remedy against RMTA for termination for convenience and Contractor hereby waives all other rights and remedies it may have against RMTA under the Contract Documents, at law or in equity.

31. **Conflicts of Interest**. Contractor represents and warrants that it, its principals, its employees, and all others in close association with it, have no conflict of interest or of time, directly or indirectly, that would prevent timely performance of Project Services in a manner that is free of appearance or fact of impropriety. Contractor promises to allow no such conflict to arise and promises to disclose such a conflict in the event that, nevertheless, one develops.

32. **Records Retention and Audit Rights**. Contractor shall, and shall cause each of its subcontractors to, maintain accurate books, records, documents and other evidence concerning Contractor's performance of the Project under this Contract (hereinafter referred to as the "*Records*"). Contractor agrees to make available, at all reasonable times during which this Contract is in effect the Records for inspection or audit by any authorized representative of RMTA. Within no more than five (5) Days after the termination of this Contract for any reason, copies of all Records shall be given by Contractor to RMTA. Records that relate to appeals, litigation, or the settlements of claims arising out of the performance of this Contract, or costs and expenses of any such agreement as to which exception has been taken by RMTA shall be retained by Contractor until such appeals, litigation, claims or exceptions have been disposed.

In addition to audit obligations as set forth in the RFP Contractor shall, and shall cause each of its subcontractors, agents and assigns to, maintain accurate books, records, documents and other evidence concerning Contractor's performance of the Project under this Contract (hereinafter referred to as the "*Records*"). Records shall include all information, communications and data, whether in writing or stored on a computer, computer disks, microfilm, writings, working papers, drafts, computer printouts, notes, charts or any other data compilations, books of account, photographs, videotapes and audiotapes supporting documents, any other papers or preserved data in whatever form, related to this Contract or Contractor's performance of the Project determined necessary or desirable by RMTA for any purpose. Contractor agrees to make available, at all reasonable times, the Records for inspection or audit by any authorized representative of RMTA. Within no more than five (5) days after the termination of this Contract for any reason, copies of all Records shall be given by Contractor to RMTA. Records that relate to appeals, litigation, or the settlements of claims arising out of the performance of this Contract, or costs and expenses of any such agreement as to which exception has been taken by the Commonwealth Auditor or any of his or her duly authorized representatives, shall be retained by Contractor until such appeals, litigation, claims or exceptions have been disposed.

Notwithstanding the foregoing paragraphs in this Section 32, any such audit and examination of Records is limited to Project Services under this Contract. Ownership in terms of work for hire under this Contract will not apply to Contractor proprietary and confidential information incidental to contract management and administration, and are not deemed deliverables or work for hire under this Contract.

33. **Attachments.** The following Attachments are incorporated by reference into and made a part of the Contract Documents:

Attachment A - Request for Proposals (and addenda thereto)
Attachment B - Contractor's Proposal

The following Attachments are attached hereto and incorporated into the Contract Documents:

Attachment C – Project Deliverable Schedule
Attachment D – Price Proposal
Attachment E – Form of Contract Bonds
Attachment F – Contractor's Software License Agreement (if applicable)

34. **Cooperative Purchasing**. As provided in the RFP and pursuant to Va. Code § 2.2-4304, Contractor agrees that, upon RMTA's written approval, other tolling entities in the Commonwealth, including but not limited to public and private members of the Virginia Toll Facilities group that operate toll roads in the Commonwealth of Virginia and other third parties (individually, "*Third Party*" and collectively, "*Third Parties*") may purchase or contract for any Project service under this Contract. In such a case, Contractor shall look solely to the Third Party placing such order for all obligations and liabilities due to Contractor under the Contract Documents for such purchase. By way of example and not limitation, RMTA shall have no liability whatsoever to Contractor for payment for such ordered service. The specific pricing, contract terms and conditions and the like shall be as mutually agreed upon between Contractor and any such Third Party, based upon the scope, timing, and other factors related to any contemplated transaction.

35. **Miscellaneous Provisions**.

35.1. Compliance with Laws. Contractor shall perform its obligations hereunder in accordance with all applicable federal, state, and local government laws, rules, regulations, orders and approvals including, but not limited, to procedures and requirements relating to labor standards, equal employment opportunity, nondiscrimination, compliance with the Americans with Disabilities Act, anti-solicitation, and auditing and reporting provisions, now or hereafter in effect, and any rules required by any federal grant funding payment by RMTA. Any changes to applicable laws, rules, or regulations that are enacted after contract award may be the subject of a Change Order only if a change to applicable laws, rules, or regulations results in an actual and direct increase in cost to Contractor to comply with such changes. In such an event, the increased cost shall reflect the unit prices set forth in Contractor's Proposal, and if a unit price is not included in Contractor's Proposal, then the Change Order shall reflect an increase in price of Contractor's actual cost plus a markup as RMTA may reasonably approve.

35.2 Parties Bound. This Contract will bind the respective heirs, executors, administrators, legal representatives, successors, and assigns of each Party.

35.3 Time of the Essence; Force Majeure. Time is of the Essence in the performance of this Contract. However, neither Party shall be liable to the other Party for any delay or failure of performance due to fire, act of war, hostile foreign action, nuclear explosion, riot, strikes or failures or refusals to perform under subcontracts, civil insurrection, earthquake, hurricane, tornado, or other catastrophic natural event or

act of God (collectively, "*Force Majeure*"). Contractor's exclusive remedies for Force Majeure events are set forth in **Section 16 (Delays and Extension of Time)**.

35.4 Reserved.

35.5 Federal Intellectual Property Bankruptcy Protection Act. RMTA shall be entitled to all rights and benefits of the Federal Intellectual Property Bankruptcy Protection Act, Public Law 100-506, codified at 11 § U.S.C. 355(n) and any amendments thereto.

35.6 Governing Law. This Contract is a Virginia agreement made under the laws of the Commonwealth. It will be enforced according to Virginia law without regard to its conflict of laws rules or any other rules directing referral to foreign law or forums. Any action related to this Contract in any way shall be brought exclusively in the Circuit Court of the City of Richmond, Virginia, or the Federal District Court of the Eastern District of Virginia, Richmond Division, and each Party hereby consents to the jurisdiction and venue of such courts and the appropriate appellate courts therefrom in any such action and irrevocably waives, to the fullest extent permitted by law, any objection that it may now or hereafter have to the personal jurisdiction and venue of such court and to any claim of inconvenient forum. Each Party hereby agrees to execute an acknowledgment of service of process at the request of the other Party in any litigation related to this agreement. In the event that a Party does not provide an acknowledgment of service as agreed, each Party consents to service of process at that Party's address set forth in **Section 35.7 (Notices)**.

35.7 Notices. All notices, notifications, Approvals, Acceptances, requests, permission, waivers or other communications (excluding invoices that will be handled as set forth in **Section 7 (Payment Terms)** hereunder shall be in writing and transmitted via hand delivery, overnight courier, or certified mail to the Parties at the respective addresses set forth below. Invoices may also be sent by U.S. Mail, postage prepaid. Notices will be deemed to have been given when received, unless otherwise noted in this Contract. If a Party refuses to accept delivery or fails to take delivery, notice shall be deemed given on the day delivery is first attempted. Notice may also be given by email, provided a hard copy of the notice is also transmitted via hand delivery, overnight courier, or certified mail to the Parties at the respective addresses set forth below.

For RMTA:

901East Byrd Street, Suite 1120
Richmond, Virginia 23219
Attention: Chief Executive Officer

For Contractor:

35.8 Compliance with Laws; Taxes. Contractor will pay all taxes lawfully imposed upon it that may arise with respect to this Contract.

35.9 Publicity. Contractor shall not communicate with the media or press concerning this Contract or the Project, or issue a press release or otherwise publicize the Project or this Contract without the prior written permission of the Authority.

35.10 Reserved.

35.11 Remedies Cumulative. The rights and remedies of RMTA under this Contract are cumulative of one another and with those otherwise provided by law or in equity.

35.12 Waiver and Severability. The waiver by RMTA of a breach of any provision of this Contract shall not be deemed to be a waiver of such provision on any subsequent breach of the same or any other provision of this Contract. Any such waiver must be in writing in order to be effective, and no such waiver shall establish a course of performance between the Parties contradictory to the terms hereof. All provisions of this Contract are severable, and the unenforceability or invalidity of any of the provisions will not affect the validity or enforceability of the remaining provisions. The remaining provisions will be construed so as to carry out the full intention of the Parties.

35.13 No Third Party Beneficiaries. It is specifically agreed between the parties executing the Contract that it is not intended by any of the provisions of any part of the Contract to create in the public or any member thereof, a third party beneficiary hereunder, or to authorize anyone not a party to the Contract to maintain a suit for personal injuries or property damage or other cause of action pursuant to the terms or provisions of the Contract

Nothing contained in the Contract Documents shall be construed as conferring upon or giving to any person, other than the Parties hereto, any rights or benefits under or by reason of this Contract.

35.14 Interpretation.

35.14.1 The captions in this Contract are solely for convenience, and will not affect the interpretation of any terms of this Contract.

35.14.2 Wherever the word "*including"* "*includes"* or "*include"* is used in this Contract, it shall be deemed to be followed by the words "*without limitation*."

35.14.3 The appropriate reasonable and professional standards as *"in the opinion of*" or "*satisfaction of*" or "*in the judgment of*" mean "the generally accepted practices in the toll systems industry," and that

RMTA's approval or acceptance of such practices and the items supplied and work performed hereunder shall not be unreasonably withheld, hindered, or delayed, or require performance beyond the specifications and scope of work.

35.14.4 Any provision or statement containing the words "*must*", "*shall*", or "*will*" is and shall be interpreted by the Parties as mandatory.

35.15 Counterparts. The Parties may execute this Contract in counterparts.

35.16 Construction of Contract. In the event this Contract must be interpreted by a court of competent jurisdiction as defined in **Section 35.6 (Governing Law)**, the Parties expressly agree that this is a negotiated contract that will not be construed against one Party over the other because such Party drafted this Contract.

35.17 Survival. In addition to those provisions, which by their terms would naturally survive termination of this Contract, **Sections 7 (Payment Terms), 9 (Warranties), 12.4 (Risk of Loss), 15 (Delivery of Software), 27 (Liquidated Damages), 18 (Confidentiality), 19 (Indemnification), 20 (Limitation of Liability of RMTA), 21 (Insurance), 27 (Event of Default; Damages/Remedies), 28 (Cover), 29 (Cooperation, Transition of Project and End of Contract Responsibilities), 30 (Termination), 31 (Conflicts of Interest), 32 (Records Retention and Audit Rights,** and **35 (Miscellaneous Provisions** shall survive the termination for whatever reason of this Contract.

35.18 Non-exclusivity. This Contract is entered into solely for the convenience of RMTA, and in no way precludes RMTA from obtaining like goods or services from other vendors at RMTA's sole discretion.

35.19 Entire Contract; Amendment. This Contract contains the entire agreement between the Parties with respect to its subject matter and supersedes all other prior and contemporaneous contracts and understandings between the Parties, whether oral or written. RMTA shall not be bound by any terms and conditions included in any packaging, Invoice, catalog, brochure, technical data sheet, or other document prepared by Contractor which attempts to impose any condition in variance with or in addition to the terms and conditions contained herein, and any such terms and conditions shall be automatically null and void. No amendment to this Contract shall be valid unless made in writing and signed by both Parties.

IN WITNESS WHEREOF, the parties have caused this Contract to be executed effective as of the day and year first above mentioned.

RICHMOND METROPOLITAN TRANSPORTATION AUTHORITY, a political subdivision of the Commonwealth of Virginia

By:_____
Chief Executive Officer

TRANSCORE, LP, a Delaware limited partnership

By:_____

Its:_____

ATTACHMENT A

REQUEST FOR PROPOSALS

[INCORPORATED BY REFERENCE]

ATTACHMENT B

CONTRACTOR'S PROPOSAL

[INCORPORATED BY REFERENCE;
INCLUDES BEST AND FINAL OFFER]

ATTACHMENT C

PROJECT DELIVERABLE SCHEDULE

[To come]

ATTACHMENT D

PRICE PROPOSAL

[To come]

ATTACHMENT E

FORM OF BOND(S)

[To come]

ATTACHMENT F

CONTRACTOR'S SOFTWARE LICENSE AGREEMENT (IF APPLICABLE)

[To come]

Appendix E
Service Level Agreements

Electronic Toll Collection System RFP

CONTENTS

1 General Provisions

The Contract obligates TSI to meet certain defined levels of performance in the execution of the Scope of Work. This Appendix which includes the SLA table, attached hereto, and incorporated herein, describes the minimum accuracy, availability, and performance requirements TSI provided System(s) must meet. TSI is responsible for demonstrating that the performance requirements of the RFP and as otherwise described herein can be met or exceeded prior to System Acceptance. The measurement of these SLAs shall be automated where possible and shall be straightforward and data-driven, as agreed to between TSI and RMTA. The performance requirements are intended to be consistent with the written requirements of the Contract documents.

TSI shall develop reports that compare actual results to the requirements as defined in this Appendix and shall submit these reports to RMTA within 15 business days of each month end. The methods and results of the measurement process shall be fully subject to independent audit and shall be utilized by TSI to trigger timely action to correct any deficiencies and failures to meet required availability, accuracy, and performance requirements.

Actual performance shall be defined and measured against the requirements and time periods in the SLA table to assess the availability, accuracy, and performance of the delivered System. This Appendix addresses requirements for the following major levels of service:

1. Availability
2. Accuracy
3. System Performance
4. Maintenance (Response/Repair timing)

The sections below provide general conditions which apply to the SLAs described herein. Should a specific SLA section define terms or conditions which appear contrary to these general provisos, the terms or conditions within the specific SLA section take precedence.

1.1 System Availability Requisites

1. The Total Expected Operations hours included within the availability calculation does not include planned System outages. A planned or scheduled outage activity occurs from preventive maintenance and is scheduled and approved by RMTA ahead of the activity.
2. For purposes of measuring System response times “during or near peak System load” times, RMTA defines peak System load times to be those times when the overall System (the TFH) is experiencing high processor, memory, and disk I/O utilization. This is not necessarily peak traffic time.
3. The availability calculation will not include downtime during any period when RMTA does not allow TSI to close a lane or otherwise work along the roadway unless such failure to approve is the result of TSI not following the RMTA procedures in making the request.

1.1.1 Chargeable and Non-Chargeable Failures

For purposes of calculating availability and for maintenance performance (response & repair times) chargeable and non-chargeable failures are defined as follows:

Chargeable Failures

Chargeable failures include any failures that are not specifically identified as non-chargeable below, including but not limited to:

1. A malfunction which prevents the ORT ETCS hardware or software from performing its designated function, when used and operated under its intended operational and environmental conditions as detailed in the Scope of Work.
2. A malfunction that poses a threat to the safety of the ORT ETCS components, customers, employees, or others.
3.
4. Any failure of equipment or software that allows revenue loss to occur on the ORT ETCS that is not already accounted for as a separate performance failure.
5. Major software anomalies and bugs that affect the performance and operation of the ORT ETCS.
6. Shutdown or unavailability of a Toll Zone or TFH unless specifically directed.
7. Failure to properly transmit a transaction record with all required data elements from a Toll Zone location to the TFH.
8. Loss of data either at the lane or TFH including failure to meet data retention requirements.
9. Failure to electronically send or receive transaction information.
10. Failure to generate the reports required to operate, reconcile, and audit the System.

Non-Chargeable Failures

1. Force majeure, as defined in the Contract.
2. Vandalism.
3. System component failures caused by environmental or operating conditions outside of the design standards of the equipment.
4. Failures that are customer or user induced.

1.1.2 Stop Clock Conditions

TSI may be excused from its obligation to meet the performance and service level requirements set forth herein under certain conditions that shall be referred to as “Stop Clock Conditions.” Only the time during which such conditions are present shall be excluded from the timeframes used to measure TSI’s performance as set forth below:

TSI will exclude from its availability calculations the time arising from any of the following “Stop Clock Conditions”:

1. The following RMTA contact/access problems, provided that TSI makes reasonable efforts to contact the RMTA Director of Operations or designee immediately upon the commencement of the Stop Clock period:
    a. Access necessary to correct the problem at a RMTA owned site is not available because access is improperly denied or not arranged by the site contact or RMTA representative, provided that TSI properly scheduled the visit or access beforehand if advance notice was required.
    b. Construction activities that prevent TSI from performing previously scheduled maintenance or repair of in-lane equipment or Systems.

c. Incorrect site contact information which prevents access, provided that TSI takes reasonable steps to immediately notify RTMA of the improper contact information and takes reasonable steps to obtain the correct information.

   If it is determined later that the cause of the problem was not the fault or responsibility of RMTA; or in the event of denied access, if the reason was determined to be proper, then the Stop Clock Condition shall not apply.

2. Routine Scheduled Maintenance provided such schedule was provided to and approved by RMTA in advance and in writing; provided however, that in no event shall the Stop Clock Condition time be extended beyond the standard routine scheduled maintenance period.
3. Force majeure events.

Notwithstanding any other provision of the Contract Documents to the contrary, Stop Clock Conditions do not apply to:

1. TSI's response time performance requirements as set forth in the RFP generally and this Appendix specifically.
2. Testing or maintenance initiated by TSI outside of routine scheduled maintenance windows.
3. Power fluctuations caused by electrical utility providers, common carriers, TSI, TSI affiliates, subsidiaries, data services providers, or subcontractors.
4. Time period during which RMTA has made reasonable efforts to notify TSI's Project Manager of a problem, but TSI's Project Manager was unavailable or unreachable.
5. Failure of TSI to provide adequate facilities (including cabinets, sunshields, etc.) to ensure delivery of the contracted services will not be considered a valid Stop Clock Condition to the extent such failure of TSI contributed to the Stop Clock Condition.
6. Any other reason or cause not expressly listed in above.
7. If TSI asserts force majeure or failure of RMTA provided equipment as an excuse to performance, TSI shall have the burden of proving:
   a. sole proximate cause to RMTA satisfaction
   b. that TSI took reasonable steps to minimize the delay and damages caused by events when known or should have been known
   c. that TSI timely notified RMTA of the actual occurrence which is claimed as grounds for a defense under this clause (if any)

1.2 Maintenance Service Level Requirements (Response & Repair Times)

TSI shall provide sufficient personnel, tools, and other necessary resources to meet the service level requirements defined in the SLA table. Maintenance response time shall be measured as beginning from the time when TSI receives notification of the maintenance event or failure and ending when the maintenance technician arrives at the site of the problem or acknowledges the associated alarm or alert in the MOMS application.

Repair time shall be measured from the time when the technician arrives at the site or when the technician acknowledges the failure, to the time when the failure condition is corrected, and the System is returned to normal operation. If access to the equipment in question is denied to TSI based on RMTA policy, the repair time shall be measured beginning when RMTA has allowed TSI access to the equipment.

Both the response time and the repair time shall be registered in the MOMS. Failure to meet the required response and repair times shall be monitored through MOMS reports and provided within the monthly report.

1.3 SLA Stipulations

1. For any SLA that includes the collection of data at predetermined locations/intervals, if there is a pre-existing maintenance event that impacts the validity of the data, then collection of data will be rescheduled for a later time within the measurement period when the maintenance event is completed. This would be a maintenance event that was already in progress prior to the collection of data at the predetermined location and the specified interval of collection.
2. In cases where an SLA measures availability of a redundant subsystem/component (e.g., a Zone Controller or host or workstation with redundant network connections, others to be determined in design), failure of an individual redundant element does not constitute a failure of the subject subsystem/component, assuming its required functionality is preserved.

1.3.1 Single Event Causing Cumulative Liquidated Damages

If TSI can prove to the reasonable satisfaction of RMTA that a single event causes TSI to fail to meet more than one SLA, cumulative Liquidated Damages shall not be imposed, but instead the highest applicable Liquidated Damages relative to such occurrence shall apply. By way of example and not limitation, if the Zone Controller goes down affecting multiple devices such as the reader and the Violation Enforcement System (VES), TSI shall include the outage time as part of the calculation for the availability, accuracy, and System performance of the Zone Controller but will be subject only to highest Liquidated Damages. If TSI fails to repair the outage according to the service levels set forth in this Appendix, then TSI shall be responsible for Liquidated Damages resulting from not meeting the repair time service levels in addition to the highest Liquidated Damages assessed for the availability, accuracy, or System performance.

1.4 TSI Obligations

1. System availability is captured within the MOMS application. Within the work order management procedures, TSI is responsible for documenting specific timestamps during the various stages of problem resolution. Within the MOMS work orders, the elapsed time between problem detection/reported time and problem repair/complete time is the actual downtime variable within the availability calculation.
2. Since TSI will be responsible to accurately capture this information within their MOMS solution, they will provide reports of all System availability exceptions to RMTA monthly.
3. During the ORT ETCS Design Phase and testing planning, TSI may define methods and reports that provide an efficient and/or precise means of measuring and reporting on these SLAs. Examples may include test instrumentation such as Automatic Vehicle Location Systems or automated performance reporting using verified reference vehicle characteristics. TSI will discuss these with RMTA during the Design Phase and testing planning stages of the project. Any resulting modifications to the SLA would be subject to approval by RMTA.

4. During the Maintenance Phase, if TSI fails to meet any quarterly or annual SLA, TSI shall report on this SLA monthly and are subject to the corresponding Liquidated Damages every month until the SLA is passed. Notwithstanding any failed SLA, subsequent quarterly or annual measurement dates remain as originally scheduled and are not affected by any additional monthly reporting required by this clause (the originally agreed-upon date does not change). SLAs that are reported monthly are exempt from this additional reporting requirement.

2 Summary of SLAs

SLA	Description	Requirement	Measurement Interval
AV1	Zone Controller Availability	99.8%	Monthly – delivered with MMR
AV2	TFH Applications Availability	98.0%	Monthly – delivered with MMR
AC1	Automatic Vehicle Detection	99.9%	Annualy
AC2	Automatic Vehicle Classification	99.8%	Annualy
AC3	Automatic Vehicle Identification	99.9%	Monthly – delivered with MMR
AC4	Violation Enforcement System	99.9%	Monthly – delivered with MMR
AC5	Image Readability	99.9%	Monthly – delivered with MMR
SP1	Report Generation (< 1 million records)	20 secs	Monthly – delivered with MMR
SP2	Report Generation (≥ 1 million records)	5 min	Monthly – delivered with MMR
SP3	Monthly SLA Reporting	By the 15th of the following month	Monthly
SP4	Host TVL File Processing	100%	Monthly
SP5	Host Transaction Processing	100%	Monthly
SP6	Automated Issue Notification	15 min	Monthly
RR1	Maintenance Time to Respond - Priority 1, 2, and 3	30 min	Monthly
RR2	Maintenance Time to Repair - Priority 1	One (1) day	Monthly
RR3	Maintenance Time to Repair - Priority 2	One (1) Week	Monthly
RR4	Maintenance Time to Repair - Priority 3	Two (2) Weeks	Monthly

3 AVAILABILITY

The following availability SLAs are required to be met by TSI for the entire period of the contract. During System Acceptance Testing (SAT), as well as monthly during the maintenance period, each of these SLAs will be measured and reported on by TSI. The measurement and reporting methods for SAT, and for the maintenance period may be the same, and may utilize System generated reports to communicate results.

Exclusions for any/all availability SLAs are defined per the contract.

3.1 AV1 - ZONE CONTROLLER AVAILABILITY

Zone Controller infrastructure at each gantry location is considered available if it is forming transactions out of data received from roadside sensors. This SLA applies to the Zone Controller redundant pair and is not measured individually.

Each Zone Controller redundant pair shall be available 99.8% of the time. This measurement is not to be averaged across all Toll Zones – it applies to each Toll Zone individually. An available Zone Controller is defined as having the ability to collect revenue either through image capture or transponder read and association.

3.1.1 SERVICE LEVEL AGREEMENT

99.8%

3.1.2 DAMAGES

For each one (1) hour or portion thereof below the SLA that the zone controller redundant pair is unavailable, TSI shall be subject to Liquidated Damages in the amount of 2% of the monthly maintenance/warranty fee.

3.1.3 MEASUREMENT METHOD

Calculated monthly.

$$Zone\ Controller\ Availability\ \% = \left[1 - \frac{Total\ Zone\ Controller\ pair\ downtime}{(Expected\ time\ of\ operations) - (Exclusions)}\right] \times 100$$

1. SLA non-compliance example:
    a. For a 30-day month for a single Zone Controller redundant pair, the allowable downtime is 86.4 minutes.
    b. In this example, the Zone Controller redundant pair was unavailable for two (2) hrs. (120 minutes).
    c. The Zone Controller redundant pair availability rate calculates as: $\left[1 - \left(\frac{120}{43200}\right)\right] \times 100 = 99.72\%$, thus failing to meet the SLA by 0.08%
2. Damages calculate as:
    a. 2% of monthly maintenance/warranty fee

3.2 AV2 - TFH Applications, including, Reporting, External Interfaces, DVAS, and MOMS

A TFH application will be considered available if it is functioning per the System design requirements and is available for use by RMTA staff in their normal workplace locations. TFH applications include, but are not limited to, reporting, external interfaces, DVAS and MOMS.

3.2.1 Service Level Agreement

98.0%

3.2.2 Damages

For each one (1) hour or portion thereof below the SLA that one or more of the TFH applications is unavailable, TSI shall be subject to Liquidated Damages in the amount of 1% of the monthly maintenance/warranty fee.

3.2.3 Measurement Method

$$TFH\ Application\ Availability\ \% = \left[1 - \frac{Total\ Facility\ Host\ Application\ system\ downtime}{(Expected\ time\ of\ operations) - (Exclusions)}\right] \times 100$$

1. This SLA includes software applications/processes, hardware and network failures that render any TFH application unavailable.
2. External Interfaces are included, and the SLA only applies to TSI provided functionality.
3. SLA non-compliance example:
    a. For a 30-day month for each TFH application $[24\ hrs. \times 30\ days\ \times (100\% - 98.0\%)]$ = [24hr x 30 days x (100%-98.0%)] = 14.4 hours = 864 minutes of allowable down time for any TFH application
    b. In this example, the reporting application was unavailable for 16 hrs. (960 mins)
    c. TFH application availability rate calculates as: $\left[1 - \left(\frac{960}{43200}\right)\right] \times 100 = 97.78\%$, thus failing to meet the SLA by 0.22%
4. Damages calculate as:
    a. From 864 min. to 924 min. is 1% of monthly maintenance/warranty fee
    b. From 924 min. to 960 min. is 1% of monthly maintenance/warranty fee
    c. Total damages from this example = 2% of monthly maintenance/warranty fee

4 ACCURACY

System accuracy SLAs shall be reported on periodically by TSI. Where possible, TSI may include System accuracy reporting with monthly availability reporting, described above.

AC1- AC5 apply to all vehicles traveling through a Toll Zone (whether completely in, or straddling lanes and shoulders) that are:

1. Moving below 30 mph and separated from other vehicles by a minimum of two (2) feet distance, or
2. Moving at or between 30 mph – 100 mph and separated from other vehicles by a minimum of five (5) feet distance.

System accuracy SLAs calculate passing performance based on observed errors within specific sample set sizes. These sample sizes vary depending on the requirement of the SLA. The tables below provide the required sample set sizes and the allowed errors per sample set based on the performance requirement. System accuracy SLAs set the maximum number of sample sets to five (5), Set 5. Thus, the total tested samples may have no more than four (4) total errors.

Table 1 applies to AC1 (AVDC), AC3 (AVI), AC4 (VES) and AC5:

Table 1: Sample Sets (99.9% accuracy at 80% confidence)

Sample Set	Required Samples	Allowed Errors	Errors (next sample set)	Errors (stop, remediate)
Set 1	1609	0	1	2
Set 2	2994	1	2	3
Set 3	4278	2	3	5
Set 4	5514	3	4	6
Set 5	6720	4	5	7
Set 6	7905	5	6	8

Table 2 applies to AC2 (AVDC):

Table 2: Sample Sets (99.8% accuracy at 80% confidence)

Sample Set	Required Samples	Allowed Errors	Errors (next sample set)	Errors (stop, remediate)
Set 1	804	0	1	2
Set 2	1497	1	2	3
Set 3	2139	2	3	5
Set 4	2757	3	4	6
Set 5	3360	4	5	7
Set 6	3952	5	6	8

As an example, any SLA with a 99.90% accuracy at 80% confidence requires the following:

- TSI samples 1,609 transactions with 0 errors. We can conclude with 80% confidence that the measured System is 99.90% accurate during the period of time represented by the sample set.
- TSI samples 1,609 transactions with a single (1) error. Based on this, a conclusion cannot be made with 80% confidence that they System is or is not meeting the accuracy requirement. TSI then expands the sample set to 2,994 transactions. If no additional errors are found, we can conclude with 80% confidence that the measured System is 99.90% accurate during the period of time represented by the sample set.
- TSI samples 1,609 transactions with a four (4) or more errors. Based on this it can be concluded with 80% confidence that the System being measured will not meet the 99.90% accuracy requirement, and therefore the System is found to be non-compliant with the accuracy requirement.

4.1 AC1 - Automatic Vehicle Detection and Classification

The Automatic Vehicle Detection and Classification (AVDC) subsystem shall detect 99.9% of vehicles passing through each Toll Zone and shall notify the Zone Controller such that one and only one Transaction Record is formed under all conditions including vehicles in the shoulders. This measurement is not to be averaged across all Toll Zones – it applies to each Toll Zone individually.

4.1.1 Service Level Agreement

99.9%

4.1.2 Damages

Direct damages

4.1.3 Measurement Method

During the maintenance phase, audits by RMTA at their discretion, executed by RMTA with minimum transaction count as determined by sample size.

This SLA must conform to the sample sizes and allowed errors shown in Table 1.

$$Automatic\ Vehicle\ Detection\ Accuracy\ (Per\ Lane)\% = \left[1 - \left(\frac{Number\ of\ missed\ and\ duplicate\ vehicles}{Total\ number\ of\ vehicles\ in\ sample}\right)\right] \times 100$$

1. During SAT, TSI will use the installed DVAS cameras at all locations to record enough video to support the sample size described above. TSI will compare this video data with System generated transaction reports to determine the accuracy of vehicle detection. TSI shall submit a report describing the results of this video audit, with all discrepancies clearly identified, and video files available for RMTA review.
2. SLA non-compliance example:
    a. Number of vehicles in the sample set = 1609, when second error occurs halting the review per Table 1
    b. TSI provided System misses/duplicates of two (2) vehicles in the sample as determined by video review
    c. Detection rate accuracy calculates as $\left[1 - \left(\frac{2}{1609}\right)\right] \times 100 = 99.86\%$, thus failing to meet the SLA by 0.04%
3. Damages calculate as:
    a. Two undetected vehicles traveling the Powhite Parkway to downtown, a 2-axle sedan and a 3-axle box truck
    b. Undetected 2-axle vehicle toll = $1.40
    c. Undetected 3-axle vehicle toll = $1.60
    d. Direct damages = undetected 2-axle ($1.40) + undetected 3-axle ($1.60)

e. Total damage = $3.00 for the two undetected vehicles

4.2 AC2 - Automatic Vehicle Detection and Classification

The AVDC subsystem shall correctly classify 99.8% of all detected vehicles. Non instrumented shoulders are excluded from this calculation. This measurement is not to be averaged across all Toll Zones – it applies to each Toll Zone individually.

4.2.1 Service Level Agreement

99.8%

4.2.2 Damages

Direct damages

4.2.3 Measurement Method

Audits by RMTA at their discretion, executed by RMTA with minimum transaction count as determined by sample size.

This SLA must conform to the sample sizes and allowed errors shown in Table 2Table 1.

$$Automatic\ Vehicle\ Classification\ Accuracy\ (Per\ lane)\% = \left[1 - \left(\frac{Axle\text{-}based\ classification\ errors}{Total\ number\ of\ vehicles\ in\ sample}\right)\right] \times 100$$

1. During SAT, TSI will use the installed DVAS cameras at all locations to record enough video to support the sample size described above. TSI will compare this video data with System generated transaction reports to determine the accuracy of vehicle detection. TSI shall submit a report describing the results of this video audit, with all discrepancies clearly identified, and video files available for RMTA review.
2. SLA non-compliance example:
    a. Number of vehicles in the sample set = 804, when second error occurs halting the review per Table 2
    b. TSI provided System misclassified two (2) vehicles in the sample as determined by video review
    c. Classification rate accuracy calculates as $\left[1 - \left(\frac{2}{804}\right)\right] \times 100 = 99.75\%$, thus failing to meet the SLA by 0.05%
3. Damages calculate as:
    a. Two misclassified vehicles traveling the Powhite Parkway to downtown, a 2-axle sedan and a 5-axle tractor/trailer
    b. The System over classified the 2-axle sedan as a 3-axle vehicle
        i. 3-axle toll rate = $1.60
        ii. 2-axle toll rate = $1.40
        iii. Refund due customer: ($1.60 - $1.40) = $0.20
    c. The System under classified the 5-axle tractor/trailer as a 3-axle vehicle

i. 5-axle toll rate = $2.00
ii. 3-axle toll rate = $1.60
iii. Uncollected revenue: ($2.00 - $1.60) = $0.40

d. Direct damages = customer refund ($0.20) + uncollected revenue ($0.40)
e. Total damage = $0.60 for the two misclassified vehicles

4.3 AC3 - Automatic Vehicle Identification

TSI's responsibility regarding AVI performance is to assign to the correct vehicle 99.9% of all transponders read and reported by the AVI Equipment. This measurement is not to be averaged across all Toll Zones – it applies to each Toll Zone individually.

4.3.1 Service Level Agreement

99.9%

4.3.2 Damages

For each sample set, based upon the measured performance in the sample set, for every 0.1% or portion thereof below the SLA, TSI shall be subject to Liquidated Damages in the amount of 1% of the monthly maintenance/warranty fee.

4.3.3 Measurement Method

Audits by RMTA at their discretion, executed by RMTA with minimum transaction count as determined by sample size.

This SLA must conform to the sample sizes and allowed errors shown in Table 1.

$$Automatic\ Vehicle\ Identification\ Accuracy\ (per\ Toll\ Zone)\% = \left[1 - \frac{(Detection\ and\ read\ errors) + (Correrlation\ errors)}{(Detection\ and\ read\ Audited\ samples\ ) + (Correlation\ audited\ samples)}\right] \times 100$$

1. For each Toll Zone individually, TSI shall provide a report of all AVI tags read and reported by the AVI Equipment (note: this data must be reported directly from the AVI reader) for a period sufficient to conform to the sample size requirements. TSI shall also provide a corresponding report detailing each transponder's assignment to a Transaction Record, including links to images of the vehicles to which each transponder was associated. This report will highlight all instances where a transponder has not been associated with a Transaction Record. The report will be provided in a CSV format to allow sorting on transponder ID, Transaction Record timestamp/ID and lane.
2. SLA non-compliance example:
    a. Number of vehicles in the sample set = 1609, when second error occurs halting the review per Table 1
    b. TSI provided System incorrectly asociates transponders on two (2) vehicles in the sample as determined by video review
    c. Detection rate accuracy calculates as $\left[1 - \left(\frac{2}{1609}\right)\right] \times 100 = 99.86\%$, thus failing to meet the SLA by 0.04%.
3. Damages calculate as:
    a. 1% of the monthly maintenance/warranty fee for the first 0.1% or portion thereof below the SLA requirement 99.86% to 99.90%

b. Total damages = 1% of the monthly maintenance/warranty fee

4.4 AC4 - Violation Enforcement System

The VES shall capture all required images for each vehicle passing through a Toll Zone and correlate them with the correct transaction at an accuracy rate of 99.9%. This measurement is not to be averaged across all Toll Zones – it applies to each Toll Zone individually.

4.4.1 Service Level Agreement

99.9%

4.4.2 Damages

For each sample set, based upon the measured performance in the sample set, for every 0.1% or portion thereof below the SLA, TSI shall be subject to Liquidated Damages in the amount of 1% of the monthly maintenance/warranty fee.

4.4.3 Measurement Method

Audits by RMTA at their discretion, executed by RMTA with minimum transaction count as determined by sample size.

This SLA must conform to the sample sizes and allowed errors shown in Table 1.

$$VES\ Image\ Capture\ and\ Correlation\ Accuracy\ (for\ each\ ORT\ Lane)\% = \left[1 - \left(\frac{Detected\ vehicles\ without\ a\ readable\ rear\ license\ plate\ image}{All\ deteted\ vehicles - exclusions}\right)\right] \times 100$$

1. TSI is not responsible for the measurement of, and reporting on this SLA. RMTA will, at its sole discretion, perform periodic audits on the VES to determine accuracy. RMTA will present VES audit results to TSI.
2. SLA non-compliance example - see AC3.

4.5 AC5 - Image Readability

The percentage of all images that are Readable Images. Readable Images are defined as images produced by the VES in which both license plate numbers and license plate issuing jurisdiction can be reliably read and the vehicle characteristics can be identified electronically or by the human eye. Exclusions are missing plates, temporary plates, obstructed plates where characters are covered, and damaged plates where characters are not visible. This measurement is not to be averaged across all Toll Zones – it applies to each Toll Zone individually.

4.5.1 Service Level Agreement

99.9%

4.5.1.1 System Acceptance Test Measurement Requirement

RMTA will audit a sample size of random images from each VES camera as directed in Table 1, using an image set representative of all lighting conditions. Measurement of this SLA must conform to the sample sizes and allowed errors shown in Table 1 for each audited Toll Zone (e.g., if three Toll Zones are audited, three separate sample sets as shown in Table 1 are required).

4.5.1.2 Operations/Maintenance Measurement Requirement

RMTA will audit a sample size of random images from each VES camera as directed in Table 1, using an image set representative of all lighting conditions.

4.5.2 Damages

For each sample set, based upon the measured performance in the sample set, for every 0.1% or portion thereof below the SLA, TSI shall be subject to Liquidated Damages in the amount of 1% of the monthly maintenance/warranty fee.

4.5.3 Measurement Method

$$Image\ Readability\ \% = \left[\frac{(Number\ of\ readable\ images\ after\ exclusions)}{(Total\ number\ of\ images\ -\ excluded\ images)}\right] \times 100$$

1. During SAT, TSI shall perform manual review of all images in the sample set.
2. SLA non-compliance example:
    a. Start with 1700 sample images, a sample size large enough to allow exclusions where the remaining samples after exclusions meets or exceeds the sample set Table 1 required samples
    b. 91 images are agreed to be exclusions (damaged/obscured plates etc.)
    c. Therefore, the resultant image set for readability evaluation is 1609
    d. Of the 1609, only 1605 are readable by either ALPR automation or the human eye
    e. Readability rate calculates as $\left[\frac{1605}{(1700-91)}\right] \times 100 = 99.75\%$, thus failing to meet the SLA by 0.12%.
3. Damages calculated as:
    a. 1% of the monthly maintenance/warranty fee for the first 0.1% below the SLA requirement, 99.75% to 99.85%
    b. 1% of the monthly maintenance/warranty fee for the remaining 0.05% below the SLA requirement, 99.85% to 99.90%
    c. Total damages = 2% of the monthly maintenance/warranty fee.

5 PERFORMANCE

5.1 SP1 - REPORT GENERATION (< 1,000,000 RECORDS)

Report generation pertains to the display of non-ad-hoc reports generated on all Systems delivered under the scope of the Project. Measured from the time the user completes the report request in the UI to the time the report results are displayed on screen

5.1.1 SERVICE LEVEL AGREEMENT

TIME	SLA
Within 20 seconds	100%

5.1.2 DAMAGES

For each sample set's times taken as an average, for each one (1) minute, or portion thereof outside the SLA, TSI shall be subject to Liquidated Damages in the amount of 0.5% of the monthly maintenance/warranty fee.

5.1.3 MEASUREMENT METHOD

Calculated monthly using the 20 most frequently generated System reports and as approved by RMTA.

$$< 1M\ Report\ Generation\ Time\ =\ Average\left(Time_{(Report\ available)} - Time_{(Report\ requested)}\right)$$

1. TSI shall develop a report that communicates reporting System performance per the equation above. TSI may implement System tools that capture user inputs, keystrokes, and/or mouse clicks, along with reporting System responses to those user activities. This is not intended to be a "stopwatch" or manual measurement.
2. If TSI believes that RMTA-provided workstations are introducing delays relative to the measurement of this SLA, then TSI at TSI's expense may provide a workstation at the RMTA location upon which to perform the measurement within two (2) weeks of contesting the assessment of Liquated Damage.
3. SLA non-compliance example:
    a. In this example, the average time of a sample set of non-ad-hoc reports generation is 1.35 minutes.
    b. In this example, the report generation of the sample set of non-ad-hoc reports had an average of 1.35 minutes of generation time, thus failing to meet the SLA by .35 minutes.
4. Damages calculate as:
    a. 0.5% of the monthly maintenance/warranty fee is charged because the average generation was > 1.0 minutes

5.2 SP2 - Report Generation (≥ 1,000,000 records)

Report generation pertains to the display of non-ad-hoc reports generated on all Systems delivered under the scope of the Project. Measured from the time the user completes the report request in the UI to the time the report is displayed on screen. For measurement of this SLA, no more than three (3) queries that will result in 1,000,000+ records returned will be conducted simultaneously.

5.2.1 Service Level Agreement

Within five (5) minutes for 1,000,000 to 1,999,999 records and an additional five (5) minutes per additional 1,000,000 records.

5.2.2 Damages

For each sample set's times taken as an average, for every one (1) minute, or portion thereof outside the SLA, TSI shall be subject to Liquidated Damages in the amount of 0.5% of the monthly maintenance/warranty fee.

5.2.3 Measurement Method

Calculated monthly using the 20 most frequently generated System reports and as approved by RMTA.

$$\geq 1M\ Report\ Generation\ Time\ =\ Average\left(Time_{(Report\ available)} - Time_{(Report\ requested)}\right)$$

1. TSI shall develop a report that communicates reporting System performance per the equation above. TSI may implement System tools that capture user inputs, keystrokes, and/or mouse clicks, along with reporting System responses to those user activities. This is not intended to be a "stopwatch" or manual measurement.
2. If TSI believes that RMTA-provided workstations are introducing delays relative to the measurement of this SLA, then TSI at TSI's expense may provide a workstation at the RMTA location upon which to perform the measurement within two (2) weeks of contesting the assessment of Liquated Damage.
3. SLA damage example – see SP1.

5.3 SP3 - Monthly SLA Reporting

Monthly reports, accurately detailing System performance relative to all Project SLAs, shall be submitted to RMTA each month. System and, as necessary, manual reports shall be provided by TSI to indicate performance. As agreed by TSA and RMTA, TSI shall provide complete reports (including cover page, table of contents, SLA table, and summaries).

5.3.1 Service Level Agreement

By the 15th of the following month

5.3.2 Damages

TSI cannot invoice for monthly maintenance/warranty without submitting this report.

For each monthly report, for every one (1) day or portion thereof outside the SLA, TSI shall be subject to Liquidated Damages in the amount of 0.5% of the monthly maintenance/warranty fee.

5.3.3 Measurement Method

Calculated monthly.

$$Monthly\ SLA\ Report\ Submittal\ Timeframe\ = \left(Date_{(Report\ delivered)} - Date_{(Report\ due)}\right)$$

1. TSI shall develop a report that communicates all SLAs for the Project. This report will include cover page(s), summary SLA metrics described individually for each SLA, and any notes that might be required to describe performance results. TSI shall make available to RMTA all detailed data supporting performance calculations.
2. If a report is submitted outside of the SLA timeframe, then Liquidated Damages shall be assessed for each day the report is late.
3. In the event RMTA rejects a report because RMTA reasonably believes one or more of the reported SLA measurements are reported inaccurately, TSI will submit a corrected report within seven (7) days of notice of rejection. If the resubmitted report is either late or contains inaccuracies or both, then Liquated Damages shall be assessed effective upon the date of the first rejection, excluding RMTA review time.
4. SLA damage example:
    a. TSI delivers the monthly report on the 18th day of the month.
    b. TSI may not invoice for monthly maintenance/warranty until the 18th of the month
5. Damages calculated as:
    a. Delivery date 18 – Due date 15 = 3 days late
    b. 0.5% of the monthly maintenance/warranty fee for the first day late
    c. 0.5% of the monthly maintenance/warranty fee for the second day late
    d. 0.5% of the monthly maintenance/warranty fee for the third day late
    e. Total damages = 1.5% of the monthly maintenance/warranty fee

5.4 SP4 - Tag Status File Processing

The TFH shall process and activate updated Transponder Validation Lists (TVLs) and correctly process transactions per the updated TVLs within 30 minutes of successfully receiving a full and incremental replacement files from the VDOT E-ZPass CSC. This measurement is taken as an average of the processing times of all TVL files processed within the measurement period.

5.4.1 Service Level Agreement

30 minutes

5.4.2 Damages

For every 30 minutes or portion thereof outside the SLA, TSI shall be subject to Liquidated Damages in the amount of 0.5% of the monthly maintenance/warranty fee.

5.4.3 Measurement Method

Calculated monthly.

$$Host\ TVL\ File\ Processing\ Time = Average\ of\ all\ TVL\ Files\ Processed\ and\ Activated\ During\ Measurement\ Period$$

1. SLA non-compliance example:
    a. In this example, for a 30-day timeframe, the average processing time for all TVL files processed = 35 minutes, thus failing the SLA by five minutes
2. Damages calculate as:
    a. From 30 minutes to 35 minutes, 0.5% of the monthly maintenance/warranty fee.
    b. Total damages = 0.5% of the monthly maintenance/warranty fee

5.5 SP5 - Host Transaction Processing

100% of all Transaction Records with associated images must be transmitted to the VDOT E-ZPass System within four (4) hours of their transaction timestamp. A Transaction Record and associated images qualify as "processed" if the Transaction Record and associated images have reached their destination within the RMTA transaction processing workflow. The transaction processing workflow is responsible for achieving the required four (4) hour processing limit within the agreed constraints of external vendor processing quantity allowances.

5.5.1 Service Level Agreement

100%

5.5.2 Damages

Direct damages. Transactions exceeding the four (4)-hour time limit will not be sent to VDOT to be pursued for payment. All toll revenue related to non-pursued transactions due to the four (4)-hour time limit will be assessed as direct damage.

5.5.3 Measurement Method

Calculated monthly.

$$Transaction\ Processing\ Time\ Performance\ \% = \left(\frac{Number\ of\ processed\ transactions\ within\ \text{required time}}{Total\ number\ of\ processed\ transactions}\right) \times 100$$

1. SLA non-compliance example:
    a. In this example, 99,500 transactions (out of 100,000 transactions) were processed within the four (4) hour time limit. $\left[1 - \left(\frac{99500}{100000}\right)\right] \times 100 = 99.5\%$, thus, failing to meet the SLA by 0.5%
2. Damages calculate as:
    a. All toll revenue related to non-pursued transactions due to the four (4) hour time limit will be assessed as direct damage.

5.6 SP6 - Automated Issue Notification

The time it takes to notify RMTA designated contact list via an automated notification for priority 1 and 2 issues/outages. This time begins when the issue or outage initially occurs.

5.6.1 Service Level Agreement

15 minutes

5.6.2 Damages

For every five (5) minutes or portion thereof outside the SLA on a per event basis, TSI shall be subject to Liquidated Damages in the amount of $300.

5.6.3 Measurement Method

Calculated monthly.

$$Automated\ Notification\ Time\ = Average\left(Time_{(Notification\ sent\ to\ RMTA)} - Time_{(Issue\ occurance)}\right)$$

1. TSI shall develop a report that communicates automated alert notification timeframes for all priority 1 and 2 issues/outages per the equation above.
2. SLA non-compliance example:
    a. For a 30-day month and a total number of 150 System issue notifications
    b. Due to System issue 20 of those notifications take 40 minutes to notify the contact list
    c. Notification rate calculates as $\left[\frac{(15\ \text{min} \times 150\ Notifications) + (40\ min \times 20\ Notifications)}{150\ Notification}\right] = 20.33$ min. per notification, thus over the SLA by 5.33 minutes
3. Damages calculate as:
    a. $300 for the 5 min. beyond the 15 min. requirement, 15 to 20 minutes
    b. $300 for the 0.33 min. beyond 20 min., 20 to 20.33 minutes
    c. Total damages = $600

6 Response and Repair

Response and repair time SLAs will be measured and reported on both during SAT and monthly thereafter. TSI may utilize reporting capabilities native to the MOMS in support of measuring and reporting on response and repair times. This report shall communicate, at a minimum, detailed descriptions (log excerpts) of all priority 1, 2, and 3 events with associated maintenance event, failure detection, notification time, response time when the technician arrives at the site of the problem or acknowledges the associated alarm failure, and the time duration between the event notification and response for each event. This data may be extracted from work orders, and all work orders associated with events shall be reported on as supporting data. Events will be tracked on an individual basis and summarized for this monthly reporting. The report will clearly indicate all response and repair times that exceed the SLA requirements. TSI must meet all response and repair time SLAs regardless of the cause of any power failure, including but not limited to power failure resulting from force majeure.

Priority Level	Definition
Priority 1	Any failure that will result in loss of ability to accurately collect revenue; an issue causing a lane closure; safety hazard; or loss of auditability of the System
Priority 2	Any failure of a System component that will result in a degradation of System performance or results in the loss of redundancy in a key System component but does not qualify as a Priority 1 event.
Priority 3	Minor failure of the equipment, network or software or an indication that an event may occur that would result in a malfunction or degradation of the System.
Non-Priority	A non-priority issue is indicative of preventative or predictive maintenance and is typically opened by maintenance staff.

Response Time: Response time is always measured as beginning when TSI receives notification of the maintenance events or failures and ending when a maintenance technician arrives at the site of the problem or acknowledges the associated alarm or alert.

Repair Time: Repair time is always measured as beginning when TSI receives notification of the maintenance event or failure and ending when the failure condition is corrected, and the System is returned to normal operation.

SLA	Response Time SLA	Repair Time SLA
RR1 - Priority 1	Maximum of 30 minutes	Maximum of four (4) hours
RR2 - Priority 2	Maximum of 30 minutes	Maximum of three (3) days
RR3 - Priority 3	Maximum of 30 minutes	Maximum of one (1) week

6.1 RR1 - Maintenance Time to Respond – Priority 1, 2, and 3

On Average, all priority 1, 2, and 3 tickets must be acknowledged within thirty (30) minutes of ticket creation.

6.1.1 Service Level Agreement

30 Minutes

6.1.2 Damages

$200 if average is > 30 minutes

6.1.3 Measurement Method

Calculated Monthly.

$$Priority 1, 2, \text{and } 3\ Response\ Time = minimum\ of\ (T_{Arrival} - T_{Notice})\ or\ (T_{Acknowledge} - T_{Notice})$$

1. SLA non-compliance example:
    a. In this example, the average TSI acknowledgment of ticket creation for all priority 1, 2, and 3 tickets was 45 minutes after ticket creation, thus over the SLA by 15 minutes.
2. Damages calculate as:
    a. $100 for the 15 minutes over the SLA
    b. Total damages = $100

6.2 RR2 - Maintenance Time to Repair – Priority 1

On average, all priority 1 tickets must be repaired within one (1) day of ticket acknowledgement.

6.2.1 Service Level Agreement

One (1) day

6.2.2 Damages

$350 if average is > one (1) day

6.2.3 Measurement Method

Calculated monthly.

$$Priority\ 1\ Repair\ Time = (T_{Corrected} - T_{Notice})$$

1. SLA non-compliance example:

a. In this example, the average TSI repaired time for priority 1 tickets was 25 hours after receiving the ticket acknowledgement, thus over the SLA by one (1) hour

2. Damages calculate as:
    a. $175 for the one hour over the SLA
    b. Total damages = $175

6.3 RR3 - Maintenance Time to Repair – Priority 2

On average, all priority 2 tickets must be repaired within one (1) week of ticket acknowledgement.

6.3.1 Service Level Agreement

One (1) Week

6.3.2 Damages

$350 if average is > one (1) week

6.3.3 Measurement Method

Calculated Monthly.

$$Priority\ 2\ Repair\ Time = (T_{Corrected} - T_{Notice})$$

1. SLA non-compliance example:
    a. In this example, the average TSI repair time for priority 2 tickets was nine (9) days after receiving the ticket acknowledgement, thus over the SLA by two (2) days
2. Damages calculate as:
    a. $175 for two (2) days over the SLA
    b. Total damages = $175

6.4 RR4 - Maintenance Time to Repair – Priority 3

On average, all priority 3 tickets must be repaired within two (2) weeks of ticket acknowledgement.

6.4.1 Service Level Agreement

Two (2) Weeks

6.4.2 Damages

$200 if average is > two (2) weeks

6.4.3 Measurement Method

Calculated Monthly.

$$Priority\ 3\ Repair\ Time = (T_{Corrected} - T_{Notice})$$

1. SLA non-compliance example:
    a. In this example, the average TSI repaired time for priority 3 tickets was three (3) weeks of receiving the ticket acknowledgement, thus over the SLA by one (1) week.
2. Damages calculate as:
    a. $100 is charged because the average response time was one (1) week over the SLA.

7 Help Desk Response

For RMTA-initiated help desk requests, TSI will respond to requests based on the following priority levels and timeframes. Help Desk Response Time SLAs will be measured and reported on both during SAT, and monthly thereafter. TSI may utilize reporting capabilities native to the MOMS or the work order/ticketing System in support of measuring and reporting on Help Desk Response Times.

7.1 Service Level Agreements

TSI shall meet the following Help Desk Response Time SLAs.

	Response Time SLA
Priority 1	30 minutes
Priority 2	One (1) hour
Priority 3	Eight (8) hours

7.2 Damages

For every 30 minutes or portion thereof outside the SLA per helpdesk request, TSI shall be subject to Liquidated Damages in the amount of $300.

7.3 Measurement Method

Calculated Monthly.

$$Help\ Desk\ Response\ Time = (time\ the\ call\ was\ logged - \text{time a response was received})$$

1. The MOMS ticket information, provided in a report, can provide the measurement.
2. SLA non-compliance example:
    a. In this example, the average TSI help desk response time to a priority 1 ticket was 45 minutes, thus over the SLA by 15 minutes
3. Damages calculate as:
    b. $300 for the 15 minutes over the SLA
    c. Total damages = $300

APPENDIX G: ORT PAVEMENT AND GANTRY STATEMENT

To Whom It May Concern:

Whereas the Richmond Metropolitan Transportation Authority (hereafter "RMTA") has posted Request for Proposals ETC-2021 with exhibits, attachments, appendices and other information (hereafter "RFP") on its website at www.rmtaonline.org.

Whereas I, (insert name) _____

am duly authorized by (insert firm's name and legal address) _____

_____

(hereafter "Proposer") to make the following binding commitment for Proposer.

Therefore be it known that Proposer has performed a complete and comprehensive review of said RFP including but not limited to the specifications, site plans and other drawings describing the pavement, gantry, structures, and other physical elements at all of the Open Road Tolling locations and proposed locations under consideration therein (hereafter "Infrastructure") and Proposer was allowed to visit and directly evaluate all of the Open Road Tolling locations and proposed locations described therein.

Therefore be it known that the Proposer (insert either the phrase "is not aware of any changes to the Infrastructure that would improve the function, performance, reliability, availability and serviceability of the Proposer's system" or the phrase "suggests the changes to the Infrastructure detailed on the attached pages")

_____

_____

_____

Name of Signor Printed: _____

Title of Signor Printed: _____

Signor Signature: _____

Any material alteration to the statements in this form are prohibited and any such alteration may result in a Proposal being removed from further consideration. Attach additional pages as necessary.

APPENDIX H: PROPOSAL FORMS

ACKNOWLEDGEMENT OF ADDENDA

I/We hereby acknowledge receipt of the following addenda and have made the necessary revisions to the Contractor's Proposal, plans, and specifications, etc., and agree that these addenda are included in the Contractor's Proposal.

Addenda #	Signature	Date

1._____

2._____

3._____

4._____

5._____

6._____

I understand that failure to confirm receipt of addenda may cause the bid to be irregular.

NON-COLLUSION AFFIDAVIT

STATE OF _____)

_____) ss.

COUNTY OF _____)

I, _____, of the City of _____, County of _____ and State of _____, being of full age and duly sworn according to law on my oath depose and say:

That I am _____(Title) of _____, the Proposer making the response submitted to the Richmond Metropolitan Transportation Authority, on the _____ day of _____, 20___, for Contract No.ETC-2021; that I executed the said response with full authority to do so;

The said Proposer has not, directly or indirectly, entered into any combination or arrangement with any person, firm or corporation or entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free, competitive bidding of which would increase the cost of construction or maintenance in connection with the said Contract; that no person or selling agency has been employed or retained to solicit or secure the said Contract, upon an agreement or understanding, for a commission, percentage, brokerage or contingent fee, except bona fide full-time employees;

I further warrant that all statements contained in said response and in this Affidavit are true and correct and made with full knowledge that the said Authority relies upon the truth of the statements contained in said response and in this Affidavit in awarding the said Contract.

Sworn to and subscribed
before me this_____
day of _____, 20__

By:_____(L.S.)
Person Signing Bid

Print Name:_____

_____
Notary Public

My commission expires:

TERMS OF DISCUSSION FORM

To Whom It May Concern:

Whereas the Richmond Metropolitan Transportation Authority (hereafter "RMTA") has posted Request for Proposals ETC-2021 with exhibits, attachments, appendices and other information (hereafter "RFP") on its website at www.rmtaonline.org.

Whereas I, (insert name) _____

am duly authorized by (insert firm's name and legal address) _____

_____

(hereafter "Proposer") to make the following binding commitment for Proposer.

Whereas Proposer has performed a complete and comprehensive review of said RFP including but not limited to the procurement process and the associated schedule described therein.

Therefore, be it known that Proposer hereby (insert either the phrase "accepts without reservation" or the phrase "formally protests, for the reasons described in detail on the following pages,")

_____

_____the procurement process and associated schedule described in the RFP.

Name of Signor Printed: _____

Title of Signor Printed: _____

Signor Signature: _____

Any material alteration to the statements in this form are prohibited and any such alteration may result in a Proposal being removed from further consideration. Attach additional pages as necessary.

SWaM-DBE Participation Form

The Authority strongly encourages the submission of bids by qualified contractors whose principal businesses are located in the Richmond Metropolitan Area and further encourages such contractors to utilize the services of local subcontractors and vendors.

In addition, the Authority strongly encourages the submission of bids by qualified contractors certified as Small, Women, and Minority Owned (SWaM) businesses and/or Disadvantaged Business Enterprises (DBE).

Furthermore, the Authority encourages the use of certified Small, Women, and Minority Owned (SWaM) businesses and Disadvantaged Business Enterprises (DBE) as subcontractors or vendors to the fullest extent reasonably possible.

Certification:

The Virginia Department of Small Business and Supplier Diversity is responsible for the certification of eligible small, women, and minority-owned businesses to participate in the SWaM Procurement Initiative, https://www.sbsd.virginia.gov/directory/ . They also certify Disadvantaged Business Enterprises (DBEs) for participation under the Virginia Unified Certification Program (as part of the federal DBE Program). Service Disabled Veterans are also able to obtain SWaM certification upon receipt of their certification by the Department of Veterans Services and by meeting the eligibility requirements of the SWaM Program.

SWaM Category Type:

(As certified by the Virginia Department of Small Business and Supplier Diversity)

Minority Owned (M)

Small Business (S)

Women Owned (W)

Minority Owned with Small Business Certification (MS)

Women Owned with Small Business Certification (WS)

Other SWaM, DBE, WBE and MBE Programs:

Any contractors, subcontractors or vendors whose principal businesses are located outside of the Commonwealth of Virginia must submit information on any business that is qualified as a Small, Women-Owned, Minority Owned and/or Disadvantaged Business Enterprises (DBE) by their home state or any federal program.

SwaM-DBE Summary:

As a part of the project closeout process and a prerequisite to final payment, the prime contractor shall submit fully executed pages DBE-3 and DBE-4, along with any additional sheets as needed, to document the actual amounts paid to each SWaM and/or DBE businesses that provided service or products during this execution of the contract.

SWaM/ DBE Summary

****

Firm Name: _____

Firm Address: _____

Owner/Contact Name: _____

Owner/Contact Phone Number: _____

SWaM Category Type: _____SWaM Certification Number: _____

Amount Paid: $_____

****

Firm Name: _____

Firm Address: _____

Owner/Contact Name: _____

Owner/Contact Phone Number: _____

SWaM Category Type: _____SWaM Certification Number: _____

Amount Paid: $_____

****

Firm Name: _____

Firm Address: _____

Owner/Contact Name: _____

Owner/Contact Phone Number: _____

SWaM Category Type: _____SWaM Certification Number: _____

Amount Paid: $_____

Contractor shall attach additional sheets if needed.

SIGNED AND SEALED THIS _____ day of _____, 20____.

_____
Business Name

_____
Address

_____

By: _____(L.S.)

Title: _____

STATE OF VIRGINIA AT LARGE: }

}

CITY/COUNTY OF } to-wit:

The foregoing instrument was acknowledged before me this _____day of _____,

20___, by _____, _____of

_____[name]_____[title]

_____,

_____[business name]

a _____ corporation/partnership, on behalf of said Corporation/partnership,

_____[state]

_____

Notary Public

My Commission expires:_____

PERFORMANCE SURETY

To Whom It May concern:

Whereas the Richmond Metropolitan Transportation Authority (hereafter "RMTA") has posted Request for Proposals ETC-2021 with exhibits, attachments, appendices and other information (hereafter "RFP") on its website at www.rmtaonline.org.

Whereas I, (insert name) _____

am duly authorized by (insert firm's name and legal address) _____

_____

(hereafter "Proposer") to make the following binding commitment for Proposer.

Upon the occurrence of an Event of Default and without waiving or releasing the TSI from any obligations, RMTA shall be entitled to make demand upon and enforce any bond, and make demand upon, draw on and enforce and collect any letter of credit, guaranty or other performance security available to RMTA under this Contract with respect to the Event of Default in question. Where access to a bond, letter of credit or other performance security is to satisfy damages owing, RMTA shall be entitled to make demand, draw, enforce, and collect, regardless of whether the Event of Default is subsequently cured. RMTA will apply the proceeds of any such action to the satisfaction of the TSI's obligations under this Contract, including payment of amounts due to RMTA. The preceding does not limit or affect RMTA's right to give notice to or make demand upon and enforce any bond, and make demand upon, draw on and enforce and collect any letter of credit, guaranty, or other performance security, immediately after RMTA is entitled to do so under the bond, letter of credit, guaranty, or other performance security.

Therefore, be it known that Proposer will provide (insert the type of Performance Surety) _____for the procurement process described in the RFP.

Name of Signor Printed: _____

Title of Signor Printed: _____

Signor Signature: _____

Any material alteration to the statements in this form are prohibited and any such alteration may result in a Proposal being removed from further consideration. Attach additional pages as necessary.

APPENDIX I: RMTA DATA RETENTION GUIDELINES

The TSI shall submit all deliverables described in Appendix J. Project Deliverables for RMTA review, comment, and approval. RMTA will review each deliverable within the initial review period described for each deliverable. Once Projet Deliverables have been approved, the TSI shall retain the different data types for the durations described below. Once the online retention period has been reached, the TSI may archive data off the system. Should RMTA request any archived data from the TSI, it shall be produced for RMTA within a single business day.

Data Type	Online Retention Period	Long Term Storage Requirement
All Images	6 months	Purge after 7 years
Toll Transactions	3 years	Purge after 7 years
DVAS video data	90 days	Purge after 7 years
Rate Tables	Indefinitely	Purge after 7 years
System Logs	90 days	Purge after 7 years
MOMS Data	13 months	Purge after 7 years
Application Configuration Files	90 days	Purge after 7 years

APPENDIX J: PROJECT DELIVERABLES SCHEDULE

The TSI shall submit all deliverables described in this Deliverables Schedule for RMTA review, comment, and approval. RMTA will review each deliverable within the initial review period described for each deliverable. Once RMTA has provided initial comments to the TSI for any deliverable, the TSI shall revise the deliverable in accordance with RMTA's comments and shall re-submit the deliverable for additional RMTA review and/or approval. The TSI shall re-submit revised deliverables in a red-lined version and a clean version such that RMTA can easily and quickly identify all updates/changes/deletions to the original deliverable. RMTA will only approve TSI provided deliverables after all comments have been resolved to RMTA's satisfaction.

This appendix is provided as a guide to aid the TSI in delivering its Project submittals. If a deliverable described in the RFP is not included herein, the RFP deliverable requirement shall take precedence. Additionally, before the TSI submits its Project Schedule and at RMTA's sole discretion for approval, the TSI may submit requested changes to this Deliverables Schedule. Specifically, the TSI may request changes to which deliverables fit into a document package. RMTA will review the TSI's request and justification for the change to the Deliverables Schedule and provide the TSI with an approval or denial of its requested change.

Table 1: Schedule of Events (ORT)

RFP SECTION	DELIVERABLE NAME	DUE DATE	INITIAL REVIEW PERIOD (BUSINESS DAYS)
Initial Document Package			
3.7.1	**Initial Master Project Schedule** (updated as required)	NTP + 15 days	5 days
3.8.7	**Safety Plan**	NTP + 15 days	5 days
3.8.1	**Project Management Plan (PMP)**	NTP + 15 days	5 days
3.8.2	**Requirements Traceability Matrix (RTM)**	NTP + 15 days	10 days
Design, Training and Maintenance Package			
3.8.3	**System Detailed Design Document (SDDD)**	NTP + 45 days	10 days
3.8.5	**Disaster Recovery Plan (DRP)**	NTP + 45 days	5 days
3.6.6.4	**Backup Recovery and Archive Plan**	NTP + 45 days	5 days
3.11.2	**Maintenance Plan**	NTP + 45 days	5 days
3.8.8	**Training Plan**	NTP + 60 days	5 days

RFP Section	Deliverable Name	Due Date	Initial Review Period (Business Days)
3.9.1.2	**Training Materials**	NTP + 60 days	10 days
3.8.9	**System User Manuals**	NTP + 60 days	10 days
3.8.6	**Security Plan**	NTP + 60 days	5 days
Test Procedures Document Package			
3.10.3	**Master Test Plan**	NTP + 45 days	5 days
3.10.5.1	**TFH (Host) FAT Test Plan/Detailed Test Procedures**	30 days prior to start of the FAT	10 days
3.10.6.1	**First Site Installation and Integration Test Plan/Detailed Test Procedures**	30 days prior to start of the FSIT	10 days
3.10.6, 3.10.2.2	**Commission Test (SICT) Plan/Detailed Test Procedures**	30 days prior to start of the SICT	10 days
3.10.7.1	**System Acceptance Test (SAT) Plan/Detailed Test Procedures**	30 days prior to start of the SAT	10 days
3.10.3.1, 3.10.5.2, 3.10.6.1, 3.10.7.1, 3.10.8.2	**Test Reports** • **TFH FAT Report** • **FSIIT Report** • **SICT Report** • **SAT Test Report**	15 days after successful completion of each test	5 days
Installation and Transition Package			
3.3.2	**Installation Plan and Checklist**	30 days prior to installation	10 days
3.4.1	**Transition Plan**	30 days prior to installation	5 days
3.8.4.1, 3.8.3	**As-Built Drawings and As-Built SDDD**	10 days prior to the completion of SAT	10 days
3.13	**Succession Plan**	10 days prior to the completion of SAT	5 days
Monthly Deliverables			
3.7.1	**Monthly Project Schedule Update**	3 days prior to each status meeting	5 days

RFP Section	Deliverable Name	Due Date	Initial Review Period (Business Days)
3.7.2	**Monthly Progress Report**	3 days prior to each status meeting	5 days
3.11.3	**Monthly Maintenance Report**	Beginning the end of the first full month after go-live	5 days

Table 2 provides the deliverables associated with the AET Conversion (refer to section 3.13 of the RFP).

Table 2: Schedule of Events (AET Conversion)

RFP Section	Deliverable Name	Due Date	Initial Review Period (Business Days)
Initial Document Package			
3.7.1, 3.13.4.1	**AET Conversion Project Schedule** (updated as required)	AET Conversion NTP + 30 days	10 days
3.8.2, 3.13.4.4	**AET Conversion Requirements Traceability Matrix (RTM)**	AET Conversion NTP + 60 days	15 days
Design, Training and Maintenance Package			
3.8.3, 3.13.4.5	**Updated System Detailed Design Document (SDDD)**	AET Conversion NTP + 120 days	15 days
3.11.2, 3.13.4.8	**Updated Maintenance Plan**	AET Conversion NTP + 120 days	10 days
Test Procedures Document Package			
3.10.3, 3.13.4.9	**Updated Master Test Plan (to include AET Testing information)**	AET Conversion NTP + 120 days	10 days
3.10.5.1, 3.13.4.10	**AET Conversion FAT Test Plan/Detailed Test Procedures**	30 days prior to start of the AET Conversion FAT	10 days
3.10.6, 3.10.2.2, 3.13.4.11	**AET Conversion Commission Test (SICT) Plan/Detailed Test Procedures**	30 days prior to start of the AET Conversion SICT	10 days

RFP Section	Deliverable Name	Due Date	Initial Review Period (Business Days)
3.10.7.1, 3.13.4.12	**AET Conversion System Acceptance Test (SAT) Plan/Detailed Test Procedures**	30 days prior to start of the AET Conversion SAT	10 days
3.10.3.1, 3.10.5.2, 3.10.7.1, 3.10.8.2, 3.13.4.13	**AET Conversion Test Reports** • **AET Conversion FAT Report (if required)** • **AET Conversion SICT Report** • **AET Conversion SAT Report**	15 days after successful completion of each AET Conversion test	10 days
Installation and Transition Package			
3.3.2, 3.13.4.2	**AET Conversion Installation Plan and Checklist**	90 days prior to AET installation	10 days
3.4.1, 3.13.4.3	**AET Conversion Transition Plan**	90 days prior to AET Conversion installation	15 days
3.8.4.1, 3.8.3, 3.13.4.6, 3.13.5.7	**AET Conversion As-Built Drawings and Updated As-Built SDDD**	10 days prior to the start of AET Conversion SAT	10 days

Appendix K. VDOT ICDs

Provided as a separate PDF Document.

The VDOT ICD documents are provided solely for the Proposer's reference and are without representation or warranty by RMTA, except where specifically stated otherwise. Proposer shall be solely responsible for the Project design and RMTA shall have no liability or obligation as a result of the design work contained in this document. This document is subject to change without notice.

Virginia Department of Transportation
E-ZPass Service Center
(Black Box)
Interface Specifications

Version 4.1

Feb 5, 2021

Revision History

Version #	Date	Change Description
Version 1.0	June 2006	Initial Release
Version 1.1	February 2007	Update to standard format
Version 2.0	May 2007	Revisions for CBBT
Version 2.1	August 2007	Grammatical revisions
Version 2.2	October 2008	3.3.4 corrected value for DST indicator
Version 3.0 – Draft	11/15/2010	Added Entry information to transaction; and converted document to Word format
Version 3.1 – DRAFT	11/18/2010	Add AVI_HOV_SWITCH_ON and status bits to tag file; add EXIT PLAZA/LANES to VSR_HEADER
Version 3.2 – DRAFT	5/2/2011	Corrected System Overview and Network Architecture section; small typos have been corrected per CBE comments; Added Appendix B – ICLP File Transfer; Added Appendix C – IITC File Transfer; Changed transfer method for transaction to use Web Service call with XML data format; added Tag Status Update File; updated Version number of AVI Status File
Version 3.3 – DRAFT	5/4/2011	Added sequence number to toll transaction; A note was

Version #	Date	Change Description
		added that all times are specific to the Eastern Time Zone.
Version 3.4 – DRAFT FINAL	5/19/2011	Removed PayMethod from transaction; added Pricing Date/Time field to transaction; add additional business rules; added unique identifier to Tag Status Update File
Version 3.5 – FINAL	5/27/2011	Revised tag status to show full tag status from file in effect at time of read; added tag file information; added business rule about tag status allowed to submit; added business rule regarding submittal of $0 transactions
Version 3.5.1 – FINAL	8/23/2011	Clarification of tags files sent to HOT Lanes will not contain Non-Revenue tags, except those in Hybrid accounts
Version 3.5.2 – FINAL	9/13/2011	Clarification of 'INVALID' tags in Tag File
Version 3.6 – FINAL	4/12/2012	Add better field definitions for the web services call to the Black Box
Version 3.7 – DRAFT	5/29/2014	-Toll Facilities not support Non-Revenue Tags need to support a internal Tag List -Backlog Transactions limited to 3 day limit

Version #	Date	Change Description
		-Non-Revenue and Hybrid not sent in ITGU files
3.8	9/21/2016	Declaration of the type of ENDIAN used in the Tag file
4.1	2/5/2021	Changed connection to ftps,changed ETC XML message to include a header field, changed ITGU, ITAG files to match IAG Spec v.1.6, removed ICLP file. Changed toll amount field type from cents to decimal for consistency with other interfaces. Removed tag region field. Added reconciliation file specification to this document rather than stand-alone

Table Of Contents

List of Tables

1 Introduction

This document describes the interface between the Virginia Department of Transportation (VDOT) E-ZPass/Smart Tag Service Center and toll systems designed to operate in the VDOT AVI toll collection system. These interface specifications (refer to as the Black Box Interface) must be used by any toll system providers wishing to set up communications with the Service Center. Questions regarding this Service Center interface should be directed to the technical support group for the VDOT EZ-Pass Customer Service Center.

1.1 System Overview

The Service Center supports an interface for all AVI toll collection systems. This interface will allow for:

1) The submittal of AVI (tag) transactions for processing (See section 3)
2) The receipt of Tag Status Files from the Service Center for all IAG Agencies, including VDOT (in a format described in this document) (see Section 4)
3) The receipt of Tag Status Update Files from the Service Center for VDOT (in a format described in this document) (see Section 5)

1.1.1 Terminology

The term "Roadway Toll System" refers to the system that belongs to a roadway agency (or other entity) that collects toll information and will send the AVI transactions to the Customer Service Center. Only one point of contact will communicate from the Roadway Toll System to the Customer Service Center. There may be redundant hardware and redundant communications lines (depending on the implementation) but there will only be one communications path to manage the flow of transactions.

1.1.2 Time Zone

All Date/Time references in this specification are for the Eastern Time Zone of the United States, and will be reflective of Daylight/Non-Daylight Savings Time. No Date/Time zone conversions will be done by the Customer Service Center. All Date/Time references in the IAG Specifications are as described in their documentation.

2 Network Architecture

The Service Center communicates with each authorized toll system using TCP/IP. Any new toll system must also communicate with the Service Center Computers using TCP/IP.

2.1 Data From Service Center to Roadway Toll System

1) The service center sends complete tag status files periodically (upon receipt of incoming IAG Tag Status File from other IAG Agencies, or generation by VDOT for VDOT accounts). Tag status files are sent for the AVI Tags supported on the E-ZPass/Smart Tag Service Center (VDOT) and the other associated IAG Service Centers in other state locations. This file is sent to the Black Box and stored in the FTPS file area for pickup by the roadway toll system. The file contains the status of every tag registered at the service center. A file is provided for the tags for each IAG system (including VDOT). The format of this file is provided later in this document. The roadway toll system must be able to receive this file and send the data on to the lane controllers.

2) The service center sends a tag status update file periodically (every 15 minutes) which contains any tags that have had a status update in the previous 15-minute period. The format of this file is provided later in this document. It is delivered to the FTPS Secure dropbox for pickup by the roadway toll system.

2.1.1 Data from Roadway Toll System to Service Center

The Black Box Interface software is designed to process multiple/multi-threaded AVI transaction from the roadway toll system at the same time. The AVI revenue transaction is processed by the Interface and logged for processing and forwarding to the Service Center. After the transaction has been logged into the Black Box, an acknowledgement/response (ACK) message to the roadway toll system software. The ACK message contains the timestamp and origination of the AVI transaction so the roadway toll system software can match the ACK message to the AVI transaction. The receipt of this ACK is the signal to the roadway toll system software to send another transaction to the interface per each thread. The formats of the AVI transaction and the associated ACK message are detailed later in this document. If no ACK is received (Time-out) the transaction should be resent.

3 Message Descriptions

All messages to and from the firewall are handled as XML messages that are transmitted through the use of a Restful Web Services call.

3.1 Interface to Submit AVI Transactions for Processing

URI: To submit new transactions:
https://<ipaddress of Black Box Interface>:443/Transactions/userObjs/
Method: POST
Media-Type: application/xml
Returned Response Code: 201 – Transaction Recorded; next transaction may be sent
412 – Precondition Failed – validation fail, returned 'error' xml
500 – Exception, connection error

3.2 Message Format

```
<?xml version="1.0" encoding="UTF-8"?>
<AVIMessage>
    <Header>
        <FacilityID></FacilityID>
        <Token></Token>
        <TimeStamp></TimeStamp>
    </Header>
    <Transaction>
        <SourceSeqNo></SourceSeqNo>
        <TransactionType></TransactionType>
        <ExitDateTime></ExitDateTime>
        <ExitPlazaID></ExitPlazaID>
        <ExitLaneID></ExitLaneID>
        <ExitLaneSeqNo></ExitLaneSeqNo>
        <EntryDateTime></EntryDateTime>
        <EntryPlazaID></EntryPlazaID>
        <EntryLaneID></EntryLaneID>
        <EntryLaneSeqNo></EntryLaneSeqNo>
        <PricingDateTime></PricingDateTime>
        <FareAxles></FareAxles>
        <TollAmount></TollAmount>
        <VehicleClass></VehicleClass>
        <NominationMethod></NominationMethod>
        <TagID></TagID>
        <TagAgency></TagAgency>
        <TagProtocol></TagStatusProtocol>
        <TagStatus></TagStatus>
        <TagHomeAgency></TagHomeAgency>
        <TagFileDateTime></TagFileDateTime>
        <Switchable></Switchable>
    </Transaction>
</AVIMessage>
```

3.2.1 Message Contents

The table below shows the contents of the message structure.

Table 3-1 AVI Transaction Header Contents

Field	Description	Field Definition	Value
FacilityID	Facility ID of the Roadway Agency. Each roadway is assigned a facility ID. (Max value 9999)	Int	> 0
Token	Token is SHA256((TimeStamp + SourceSeqNo) + "Secret Key") This ensures, that each transaction is unique. e.g: Timestamp = 20201014085422321 SourceSeqNo = 32323232 Secret = S3cr3tT3st Token = SHA256((20201014085422321 + 32323232) + S3cr3tT3st)	Char(128)	Example value: 093E207766BBF9E0C5BEE21C8A59E6EB0F63071DF8205E08EED3288497ECE98A
TimeStamp	Datetime of the creation of the transaction in format: YYYYMMDDHHMMSSFFF	Bigint	> 0

Table 3-2 AVI Transaction Contents

Field	Description	Field Definition	Value
SourceSeqNo	This is the sequence number provided by the roadway toll system. It must be sequential and is used only for the transactions sent to the Service Center.	Bigint	> 0
TransactionType	This field is used to denote the type of transaction.	Char(1)	Toll transactions: B – Barrier C – Ticketed Complete X – Ticketed Unmatched Exit
ExitDateTime	Time of AVI tolling event in the lane ("Exit Time")	Char(19)	Formatted as YYYY-MM-DD HH:MM:SS
ExitPlazaID	The Plaza ID of the Exit Event	Smallint	Provided by the Roadway Toll System. Must match Plaza ID used by VDOT CSC.
ExitLaneID	The Lane ID of the Exit Event	Tinyint	Provided by the Roadway Toll System. Must match Lane ID used by VDOT CSC.
ExitLaneSeqNo	The Lane Sequence Number of the Transaction for the Exit Event	Smallint	Provided by the Roadway Toll System. Required. Default to 0 if not used by Roadway Toll System.
EntryDateTime	Time of AVI tolling event in the lane ("Entry Time")	Char(19)	Formatted as YYYY-MM-DD HH:MM:SS If Transaction Type = B, or X, then set this field to *
EntryPlazaID	The Plaza ID of the Entry Event	Smallint	Provided by the Roadway Toll System. Must match Plaza ID used by VDOT CSC. If Transaction Type = B, or X, then set this field to *
EntryLaneID	The Lane ID of the Entry Event	Tinyint	Provided by the Roadway Toll System. Must match Lane ID used by VDOT CSC. If Transaction Type = B, or X, then set this field to *

Field	Description	Field Definition	Value
EntryLaneSeqNo	The Lane Sequence Number of the Transaction for the Entry Event	Smalint	Provided by the Roadway Toll System. If Transaction Type = B, or X, or is not used not used by Roadway Toll System then set this field to 0
PricingDateTime	Date/Time used for pricing this transaction	Char(19)	Formatted as YYYY-MM-DD HH:MM:SS (optional)
FareAxles	Forward axle count	Smallint	Varies, default should be 0
TollAmount	Toll amount as determined by lane/plaza processing. Amount to be charged to patron account by CSC.	Decimal	Varies
VehicleClass	Vehicle classification resulting from lane/plaza processing. Based on lane sensors, tag class, collector input, etc. according to business rules specific to the facility.	Tinyint	Valid vehicle classes for the facility (as determined by the roadway toll system)
NominationMethod	Nomination method code for AVI	Tinyint	0 = Normal AVI Transaction 1 = HOV AVI – Switchable Tag 2 = HOV AVI – HOV Nomination
TagID	Tag id. Supplied by lane, as read by the tag reader in the lane. The tag number here should be one of those present in the tag status file	Bigint	Varies

Field	Description	Field Definition	Value
	provided by the CSC. Max length 10 digits.		
TagAgency	Issuing authority – supplied by lane, as read by tag reader. Typically IAG agency code. Equal to TagAgencyID from IAG spec.v.1.6 (max value 9999)	Int	Per IAG specs
TagProtocol	Protocol of tag as determined by the reader	Char(3)	The tag protocol that was used to determine the TagID, if available or the protocols supported by the transponder, if available. Values: T – TDM S – SeGo 6 – 6C TS – TDM/SeGo T6 – TDM/6C S6 – SeGo/6C TS6 – TDM/SeGo/6C *** – Not Available
TagStatus	Tag status, as known by lane/plaza system at time of transaction	Char(1)	Per IAG Specs: 1 – Valid 2 – Low Balance 3 – Zero/Negative
TagHomeAgency	Tag Home Agency from the Tag file containing this Tag Status. Equal to Tag Home Agency from IAG v.1.6 spec.	Int	Per IAG specs (for example VDOT is 0010). This is the Agency that owns the account, not necessarily the Agency programmed into the tag. (max value 9999)
TagFileDateTime	Date/Time of the Tag file containing this Tag Status	Char(19)	Formatted as `YYYY-MM-DD HH:MM:SS`
Switchable	HOV status of tag	Tinyint	0 = Normal; 1 = HOV selected

3.3 Field Definition Sizes

Data type	Range	Storage
bigint	-2^63 (-9,223,372,036,854,775,808) to 2^63-1 (9,223,372,036,854,775,807)	8 Bytes
int	-2^31 (-2,147,483,648) to 2^31-1 (2,147,483,647)	4 Bytes
smallint	-2^15 (-32,768) to 2^15-1 (32,767)	2 Bytes
Tinyint	0 to 255	1 Byte

3.4 Sample Message

```
<?xml version="1.0" encoding="UTF-8"?>
<Header>
        <FacilityID>10</FacilityID>
        <Token>2afc0a24e33f70237a2a568f3a96224d</Token>
        <TimeStamp>20201014085422321</TimeStamp>
</Header>
<Transaction>
        <SourceSeqNo>12345</SourceSeqNo>
        <TransactionType>B</TransactionType>
        <ExitDateTime> 2011-05-02 23:59:59</ExitDateTime>
        <ExitPlazaID>145</ExitPlazaID>
        <ExitLaneID>12</ExitLaneID>
        <ExitLaneSeqNo>123456789</ExitLaneSeqNo>
        <EntryDateTime>*</EntryDateTime>
        <EntryPlazaID>*</EntryPlazaID>
        <EntryLaneID>*</EntryLaneID>
        <EntryLaneSeqNo>*</EntryLaneSeqNo>
        <FareAxles>2</FareAxles>

        <TollAmount>9999.99</TollAmount>
        <VehicleClass>5</VehicleClass>
        <NominationMethod>0</NominationMethod>
        <TagID>1234567890</TagID>
        <TagAgency>0010</TagAgency>
        <TagStatus>1</TagStatus>
        <TagHomeAgency>0010</TagHomeAgency>
        <TagFileDateTime>2011-05-27 10:00:01</TagFileDateTime>
        <Switchable>0</Switchable>
</Transaction>
```

3.5 Other Messages

No other messages are provided through the Black Box Interface. All messaging is now performed through the use of the Web Service calls documented above.

3.5.1 Keep Alive

This message is no longer provided by the Black Box Interface.

3.5.2 Time

It is expected that the Roadway Toll System will use the NTP time protocol to sync their servers to a timeserver provided either on their network or from the web. Time services will not be provided by the Black Box Interface. All times will be recorded in the local time of the facility.

3.6 Business Rules

1) Transactions compiled from trip data using multiple read points or gantries shall be classed as ticketed transactions (sent as TransactionType = C, ticketed complete). Only transactions that include at least one transponder read shall be sent to the Black Box. Trip transactions compiled from multiple reads that include license plate only reads at some gantries may be sent to the Black Box as long as the license plate has been positively correlated with the transponder number in at least one of the reads used to build the trip. I.e., the transaction may be sent to the Black Box as an AVI transaction if both the transponder and plate were read at one gantry and only the license plate was read at all other gantries on the trip. Transactions using other data to correlate license plates and transponders shall be sent as VToll transactions.
2) Transactions may be sent up to 30 days after transaction date/time, subject to Rule 6 below.
3) For purposes of validation against tag files, the exit date/time of the transaction will be used.
4) Transactions shall be validated against the most recent Tag Status File or Tag Status update prior to the transaction Exit Date Time.
5) Transaction processing shall use the TAG_STATUS, TAG_ACCT_INFO and TAG_AC_TYPE_IND to determine whether the transaction can be sent via the black box interface for that toll facility. The following business rules apply (see table and flow chart and end of this section for more information):
    a. If NON-REV/HYBRID bit set to 1:
        i. If the toll facility supports VDOT non-revenue accounts, transactions for tags with NON-REV/HYBRID bit set to 1 shall be sent as $0 regardless of TAG_STATUS or HYBRID bit.
        ii. If toll facility does not support VDOT non-revenue accounts and both the NON-REV/HYBRID and HYBRID bits are set to 1, the toll facility shall use the TAG_STATUS to determine if the transaction should be sent based on Rules 4) and 5) above.

iii. If toll facility does not support VDOT non-revenue accounts and the REV/HYBRID HYBRID bit is NOT set to 1 the transponder shall be treated as a TAG_STATUS = INVALID

b. If TAG_AC_TYPE_IND is R (retail) and Home Agency is 10 and the transaction is being submitted more than 24 hours after the Exit Date Time then either:
   i. The most recent tag status (ITAG or ITGU) file shall be used to determine the status of that tag before sending the transaction and rules 5.c.i. and 5.c.ii below shall apply, or
   ii. The transaction shall be submitted via the Tag VToll interface

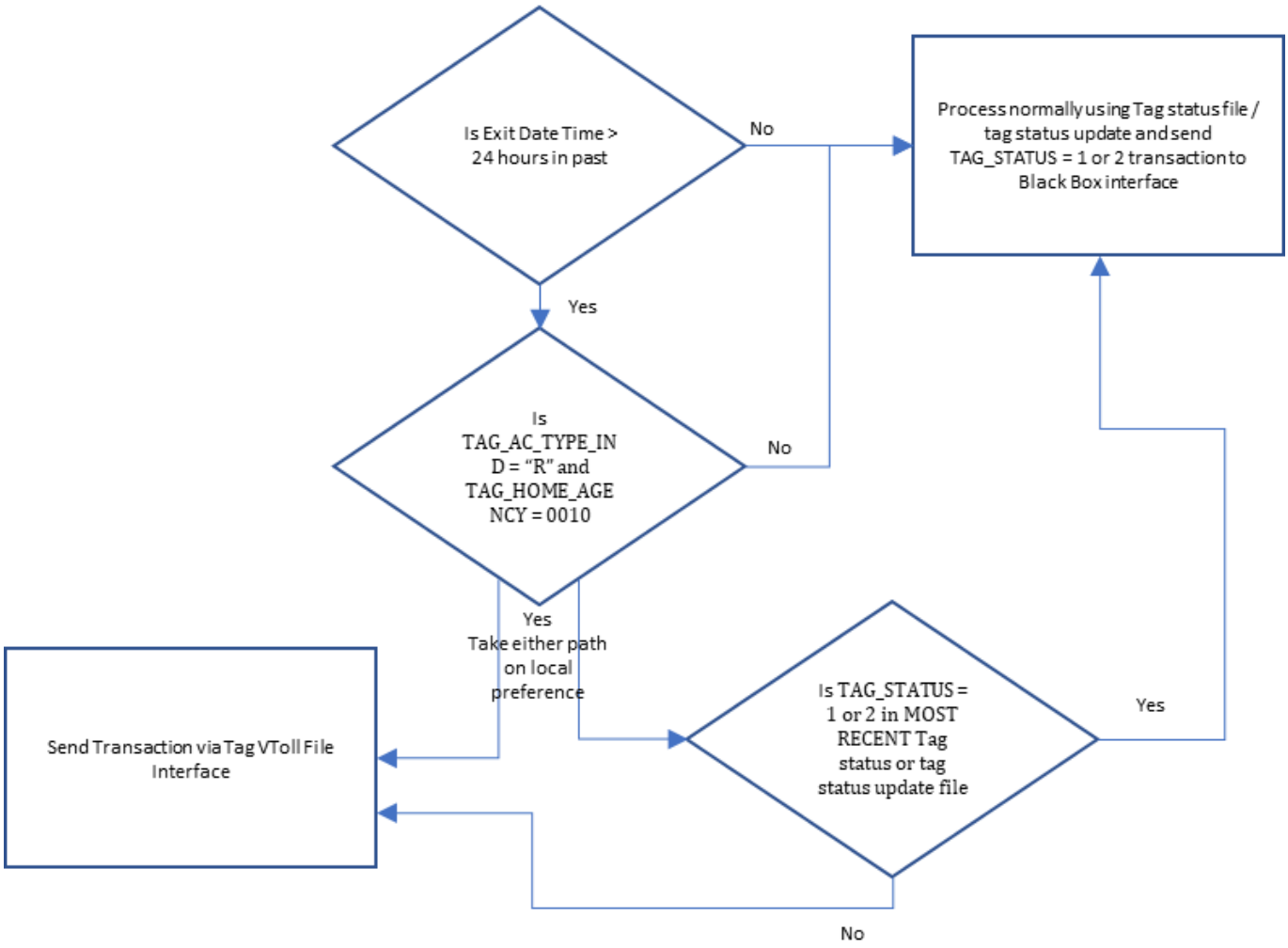
c. Transactions not falling into rules a) and b)
   i. Transactions with a value of greater than $0 (> $0) may be submitted for tag status of VALID or LOW BALANCE.
   ii. Transactions with a value of $0 (= $0) may be submitted for tag status of VALID, LOW BALANCE, and INVALID.

6) Backlog transactions can be submitted to the CSC at a rate of either 3 backlog days per one posting day or 6 transactions per transponder per one posting day. For example, if a customer uses their transponder 5 times a day, then three days of transactions can be submitted for 15 transactions per posting day. However, if the transponder is only used every other day, 6 transactions can be submitted on a single posting day that span 12 days.

The following table provides a summary of how to process a transaction with the Non-revenue bit set to 1:

	Non rev bit (Bit 15)	**Hybrid bit (Bit 16)**	**Tag status**	**How to process**
Facility accepts VDOT non rev	1	Ignore	Ignore	Send $0 transaction to CSC Interface
Facility does not accept VDOT non rev	1	0	Ignore	Process as TAG_STATUS =INVALID
	1	1	VALID or LOW BALANCE	Send to black box

The following chart illustrates how to process a delayed transaction


Is Exit Date Time > 24 hours in past
No
Process normally using Tag status file / tag status update and send TAG_STATUS = 1 or 2 transaction to Black Box interface
Yes
Is TAG_AC_TYPE_IND = "R" and TAG_HOME_AGENCY = 0010
No
Yes
Take either path on local preference
Send Transaction via Tag VToll File Interface
Is TAG_STATUS = 1 or 2 in MOST RECENT Tag status or tag status update file
Yes
No

4 ITAG Tag Status File Description

The AVI tag status files from the Service Center and the associated IAG agencies are created using the following naming convention:

<IAG #>_YYYYMMDDHHMMSS_ITAG.ZIP

Where:

IAG # is the Issuing Authority number assigned by the IAG network, 4 digits e.g: 0010 for VDOT
YYYYMMDDHHMMSS is the time stamp of the ITAG tag status file. The timestamp of the ITAG status file is in UTC for all agencies.

4.1 ITAG Tag Status File Structures and Definitions

The following describes the ITAG tag status file structure.

Table 4-1 Tag Status file Definition Header

Tag Status File – Header Structure		
Field Name	**Type/Size**	**Description/Valid Values**
FILE_TYPE	CHAR(4)	ITAG
VERSION	CHAR(8)	File format/content version. Format: ##.##.##
FROM_AGENCY_ID	CHAR(4)	Standard agency ID code of the Home Agency/CSC (See Appendix A)
FILE_DATE	CHAR(8)	Date file created. Format: YYYYMMDD
FILE_TIME	CHAR(6)	Time file created: Format: HHMMSS
RECORD_COUNT	CHAR(10)	Count of all tags in file. Does not include header record. Values: 0000000000 – 9999999999
COUNT_STAT1	CHAR(10)	Count of all tags with status code 1. Values: 0000000000 – 9999999999
COUNT_STAT2	CHAR(10)	Count of all tags with status code 2. Values: 0000000000 – 9999999999
COUNT_STAT3	CHAR(10)	Count of all tags with status code 3. Values: 0000000000 – 9999999999
DELIMITER	CHAR(1)	LF
Header Total	**71**	

Table 4-2 AVI Tag Status file Definition Tag

Tag Status File - Detail Structure		
Field Name	**Type/ Size**	**Description/Valid Values**
TAG_AGENCY_ID	CHAR(4)	The agency ID encoded on the transponder. Values: 0000 – 9999
TAG_SERIAL_NUMBER	CHAR(10)	The serial number encoded on the transponder. Values: 00000001 – 9999999999

Tag Status File - Detail Structure		
Field Name	**Type/ Size**	**Description/Valid Values**
TAG_STATUS	CHAR(1)	1 – Valid 2 – Low Balance 3 – Zero/Negative Balance (tag is not valid for use and will not be honored by the Home Agency/CSC. However, the tag may become valid again in a future ITAG file). 4 – Invalid (tag will not be honored by the Home Agency/CSC)
TAG_ACCT_INFO	CHAR(6)	A string of 24 bits (3 characters) converted to Hex-ASCII format (6 characters). The 24 bits represent the following: Bit 1 (rightmost bit): E-ZPass Plus - Parking status 1 – Tag is valid for E-ZPass Plus parking applications 0 – Tag is NOT valid for E-ZPass Plus parking applications Bit 2 – 23: Discount bits 1 – Tag has associated discount plan 0 – Tag does not have associated plan Plan bits are defined as follows: Bit 2: PANYNJ Staten Island Bridges Bit 3: PANYNJ Green Discount Bit 4: PANYNJ Carpool Bit 5: PANYNJ Non-revenue Bit 6: NYSBA Discount Bit 7: Reserved Bit 8: Reserved Bit 9: Reserved Bit 10: MTA Rockaway Resident Bit 11: MTA Staten Island Resident Bit 12: DRPA Discount Bit 13: SJTA Discount Bit 14: NJHA Bus Discount Bit 15: NON-REV/HYBRID Account Type (VDOT E-ZPass Specific) Bit 16: HYBRID (VDOT E-ZPass Specific) Bits 17 – 23: Reserved (must be set to zero) Bit 24 (leftmost bit): E-ZPass Plus - Non-Parking status 1 – Tag is valid for E-ZPass Plus non-parking applications 0 – Tag is NOT valid for E-ZPass Plus non-parking applications Note that at this time, Bit 24 should be set to 0.
TAG_HOME_AGENCY	CHAR(4)	The ID assigned to the Home Agency. This is the Agency/CSC that manages the customer account to which toll charges may be posted. Values: 0000 - 9999

Tag Status File - Detail Structure		
Field Name	**Type/ Size**	**Description/Valid Values**
TAG_AC_TYPE_IND	CHAR(1)	Used to denote the account type to aid Away Agencies/CSCs in processing transactions and researching processing issues. Note that in some cases, based on Home Agency/CSC business rules, more than one of the values below may be applicable. In such a case, it is up to the Home Agency/CSC to determine the most relevant value. Values: B – Business/Commercial account with a large number of vehicles (where large is defined by Home Agency/CSC business rules) F – Fleet account (e.g., rental car, etc.) where there is a potential that the same transponder (or license plate) could be temporarily placed on another account or also exist on an account local to the Away Agency/CSC P – Private account with a small number of vehicles (where small is defined by Home Agency/CSC business rules) V – Violation avoidance account with a large number of license plates and a small number of transponders (if any) used to generate I-Tolls in place of violations or video toll invoices R – Retail transponder that has not yet been registered or is not active when sold. * – Account type is unknown/not available
TAG_ACCOUNT_NO	CHAR(50)	The unique account number at the Home Agency/CSC of the associated tag data. Must be provided for all E-ZPass Home Agencies. May not be provided for all NIOP agencies. If not available/provided, will be filled with asterisks (*).
TAG_PROTOCOL	CHAR(3)	The protocol(s) supported by the transponder. Values: T – TDM S – SeGo 6 – 6C TS – TDM/SeGo T6 – TDM/6C S6 – SeGo/6C TS6 – TDM/SeGo/6C *** – Not Available Note: If a transponder supports multiple protocols and the TAG_AGENCY_ID/TAG_SERIAL_NUMBER combination differs between protocols, there will be one record in the ITAG file for each unique combination of TAG_AGENCY_ID/ TAG_SERAL_NUMBER used by the transponder. Note: Any linkage of the multiple records would be done via a manifest file provided by the transponder manufacturers and is outside the purview of this specification.
TAG_TYPE	CHAR(1)	The type of transponder. Values: F – Feedback G – Feedback and Switchable S – Switchable T – Sticker * – Not Available
TAG_MOUNT	CHAR(1)	The typical mounting location of the transponder: Values: I – Interior L – License Plate R – Roof Mount H – Headlamp V – Vehicle Integrated * – Not Available

Tag Status File - Detail Structure		
Field Name	**Type/ Size**	**Description/Valid Values**
TAG_CLASS	CHAR(4)	The IAG class expected to be encoded in the transponder. See Appendix C for value values. **** if not available.
DELIMITER	CHAR(1)	LF
Record Total	**86**	

5 Tag Status Update File

5.1 Tag Status Update File Type:

Flat File

5.2 Tag Status Update File Name:

<IAG #>_YYYYMMDDHHMMSS_ITGU.ZIP

IAG # is the Issuing Authority number assigned by the IAG network, 4 digits e.g: 0010 for VDOT

Example: 0010_19971201001015_ITGU.ZIP

5.3 Tag Status Update File Use:

The Tag Status Update File is created by the Customer Service Center to inform Roadway Toll System as to the updated status of particular new and/or existing tags associated with an account held by the VDOT E-ZPass CSC only. It is based on the same file format as the ITAG Tag Status file definition.

5.4 Tag Status Update File Layout:

Please refer to section **4.1** for the detail of the file layout. The layout is the same as ITAG file definition.

5.5 Processing Requirements:

1. This file is sent in differential format, which means that it includes all changes made since the last Tag Status Update File was sent.

2. Frequency of this file could be as often as every 15 minutes.

3. File size should be negligible since the file will primarily be used to inform the Roadway Toll Systems of updated tag information on an as needed basis.

4. If there are no updates, no file will be sent.

6 Toll Reconciliation Response File

6.1 Toll Reconciliation Response File Content

The following detail fields are included in Toll Reconciliation Response File:

- Source Sequence Number
- Original Toll Amount
- CSC Transaction Sequence ID
- Transaction Posting Date
- Collected Revenue
- Posting Status

6.2 Toll Reconciliation Response File Naming

The Toll Reconciliation Response File is named according to the following convention:

TRECON[AgencyID]_[FileDateTime].XML
TRECON – Is the Toll Reconciliation Response File
AgencyID – Identification of the Agency receiving this reconciliation file
FileDateTime – Is the FileDateTime

Example: For a Toll Reconciliation Response File created at 00:43:21 on November 31, 2006 for agency 002, the name of the file would be TRECON002_20061131004321.XML.

6.3 Toll Reconciliation Response File Use

The *Toll Reconciliation Response File is* transmitted from the VDOT Customer Service Center (CSC) to the VTFG Agencies that provides the transaction posting status for transactions submitted through the AVI message via the web service call that received a Returned Response Code = 201. The file will be generated daily for the prior posting day.

6.4 Toll Reconciliation Response File Layout

The Toll Reconciliation Response File uses XML formatting as defined below.

```
<TRECONFile_1.0>
        <HEADER>
                <RevenueDate></RevenueDate>
                <TransactionCount></TransactionCount>
                <ExpectedSum></ExpectedSum>
                <CollectedSum></CollectedSum>
        </HEADER>
        <TRECON>
                <SourceSeqNo></SourceSeqNo>
                <TollAmount></TollAmount>
                <TransSeqID></TransSeqID>
                <TransPostingDate></TransPostingDate>
                <CollectedRevenue></CollectedRevenue>
                <PostingStatus></PostingStatus>
        </TRECON>
        …
        <FOOTER></FOOTER>
</TRECONFile_1.0>
```

6.5 Toll Reconciliation Response File Data Elements

6.5.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <TRECONFile_1.0>.

6.5.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 2-1 are the data elements for the <Header> record in a Toll Reconciliation Response File.

Table 6-1 Data Elements for the <HEADER> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
RevenueDate	Yes	Char(10)	Revenue Date for the transactions contained in this File. Formatted as YYYY-MM-DD
TransactionCount	Yes	Int	Number of Transaction records in the file.
ExpectedSum	Yes	Decimal	Total summation of the Toll Amount field for all Transaction records in this file.
CollectedSum	Yes	Decimal	Total summation of the Revenue Collected field for all Transaction records in this file.

6.5.3 Toll Reconciliation Response Data

Each transaction record will be contained within a <TRECON> record. Listed in Table 2-2 are the data elements for the <TRECON> record.

Table 6-2 Data Elements for the <TRECON> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
SourceSeqNo	Yes	Int	Original Sequence Number of the

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			transaction provided by the roadway toll system.
TollAmount	Yes	Decimal	Expected Transaction Amount.
TransSeqID	Yes	Int	The Transaction Sequence ID assigned by the CSC.
TransPostingDate	Yes	Int	Transaction Posting Date assigned by the CSC. Formatted as YYYYMMDD
CollectedRevenue	Yes	Decimal	Amount of the revenue collected, if the transaction has a POST, PPST, or NPST status. Any other posting status will have Collected Revenue of 0.
PostingStatus	Yes	Char(4)	POST – Toll transaction posted successfully via tag. INSU – Rejected, account has insufficient funds where transaction date/time (ETC_EXIT_DATE/ ETC_EXIT_TIME) is greater than date/time of Tag Status File that indicated that the tag was in Negative Balance status. OLD1 - Rejected, old transaction – account closed. The difference between the date of the transaction and the date the transaction was received by the CSC exceeded that specified in the Black Box Interface Specification or the IAG Reciprocity Agreement under Account Settlement Process for Valid Tag Transactions when accounts are closed. OLD2 - Rejected, old transaction – other. The difference between the date of the transaction and the date the transaction was

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			received by the CSC exceeded that specified in the Black Box Interface Specification or the IAG Reciprocity Agreement under Account Settlement Process for Valid Tag Transactions when accounts are not closed. ACCB – Rejected, account in bad status (revoked, closed, etc.) where transaction date/time (ETC_EXIT_DATE/ ETC_EXIT_TIME) is greater than date/time of Tag Status File that indicated that the tag was in an Invalid status. RINV - Rejected, the transaction contains invalid data. TAGB – Rejected, tag in bad status (e.g., lost, stolen, etc.) where transaction date/time (ETC_EXIT_DATE/ ETC_EXIT_TIME) is greater than date/time of Tag Status File that indicated that the tag was in a Lost/Stolen status. RJDP - Rejected, duplicate transaction. Usually associated with a skip read or cross lane read where a tagged transaction and license plate transaction exist for the same customer at the same plaza within forty-five (45) seconds. RJTA - Rejected due to toll amount exceeding the configured maximum amount.

6.5.4 Footer

Each file will contain a footer record with no required data elements.

7 File Transfer Requirements:

1. All files shall be compressed (ZIPped) using a standard Lempel-Zif compression algorithm that should yield a compression rate of at least 75% (meaning a file will be reduced so that it is only 25% of its original size).
2. When compressed, file names shall be converted from {FILE_NAME}.{FILE_TYPE} to {FILE_NAME}_{FILE_TYPE}.ZIP and all files names shall be created using uppercase characters only. Therefore, when file "0010_20061131004321_.ITGU" is compressed, the compressed file shall be named "0010_20061131004321_.ITGU .ZIP".
3. Files will be fully created, and zipped before being made available on the FTPS server section of the Black Box interface.
4. The FTPS space using this service is divided into 'IN' and 'OUT' subdirectories.
5. All files being delivered by the Roadway Toll System (when required) will be dropped off into the 'IN' subdirectory.
6. When transferring the .ZIP files to the FTPS server, rename the extension from .ZIP to .ZAP before transferring the file. Then transfer the file to the FTPS site. The .ZAP extension tells the receiving code that a file transfer is in progress and do not process this file.
7. When the file transfer has been completed, change the file extension back to .ZIP for the file just delivered to the FTPS server. This lets the receiving code know that the file can now be processed.
8. The process described in 6) and 7) are also used by the CSC when delivering response files to the 'OUT' subdirectory. Never pick up a file with the .ZAP extension.
9. If a file has been delivered to the 'IN' subdirectory, and the receiving code determines that there is a problem between the header data and the contents of the file, the original file will have a .bad extension added to it, and will then be placed in the 'OUT' subdirectory.
10. The CSC receiving code will be responsible for keeping the 'IN' subdirectory cleaned out of all processed files.
11. The using Roadway Toll System is responsible for cleaning out the 'OUT' subdirectory after receiving the response and .bad files.

8 Appendix A - Glossary

AVI	Automatic Vehicle Identification
AVI Tag Status File	A file that describes the current status of the AVI Tags addressed by the Service Center.
AVI Transaction	A valid transaction using a valid transponder
Firewall/Black Box Interface	A combination of hardware and software designed to collect and store transactions from toll facilities. The Service Center places the AVI Tag File in a public folder on the interface for retrieval by the toll system.
IAG	InterAgency Group. A consortium of tolling agencies that cooperate to allow patrons to use their AVI tags on toll roads operated by its members. For more information, see their web site at http://www.e-zpass.info/index.htm
Plaza	When used alone, it refers to the hardware and software used at the main collection point in its entirety. For example, “plaza” in the sentence ‘The “plaza” must communicate with the Service Center using TCP/IP.’ refers to the hardware, software and networking at the main toll collection point. It is often used in combination with other descriptors such as “plaza software”, “plaza hardware”, “plaza communications”, etc.
Service Center	The VDOT E-ZPass Service Center where E-ZPass transactions are debited from a patron’s account and credited to the Toll Road’s account or forward to Away agencies if the account is managed by a different back-office. The E-ZPass Service Center is also responsible for replenishing E-ZPass accounts and transmitting a list of valid tags to the Virginia Toll Roads and Away Agencies.
VDOT	Virginia Department of Transportation

IAG Reconciliation Response File Interface

Virginia Toll Facilities Group – VDOT CSC

Specifications

Version 1.1

Oct 14, 2020

Revision Status

Date	Version Number	Responsible Party	Comments
July 8, 2019	1.0	Khizer Ansari	Final initial version for distribution
Oct, 14, 2020	1.1	VDOT	Changed Connection type to FTPS

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List of Tables

1 Introduction

The *IAG Reconciliation Response File Interface – VTFG - VDOT CSC - Specifications* document defines the format for the file that will be transmitted from the VDOT Customer Service Center (CSC) to the VTFG Agencies. This file provides an updated reconciliation status for Away Agency transactions once they have been processed by that Away Agency. This will allow a toll facility to pursue customers whose transactions were rejected due to insufficient funds or account closure.

2 IAG Reconciliation Response File

2.1 IAG Reconciliation Response File Content

The following detail fields are included in IAG Reconciliation Response File:

- Source Sequence Number
- Original Toll Amount
- CSC Transaction Sequence ID
- Transaction Posting Date
- Collected Revenue
- Posting Status

2.2 IAG Reconciliation Response File Naming

The IAG Reconciliation Response File is named according to the following convention:

IRECON [AgencyID]_[FileDateTime].XML
IRECON – Is the IAG Reconciliation Response File
AgencyID – Three digit identification of the VTFG Agency receiving this reconciliation file
FileDateTime – Is the FileDateTime in the format YYYMMDDHHMMSS

Example: For an IAG Reconciliation Response File created at 00:43:21 on November 31, 2019 for agency 002, the name of the file would be IRECON002_20191131004321.XML.

2.3 IAG Reconciliation Response File Layout

The IAG Reconciliation Response File uses XML formatting as defined below.

```
<IRECONFile_1.0>
        <HEADER>
                <RevenueDate></RevenueDate>
                <TransactionCount></TransactionCount>
                <ExpectedSum></ExpectedSum>
                <CollectedSum></CollectedSum>
        </HEADER>
        <IRECON>
                <SourceSeqNo></SourceSeqNo>
                <TollAmount></TollAmount>
                <TransSeqID></TransSeqID>
                <TransPostingDate></TransPostingDate>
                <CollectedRevenue></CollectedRevenue>
                <PostingStatus></PostingStatus>
        </IRECON>
        …
        <FOOTER></FOOTER>
</IRECONFile_1.0>
```

2.4 IAG Reconciliation Response File Data Elements

2.4.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <IRECONFile_1.0>.

2.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 2-1 are the data elements for the <Header> record in an IAG Reconciliation Response File.

Table 2-1 Data Elements for the <HEADER> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
RevenueDate	Yes	Char(10)	Revenue Date for the transactions contained in this File. Formatted as YYYY-MM-DD
TransactionCount	Yes	int	Number of Transaction records in the file.
ExpectedSum	Yes	Decimal	Total summation of the Toll Amount field (requested toll) for all Transaction records in this file.
CollectedSum	Yes	Decimal	Total summation of the Revenue Collected field (posted toll) for all Transaction records in this file.

2.4.3 IAG Reconciliation Response Data

Each transaction record will be contained within a <IRECON> record. Listed in Table 2-2 are the data elements for the <IRECON> record.

Table 2-2 Data Elements for the <IRECON> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
SourceSeqNo	Yes	Bigint	Original Sequence Number of the transaction provided by the roadway toll system.
TollAmount	Yes	Decimal	Expected Transaction Amount.
TransSeqID	Yes	Int	The Transaction Sequence ID assigned by the CSC for the original transaction.
TransPostingDate	Yes	Int	Transaction Posting Date assigned by the CSC as the date the transactions reconciliation was processed from the Away Agency. Formatted as YYYYMMDD
CollectedRevenue	Yes	Decimal	Amount of the revenue collected, if the transaction has a POST, PPST, or NPST status. Any other posting status will have Collected Revenue of 0.

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
PostingStatus	Yes	Char(4)	The result of the Away Agency CSC's attempt to post the transaction. Values: for Toll transactions: POST – Toll transaction posted successfully via tag. PPST – Toll transaction posted successfully via license plate. INSU – Rejected, account has insufficient funds where transaction date/time (ETC_EXIT_DATE/ ETC_EXIT_TIME) is greater than date/time of acknowledgement from that Away Agency/CSC of receipt of full Tag Status File which indicated that the tag was in an Invalid status. See Invalid Tag Customer File for associated name/address information. RJPL - Rejected license plate transaction. The license plate transaction could not be posted. OLD1 - Rejected, old transaction – account closed. The difference between the date of the transaction and the date the transaction was received by the Home Agency/CSC exceeded that specified in the Reciprocity Agreement under Account Settlement Process for Valid Tag Transactions when accounts are closed. OLD2 - Rejected, old transaction – other. The difference between the date of the transaction and the date the transaction was received by the Home Agency/CSC exceeded that specified in the Reciprocity Agreement under Account Settlement Process for Valid Tag Transactions when accounts are not closed. ACCB – Rejected, account in bad status (revoked, closed, etc.) where transaction date/time (ETC_EXIT_DATE/ ETC_EXIT_TIME) is

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			greater than date/time of acknowledgement from that Away Agency/CSC of receipt of full Tag Status File which indicated that the tag was in an Invalid status. See Invalid Tag Customer File for associated name/address information. RINV - Rejected, the transaction contains invalid data (e.g., invalid agency as defined in Appendix A, invalid plaza as defined in Appendix B, invalid class as defined in Appendix C, etc.). TAGB – Rejected, tag in bad status (e.g., lost, stolen, etc.) where transaction date/time (ETC_EXIT_DATE/ ETC_EXIT_TIME) is greater than date/time of acknowledgement from that Away Agency/CSC of receipt of full Tag Status File which indicated that the tag was in a Lost/Stolen status. RJDP – Rejected, duplicate transaction. Usually associated with a skip read or cross lane read where a tagged transaction and license plate transaction exist for the same customer at the same plaza within one (1) minute. The license plate transaction is rejected as the duplicate. RJTA – Rejected due to toll amount exceeding the configured maximum amount. Note: the VTFG Agency can consider pursuing collection on all reject transactions except those rejected as RJDP. OLD transactions may be subject to additional business rules regarding collection that are outside of this specification.

2.4.4 Footer

Each file will contain a footer record with no required data elements.

3 General File Requirements

1) All files shall be compressed (ZIPped) using a standard Lempel-Zif compression algorithm which should yield a compression rate of at least 75% (meaning a file will be reduced so that it is only 25% of its original size).
2) When compressed, file names shall be converted from {FILE_NAME}.{FILE_TYPE} to {FILE_NAME}_{FILE_TYPE}.ZIP and all files names shall be created using uppercase characters only. Therefore, when file "IRECON002_20061131004321.XML" is compressed, the compressed file shall be named "IRECON002_20061131004321_XML.ZIP".
3) Files will be fully created, and zipped before being made available on an FTPS server.
4) The FTPS account space for each agency using this service is divided into 'IN' and 'OUT' subdirectories.
5) All files being delivered by the CSC will be dropped off into the 'OUT' subdirectory.
6) When transferring the .ZIP files to the FTPS server, rename the extension from .ZIP to .ZAP before transferring the file. Then transfer the file to the FTPS site. The .ZAP extension tells the receiving code that a file transfer is in progress and do not process this file.
7) When the file transfer has been completed, change the file extension back to .ZIP for the file just delivered to the FTPS server. This lets the receiving code know that the file can now be processed.
8) The using Agency is responsible for cleaning out the 'OUT' subdirectory after receiving the response and .bad files.
9) The connection made to the FTPS server is made with FTP with TLS/SSL Explicit Encryption to host ftps.ezpassva.com (ftps-uat.ezpassva.com for testing) over port 21. The communication will be secured on the transport layer via *.ezpassva.com publicly valid certificate. The FTPS server will have a white-list of ip addresses which it will accept connections from, each roadway is required to provide a list of IP addresses.

4 Business Rules

1) A reconciliation file will be sent every day, seven days a week.
2) A reconciliation file will be sent will zero detail records when no IAG responses are received from the IAG network for a facility. There will be a header record.
3) The period cover by the reconciliation file will be for the previous day (all transaction reconciliations received from Away Agencies for the previous day from midnight to midnight).
4) The file will be delivered after 2AM (Eastern Time).
5) IRECON file's posting status will update the TRECON file posting status for all Away Agency (nonagency 10) ETC transactions that originally were reconciled in the TRECON as a POST) transaction.
6) IRECON file's posting status will supersede the VTOLL response file (R files) posting status for all Away Agency (non-agency 10) VTOLL transactions.
7) IRECON file's will not contain IAG VTOLL recon status for any toll facility that uses VDOT to process Image Base Tolls. (Violations Processing Services)
8) IRECON will only respond to Away Agency (non Agency 10) transactions
9) The timing of the final reconciliation of a transaction will depend upon the Away Agency. Each Away transaction originally reconciled as a POST will eventually receive an updated reconciliation status, this would normally occur with a few days of transaction submission to the CSC.

Toll Corrections File Interface

Virginia Toll Facilities Group – VDOT CSC

Specifications

Version 1.8

Dec21, 2020

Revision Status

Date	Version Number	Responsible Party	Comments
5/6/2011	V1.0 - DRAFT	FSTech	Initial Draft
5/19/2011	V1.1 – DRAFT FINAL	FSTech	Add correction reasons the same as IAG; add file delivery timing; add business rules section; add note about posted to IAG queue; allow full transaction modification.
5/27/2011	V1.2 – FINAL	FSTech	Cleaned up XML to match table definitions
5/6/2012	V1.3 – FINAL	FSTech	Added codes for Agency Incentive Corrections to CorrectionReason; Added to Business Rules that Toll Corrections can be made to VTolls; Added VToll Correction File and VToll Correction Reconciliation File
7/6/2012	V1.4 – FINAL	FSTech	Minor Corrections
10/9/2012	V1.5 – FINAL	3M	Corrections for VToll file layout
11/22015	V.1.6 – FINAL	Faneuil (OP)	Changed TollAmount value from cents to Dollars
2/22/2019	V.1.7 - Final	VDOT(OP)	Changed Transpostingdate format to YYYYMMDD
12/21/2020	V.1.8	VDOT	Changed connection to ftps, changed description for Tag Authority and Tag File Agency Updated field type definitions for consistency Removed tag region field

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List of Tables

1 Introduction

The *Toll Corrections File Interface – VTFG to VDOT CSC - Specifications* document defines the formats for the files that shall be transmitted between the VTFG agencies and the VDOT Customer Service Center (CSC) required to process correction of toll transactions.

1.1 Interface Files

The interface files defined are:

File Name	File Usage
Toll Correction File (see Section 2)	Created by the VTFG agency to inform the CSC of all toll corrections being requested.
Toll Correction Reconciliation File (see Section 3)	Created by the CSC to inform the VTFG agency as to the disposition of toll corrections processed by the CSC as requested by the VTFG agency.
VToll Correction File (see Section 4)	Created by the VTFG agency to inform the CSC of all VToll corrections being requested.
VToll Correction Reconciliation File (see Section 5)	Created by the CSC to inform the VTFG agency as to the disposition of VToll corrections processed by the CSC as requested by the VTFG agency.

1.2 Toll Correction Example

1) A transaction received by the VDOT CSC contains a collected fare of $1.50.
2) The toll facility determines that the toll amount (for whatever the reason) should be $1.00. The toll facility prepares a Toll Correction File (TCF) with the correct fare of $1.00 for the transaction. The original TransSeqID assigned by the VDOT CSC is included for each transaction contained in the Toll Correction File (TCF) prepared by the facility.
3) The Toll Correction File (TCF) is processed and upon finding a match between the TransSeqID in the TCF and the original transaction with the same TransSeqID in the CSC database, the system creates a reversing transaction of +$1.50 (i.e., a $1.50 credit to the account). This is followed by a correcting transaction of -$1.00 (i.e., a $1.00 debit to the account).
4) The original transaction, the reversing transaction, and the correcting transaction are all tracked by the system and logically linked together within the CSC database.
5) A Toll Correction Reconciliation File is produced for all of the corrections processed and returned with a posting status for each correction.
6) The reversing and correcting transactions will also appear on the Disbursement Report for their day of processing.

NOTE: Corrections may be applied to transactions only one time. Any successfully corrected transactions may not be corrected again. If the correction is not successful, the failed correction transaction will be placed in the exception table and appear on the Exception Report as a 'FAILED CORRECTION.'

1.3 VToll Correction Example

1) A VToll by the VDOT CSC contains a collected fare of $1.50.
2) The toll facility determines that the toll amount (for whatever the reason) should be $1.00. The toll facility prepares a VToll Correction File (VTC) with the correct fare of $1.00 for the transaction. The original TransSeqID assigned by the VDOT CSC is included for each transaction contained in the VToll Correction File (VTC) prepared by the facility.
3) The VToll Correction File (VTC) is processed and upon finding a match between the TransSeqID

in the VTC and the original vtoll with the same TransSeqID in the CSC database, the system creates a reversing vtoll of +$1.50 (i.e., a $1.50 credit to the account). This is followed by a correcting vtoll of -$1.00 (i.e., a $1.00 debit to the account).

4) The original vtoll, the reversing vtoll, and the correcting vtoll are all tracked by the system and logically linked together within the CSC database.
5) A VToll Correction Reconciliation File is produced for all of the corrections processed and returned with a posting status for each correction.
6) The reversing and correcting vtolls will also appear on the Disbursement Report for their day of processing.

NOTE: Corrections may be applied to vtolls only one time. Any successfully corrected vtolls may not be corrected again. If the correction is not successful, the failed correction vtoll will be placed in the exception table and appear on the Exception Report as a 'FAILED CORRECTION.'

2 Toll Correction File

2.1 Toll Correction File Content

The following detail fields are included in Toll Correction File:

- The transaction sequence ID for the wrong-fare transaction
- The transaction posting date for the wrong-fare transaction
- The original fare amount for the wrong-fare transaction
- The correct fare amount

2.2 Toll Correction File Naming

The Toll Correction File is named according to the following convention:

TCF[FacilityID]_[FileDateTime].XML
TCF – Is the Toll Correction File
FacilityID – Is the Facility ID
FileDateTime – Is the FileDateTime

Example: For a Toll Correction File created by Agency 002 at 00:43:21 on November 31, 2006, the name of the file would be TCF002_20061131004321.XML.

2.3 Toll Correction File Layout

The Toll Correction File uses XML formatting as defined below.

```
<TollCorrectionFile_1.0>
    <Header>
        <FacilityID></FacilityID>
        <FileID></FileID>
        <FileDateTime></FileDateTime>
        <TransactionCount></TransactionCount>
        <OriginalSum></OriginalSum>
    </Header>
    <DetailData>
        <Transaction>
            <TransSeqID></TransSeqID>
            <TransPostingDate></TransPostingDate>
            <OriginalTollAmount> </OriginalTollAmount>
```

```
                <CorrectionReason></CorrectionReason>
                <TransactionType></TransactionType>
                <ExitDateTime></ExitDateTime>
                <ExitPlazaID></ExitPlazaID>
                <ExitLaneID></ExitLaneID>
                <ExitLaneSeqNo></ExitLaneSeqNo>
                <EntryDateTime></EntryDateTime>
                <EntryPlazaID></EntryPlazaID>
                <EntryLaneID></EntryLaneID>
                <EntryLaneSeqNo></EntryLaneSeqNo>
                <PricingDateTime></PricingDateTime>
                <FareAxles></FareAxles>
                <TollAmount></TollAmount>
                <VehicleClass></VehicleClass>
                <NominationMethod></NominationMethod>
                <TagID></TagID>
                <TagAgency></TagAgency>
                <TagStatus></TagStatus>
                <TagHomeAgency></TagHomeAgency>
                <TagFileDateTime></TagFileDateTime>
                <Switchable></Switchable>
            </Transaction>
…
        </DetailData>
        <Footer></Footer>
</TollCorrectionFile_1.0>
```

2.4 Toll Correction File Data Elements

2.4.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <TollCorrectionFile_1.0>.

2.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 2-1 are the data elements for the <Header> record in a Toll Correction File.

Table 2-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	Smallint	Facility ID providing this data file. . Match to the number used by the VDOT CSC.
FileID	Yes	Int	Unique Identifier for this file. To help with tracking the files and associating them with sets of corrections. Ideally, an ascending sequence starting with 1, unique within the facility. Not necessarily contiguous (to allow for files that are generated but not submitted)
FileDateTime	Yes	Char(19)	Date/Time this file was created. Formatted as

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	Int	Number of Transaction records in the file.
OriginalSum	Yes	Decimal	Total summation of the OriginalTollAmount field in all Transaction records in this file.

2.4.3 Detail Data

Each transaction record will be contained within a <Transaction> record. Listed in Table 2-2 are the data elements for the <Transaction> record.

Table 2-2 Data Elements for the <Transaction> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransSeqID	Yes	Int	Transaction Sequence Number for the transaction to be adjusted
TransPostingDate	Yes	Char(8)	Transaction Posting Date of the transaction that is to be adjusted. Formatted as YYYYMMDD If this value exist, then TransSeqID is mandatory.
OriginalTollAmount	Yes	Decimal	Original Transaction Amount to be corrected
CorrectionReason	Yes	Tinyint	A code denoting the reason for the correction. Values: 01 – Resolved mismatch: class/toll corrected 02 – Ignore license plate transaction 03 – Ignore tagged transaction 04 – Corrected plaza/lane information 05 – Corrected toll 06 – 09 – RESERVED FOR FUTURE USE 10 – 495 Express Lanes Incentive 11 – Elizabeth River Incentive
TransactionType	Yes	Char(1)	Type of Transaction – per Black Box Specs

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
ExitDateTime	Yes	Chart(19)	Date/Time of the Exit event – per Black Box specs
ExitPlazaID	Yes	Smallint	Plaza ID of the Exit event – per Black Box specs
ExitLaneID	Yes	Tinyint	Lane ID of the Exit event – per Black Box specs
ExitLaneSeqNo	Yes	Int	Lane Sequence Number of the transaction for the Exit event – per Black Box specs
EntryDateTime	Yes	Chart(19)	Date/Time of the Entry event – per Black Box specs
EntryPlazaID	Yes	Smallint	Plaza ID of the Entry event – per Black Box specs
EntryLaneID	Yes	Tinyint	Lane ID of the Entry event – per Black Box specs
EntryLaneSeqNo	Yes	Int	Lane Sequence Number of the transaction for the Entry event – per Black Box specs
PricingDateTime	No	Chart(19)	Date/Time used to price this transaction – per Black Box specs
FareAxles	Yes	Tinyint	Forward axle count – per Black Box specs
TollAmount	Yes	Decimal	Toll amount dollars. e.g (twelve dollars) 12.00
VehicleClass	Yes	Tinyint	Vehicle classification resulting from lane/plaza processing. Based on lane sensors, tag class, collector input, etc. according to business rules specific to the facility – per Black Box Specs
NominationMethod	Yes	Tinyint	Nomination method code for AVI – Per Black Box Specs
TagID	Yes	Bigint	Tag id – supplied by lane, as read by the tag reader. Tag number should be one of those present in the tag status file provided by the CSC.
TagAgency	Yes	Int	Equal to TagAgencyID from IAG spec.v.1.6 (max value 9999)
TagStatus	Yes	Char(1)	Tag status, as known by lane/plaza system at time of transaction per IAG Specs: 1 – Valid

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			2 – Low Balance 3 – Zero/Negative
TagHomeAgency	Yes	Int	Agency ID from the Tag file containing this Tag Status. Tag File Agency is equal to Home Agency ID from IAG v.1.6 spec. (max value 9999)
TagFileDateTime	Yes	Char(19)	Date/Time of the Tag file containing this Tag Status. Formatted as YYYY-MM-DD HH:MM:SS
Switchable	Yes	Tinyint	HOV Status of Tag – Per Black Box Specs

2.4.4 Footer

Each file will contain a footer record with no required data elements.

3 Toll Correction Reconciliation File

3.1 Toll Correction Reconciliation File Content

The following detail fields are included in Toll Correction Reconciliation File:

- OriginalTransSeqID
- OriginalTransPostingDate
- The posting status

3.2 Toll Correction Reconciliation File Naming

The Toll Correction Reconciliation File is named according to the following convention:.

TCR[FacilityID]_[FileDateTime].XML
TCR – Is the Toll Correction Reconciliation File
FacilityID – Is the Facility ID of the original transaction file
FileDateTime – Is the FileDateTime of the original transaction file

Example: For a Toll Correction Reconciliation File created to respond to a Toll Correction File created by Facility 002 at 00:43:21 on November 31, 2006, the name of the file would be TCR002_20061131004321.XML.

3.3 Toll Correction Reconciliation File Layout

The Toll Correction Reconciliation File uses XML formatting as defined below.

```
<TollCorrectionReconciliationFile_1.0>
        <Header>
                <FacilityID></FacilityID>
                <FileID></FileID>
                <FileDateTime></FileDateTime>
                <TransactionCount></TransactionCount>
        </Header>
        <DetailData>
                <TollCorrectionReconciliation>
                        <OriginalTransSeqID></OriginalTransSeqID>
                        <OriginalTransPostingDate></OriginalTransPostingDate>
                        <PostingStatus></PostingStatus>
                </TollCorrectionReconciliation>
                …
        </DetailData>
        <Footer></Footer>
</TollCorrectionReconciliationFile_1.0>
```

3.4 Toll Correction Reconciliation File Data Elements

3.4.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <TollCorrectionReconciliationFile_1.0> .

3.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 3-1 are the data elements for the <Header> record in a Toll Correction Reconciliation File.

Table 3-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	Smallint	Facility ID from the original Toll Correction File.
FileID	Yes	Int	Unique Identifier for this file from the original Toll Correction File.
FileDateTime	Yes	Date	Date/Time from the original Toll Correction File. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	Int	Number of Transaction records in this file.

3.4.3 Detail Data

Each transaction record will be contained within a <TollCorrectionReconciliation> record. Listed in Table 3-2 are the data elements for the <TollCorrectionReconciliation> record.

Table 3-2 Data Elements for the <TollCorrectionReconciliation> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransSeqID	Yes	Int	TransactionSeqID of the original transaction
TransPostingDate	Yes	Int	TransPostingDate of the original transaction Formatted as YYYYMMDD
PostingStatus	Yes	Char(10)	POST – Toll correction posted successfully. FAILED – Toll correction failed to post.

3.4.4 Footer

Each file will contain a footer record with no required data elements.

4 VToll Correction File

4.1 VToll Correction File Content

The following detail fields are included in VToll Correction File:

- The transaction sequence ID for the original transaction
- The transaction posting date for the original transaction
- The original fare amount for the original transaction
- The correct fare amount

4.2 VToll Correction File Naming

The VToll Correction File is named according to the following convention:

VTC[FacilityID]_[FileDateTime].XML
VTC – Is the VToll Correction File
FacilityID – Is the Facility ID
FileDateTime – Is the FileDateTime

Example: For a VToll Correction File created by Agency 002 at 00:43:21 on November 31, 2006, the name of the file would be VTC002_20061131004321.XML.

4.3 VToll Correction File Layout

The VToll Correction File uses XML formatting as defined below.

```
<VTollCorrectionFile_1.0>
    <Header>
        <FacilityID></FacilityID>
        <FileID></FileID>
        <FileDateTime></FileDateTime>
        <TransactionCount></TransactionCount>
        <OriginalSum></OriginalSum>
    </Header>
    <DetailData>
        <Transaction>
            <TransSeqID></TransSeqID>
            <TransPostingDate></TransPostingDate>
            <OriginalTollAmount> </OriginalTollAmount>
            <CorrectionReason></CorrectionReason>
            <TransactionType></TransactionType>
            <ExitDateTime></ExitDateTime>
            <ExitPlazaID></ExitPlazaID>
            <ExitLaneID></ExitLaneID>
            <ExitLaneSeqNo></ExitLaneSeqNo>
            <EntryDateTime></EntryDateTime>
            <EntryPlazaID></EntryPlazaID>
            <EntryLaneID></EntryLaneID>
            <EntryLaneSeqNo></EntryLaneSeqNo>
            <PricingDateTime></PricingDateTime>
            <FareAxles></FareAxles>
```

```
                    <TollAmount></TollAmount>
                    <VehicleClass></VehicleClass>
                    <NominationMethod></NominationMethod>
                    <TagID></TagID>
                    <TagAgency></TagAgency>
                    <TagStatus></TagStatus>
                    <TagHomeAgency></TagHomeAgency>
                    <TagFileDateTime></TagFileDateTime>
                    <LicenseNumber></LicenseNumber>
                    <LicenseState></LicenseState>
                    <LicensePlateType></LicensePlateType>

                    <Switchable></Switchable>
                </Transaction>
…
        </DetailData>
        <Footer></Footer>
</VTollCorrectionFile_1.0>
```

4.4 VToll Correction File Data Elements

4.4.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <VTollCorrectionFile_1.0>.

4.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 2-1 are the data elements for the <Header> record in a VToll Correction File.

Table 4-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	Smallint	Facility ID providing this data file. . Match to the number used by the VDOT CSC.
FileID	Yes	Int	Unique Identifier for this file. To help with tracking the files and associating them with sets of corrections. Ideally, an ascending sequence starting with 1, unique within the facility. Not necessarily contiguous (to allow for files that are generated but not submitted)
FileDateTime	Yes	Char(19)	Date/Time this file was created. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	Int	Number of Transaction records in the file.

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
OriginalSum	Yes	Decimal	Total summation of the OriginalTollAmount field in all Transaction records in this file.

4.4.3 Detail Data

Each transaction record will be contained within a <Transaction> record. Listed in Table 2-2 are the data elements for the <Transaction> record.

Table 4-2 Data Elements for the <Transaction> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransSeqID	Yes	Int	Transaction Sequence Number for the transaction to be adjusted
TransPostingDate	Yes	Int	Transaction Posting Date of the transaction that is to be adjusted. Formatted as YYYYMMDD If this value exist, then TransSeqID is mandatory.
OriginalTollAmount	Yes	Decimal	Original Transaction Amount to be corrected
CorrectionReason	Yes	Tinyint	A code denoting the reason for the correction. Values: 01 – Resolved mismatch: class/toll corrected 02 – Ignore license plate transaction 03 – Ignore tagged transaction 04 – Corrected plaza/lane information 05 – Corrected toll 06 – 09 – RESERVED FOR FUTURE USE 10 – 495 Express Lanes Incentive 11 – Elizabeth River Incentive
TransactionType	Yes	Char(1)	Type of Transaction – per Black Box Specs
ExitDateTime	Yes	Char(19)	Date/Time of the Exit event – per Black Box specs
ExitPlazaID	Yes	Smallint	Plaza ID of the Exit event – per Black Box specs
ExitLaneID	Yes	Tinyint	Lane ID of the Exit event – per Black Box specs

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
ExitLaneSeqNo	Yes	Int	Lane Sequence Number of the transaction for the Exit event – per Black Box specs
EntryDateTime	Yes	Char(19)	Date/Time of the Entry event – per Black Box specs
EntryPlazaID	Yes	Smallint	Plaza ID of the Entry event – per Black Box specs
EntryLaneID	Yes	Tinyint	Lane ID of the Entry event – per Black Box specs
EntryLaneSeqNo	Yes	Int	Lane Sequence Number of the transaction for the Entry event – per Black Box specs
PricingDateTime	No	Char(19)	Date/Time used to price this transaction – per Black Box specs
FareAxles	Yes	Smallint	Forward axle count – per Black Box specs
TollAmount	Yes	Decimal	Toll amount dollars. e.g (twelve dollars) 12.00
VehicleClass	Yes	Tinyint	Vehicle classification resulting from lane/plaza processing. Based on lane sensors, tag class, collector input, etc. according to business rules specific to the facility – per Black Box Specs
NominationMethod	Yes	Tinyint	Nomination method code for AVI – Per Black Box Specs
TagID	Yes(if no plate info)	Bigint	Tag id – supplied by lane, as read by the tag reader. Tag number should be one of those present in the tag status file provided by the CSC.
TagAgency	Yes(if no plate info)	Int	Equal to TagAgencyID from IAG spec.v.1.6 (max value 9999)
TagStatus	Yes(if no plate info)	Char(1)	Tag status, as known by lane/plaza system at time of transaction per IAG Specs: 1 – Valid 2 – Low Balance 3 – Zero/Negative
TagHomeAgency	Yes(if no plate info)	Int	Agency ID from the Tag file containing this Tag Status.

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			Tag File Agency is equal to Home Agency ID from IAG v.1.6 spec. (max value 9999)
TagFileDateTime	Yes (if no plate info)	Char(19)	Date/Time of the Tag file containing this Tag Status. Formatted as YYYY-MM-DD HH:MM:SS
LicenseNumber	Yes (if no tag info)	Char(10)	License number of the transaction
LicenseState	Yes (if no tag info)	Char(2)	License state of the transaction
LicensePlateType	Yes (if no tag info)	Char(30)	License Plate type of the transaction
Switchable	Yes	Tinyint	HOV Status of Tag – Per Black Box Specs

4.4.4 Footer

Each file will contain a footer record with no required data elements.

5 VToll Correction Reconciliation File

5.1 VToll Correction Reconciliation File Content

The following detail fields are included in VToll Correction Reconciliation File:

- OriginalTransSeqID
- OriginalTransPostingDate
- The posting status

5.2 VToll Correction Reconciliation File Naming

The VToll Correction Reconciliation File is named according to the following convention:.

VCR[FacilityID]_[FileDateTime].XML
VCR – Is the VToll Correction Reconciliation File
FacilityID – Is the Facility ID of the original transaction file
FileDateTime – Is the FileDateTime of the original transaction file

Example: For a VToll Correction Reconciliation File created to respond to a VToll Correction File created by Facility 002 at 00:43:21 on November 31, 2006, the name of the file would be VCR002_20061131004321.XML.

5.3 VToll Correction Reconciliation File Layout

The VToll Correction Reconciliation File uses XML formatting as defined below.

```
<VTollCorrectionReconciliationFile_1.0>
        <Header>
                <FacilityID></FacilityID>
                <FileID></FileID>
                <FileDateTime></FileDateTime>
                <TransactionCount></TransactionCount>
        </Header>
        <DetailData>
                <VTollCorrectionReconciliation>
                        <OriginalTransSeqID></OriginalTransSeqID>
                        <OriginalTransPostingDate></OriginalTransPostingDate>
                        <PostingStatus></PostingStatus>
                </VTollCorrectionReconciliation>
…
        </DetailData>
        <Footer></Footer>
</VTollCorrectionReconciliationFile_1.0>
```

5.4 VToll Correction Reconciliation File Data Elements

5.4.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <VTollCorrectionReconciliationFile_1.0> .

5.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 5-1 are the data elements for the <Header> record in a VToll Correction Reconciliation File.

Table 5-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	Smallint	Facility ID from the original Toll Correction File.
FileID	Yes	Int	Unique Identifier for this file from the original Toll Correction File.
FileDateTime	Yes	Char(19)	Date/Time from the original Toll Correction File. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	Int	Number of Transaction records in this file.

5.4.3 Detail Data

Each transaction record will be contained within a <VTollCorrectionReconciliation> record. Listed in Table 5-2 are the data elements for the <VTollCorrectionReconciliation> record.

Table 5-2 Data Elements for the <TollCorrectionReconciliation> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
TransSeqID	Yes	Int	TransactionSeqID of the original transaction
TransPostingDate	Yes	Int	TransPostingDate of the original transaction Formatted as YYYYMMDD
PostingStatus	Yes	Char(10)	POST – Toll correction posted successfully. FAILED – Toll correction failed to post.

5.4.4 Footer

Each file will contain a footer record with no required data elements.

6 General File Requirements

1) All files shall be compressed (ZIPped) using a standard Lempel-Zif compression algorithm which should yield a compression rate of at least 75% (meaning a file will be reduced so that it is only 25% of its original size).
2) When compressed, file names shall be converted from {FILE_NAME}.{FILE_TYPE} to {FILE_NAME}_{FILE_TYPE}.ZIP and all files names shall be created using uppercase characters only. Therefore, when file "TCF002_20061131004321.XML" is compressed, the compressed file shall be named "TCF002_20061131004321_XML.ZIP".
3) Files will be fully created, and zipped before being made available on an FTPS server.
4) The FTPS account space for each agency using this service is divided into 'IN' and 'OUT' subdirectories.
5) All files being delivered by the using Agency will be dropped off into the 'IN' subdirectory.
6) When transferring the .ZIP files to the FTPS server, rename the extension from .ZIP to .ZAP before transferring the file. Then transfer the file to the FTPS site. The .ZAP extension tells the receiving code that a file transfer is in progress and do not process this file.
7) When the file transfer has been completed, change the file extension back to .ZIP for the file just delivered to the FTPS server. This lets the receiving code know that the file can now be processed.
8) The process described in 6) and 7) are also used by the CSC when delivering response files to the 'OUT' subdirectory. Never pick up a file with the .ZAP extension.
9) If a file has been delivered to the 'IN' subdirectory, and the receiving code determines that there is a problem between the header data and the contents of the file, the original file will have a .bad extension added to it, and will then be placed in the 'OUT' subdirectory.
10) The CSC receiving code will be responsible for keeping the 'IN' subdirectory cleaned out of all processed files.
11) The using Agency is responsible for cleaning out the 'OUT' subdirectory after receiving the response and .bad files.
12) The connection made to the FTPS server is made with FTP with TLS/SSL Explicit Encryption to host ftps.ezpassva.com (ftps-uat.ezpassva.com for testing) over port 21. The communication will be secured on the transport layer via *.ezpassva.com publicly valid certificate. The FTPS server will have a white-list of IP addresses which it will accept connections from, each roadway is required to provide a list of IP addresses.

7 Business Rules

1) The toll corrections apply to all VDOT and IAG accounts.
2) Toll corrections can be made to tolls and VTolls
3) Toll corrections to normal transactions (tolls) are applied through the use of the Toll Correction File and the Toll Correction Reconciliation File.
4) Toll corrections to VTolls are applied through the use of the VToll Correction File and VToll Correction Reconciliation File.
5) A response to a toll correction posted to an IAG account will ONLY indicate that the correction has been posted to the Outgoing IAG queue.
6) The correction files for processing can be submitted for processing anytime during the day, the response should be delivered within an hour. The maximum number of transactions per file should be limited to 25,000 and no more than 1 file shall be sent per hour.
7) If the number of transactions is larger than 25,000 contact the CSC prior to sending the correction file.

VTOLL Interface

Virginia Toll Facilities Group – VDOT CSC

Specifications

Version 3.5

Feb 21, 2020

Revision Status

Date	Version Number	Responsible Party	Comments
8/23/2010	V1	VESystems	Initial Draft
8/26/2010	V1.1	VESystems	Revision based on comments received from IBI
9/9/2010	V1.2	VESystems	Revision based on comments received from J. Mason - NPLT response added to VTOLL Reconciliation File - Updated description of 'CollectedRevenue' in VTOLL reconciliation file - Corrected TransPostingDate to int, format: YYYYMMDD
9/10/2010	V1.3	VESystems	Added General File Requirements section
11/15/2010	V1.4 – DRAFT	VESystems	Add Entry Information (Date, Time, Plaza, Lane) to Transaction File and VTOLL File
3/28/2011	V1.4.1 – DRAFT	VESystems	Added more information about file transfer process Added additional comments on license plate processing Merge Business Rules as an Appendix to this document
5/5/2011	V2.0 – DRAFT	FSTech	Renamed new spec to V2.0; added Real-Time VTOLL Interface spec; fields adjusted in Tag VTOLL Transaction to match new Black Box Interface specification;
5/19/2011	V2.1 – DRAFT FINAL	FSTech	Added definitions for B, C, and X transaction types; add file delivery timing for processing; deleted Real-Time VTOLL interface; added Pricing Date/Time to files; added Plate File Agency Date/Time to VTOLL file.
5/27/2011	V2.2 – FINAL	FSTech	Revised tag status to show full tag status from file in effect at time of read; added tag file information; add guaranteed status flag

			field to VTOLL (LPN) file; add guaranteed status flag use to business rules
5/30/2011	V2.2.1 – FINAL	FSTech	Clarification of business rule 5 under Section 7.5 – use of Guaranteed Status Flag
8/23/2011	V2.2.2 – FINAL	FSTech	Clarification of Business Rules for processing Tag and Plate VTOLLs against VDOT accounts
11/2/2012	V2.3 – FINAL	3M	Added posting status RNRT to identify rejections due to non rev vtoll with amount greater than 0.00
8/11/2015	V2.3.5	Faneuil	Change 5 days to 10 days for retry, Clarification of business rule under Section 7.4.3, 7.5.1 & 7.5.5 Added resubmission rules
6/9/2016	V3.0		Add support for new legal timelines required for notifications. Add “Draft” license plate transaction processing. Change ICLP file checking to optional. Add support for multiple plate files from an agency each day.
10/24/2016	V3.1	Faneuil	Added posting statuses for Draft transactions
7/6/2018	V3.2	VDOT	Added Non revenue response for VTOLL by Plate file
2/21/2020	V3.3	VDOT	Added new response status for insufficient Unregistered Retail Tags (INSR)
02/05/2021	V3.5	VDOT	Changed connection to FTPS, clarified Tag File Agency description

Table of Contents

List of Tables

1 Introduction

The *VTOLL Interface – VTFG to VDOT CSC - Specifications* document defines the formats for all files that shall be transmitted between the VTFG agencies and the VDOT Customer Service Center (CSC).

The interface files defined are:

File Name	File Usage
Transaction File (see Section 2)	Created by the VTFG agency to inform the CSC of all toll transactions occurring at the VTFG Agency facilities with invalid tags.
Transaction Reconciliation File (see Section 3)	Created by the CSC to inform the VTFG agency as to the disposition of toll transactions processed by the CSC that occurred at the VTFG agency's facilities. Performing detailed transaction level reconciliation allows the VTFG agency to ensure that all transactions were properly received and processed.
VTOLL File (see Section 4)	Created by the VTFG agency to inform the CSC of all violation/plate-based transactions occurring at the VTFG Agency facilities with license plates.
VTOLL Reconciliation File (see Section 5)	Created by the CSC to inform the VTFG agency as to the disposition of violation/plate-based transactions processed by the CSC that occurred at the VTFG agency's facilities. Performing detailed transaction level reconciliation allows the VTFG agency to ensure that all transactions were properly received and processed.

2 Transaction File

2.1 Transaction File Content

The following detail fields are included in Transaction File:

- Unique sequence ID
- Transaction Type
- The transaction Entry Plaza Id
- The transaction Entry Lane Id
- The transaction Entry Date/Time
- The transaction Entry Lane Sequence Number
- The transaction Exit Plaza Id
- The transaction Exit Lane Id
- The transaction Exit Date/Time
- The transaction Exit Lane Sequence Number
- The transaction Pricing Date/Time (optional)
- The transaction Tag number
- The transaction Tag Agency Id
- The transaction Tag Status
- The Tag Status File Agency
- The Tag Status File Date/Time
- Switchable Status
- PreClass Forward Axle Count
- PreClass Reverse Axle Count
- Forward Axle Count
- Reverse Axle Count
- Vehicle Classification
- Nomination Method
- Draft Transaction Flag
- The Expected Revenue amount

2.2 Transaction File Naming

The Transaction File is named according to the following convention:.

T[FacilityID]_[FileDateTime]_TRX.XML
T – Is the Transaction File
FacilityID – Is the Facility ID
FileDateTime – Is the FileDateTime
TRX – Is the transaction file.

Example: For a Transaction File created by Facility 002 at 00:43:21 on November 31, 2006, the name of the file would be T002_20061131004321_TRX.XML.

2.3 Transaction File Layout

Transaction File uses XML formatting as defined below.

```
<TransactionFile_2.0>
        <Header          FacilityID=""
                         FacilityName=""
                         FileDateTime=""
                         TransactionCount=""
                         TransactionSum="" />
        <DetailData>
                <Transaction     UniqueSequenceNo=""
                                 TransactionType=""
                                 EntryPlazaID=""
                                 EntryLaneID= ""
                                 EntryDateTime=""
                                 EntryLaneSeqNo=""
                                 ExitPlazaID=""
```

```
                                        ExitLaneID= ""
                                        ExitDateTime=""
                                        ExitLaneSeqNo=""
                                        PricingDateTime=""
                                        TagNumber=""
                                        TagAgencyID=""
                                        TagStatus=""
                                        TagFileAgency=""
                                        TagFileDateTime=""
                                        Switchable=""
                                        PreClassForwardAxle=""
                                        PreClassReverseAxle=""
                                        ForwardAxle=""
                                        ReverseAxle=""
                                        VehicleClass=''
                                        Nomination=""
                                        DraftTransactionFlag=""
                                        ExpectedRevenue="" />
        …
        </DetailData>
        <Footer />
</TransactionFile_2.0>
```

2.4 Transaction File Data Elements

2.4.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <TransactionFile_2.0> .

2.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 2-1 are the data elements for the <Header> record in a Transaction File.

Table 2-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	Smallint	Facility ID providing this data file. . Match to the number used by the VDOT CSC.
FacilityName	No	Char(50)	Name of facility. Match to the name as used in the VDOT CSC.
FileDateTime	Yes	Date	Date/Time this file was created. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	Int	Number of Transaction records in the file.
TransactionSum	Yes	Decimal	Total summation of all Transaction records in this file.

2.4.3 Detail Data

Each transaction record will be contained within a <Transaction> record. Listed in Table 2-2 are the data elements for the <Transaction> record.

Table 2-2 Data Elements for the <Transaction> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
UniqueSequenceNo	Yes	BigInt	Unique sequence number of this transaction. This is assigned by the sending agency. Must be > 0 and in sequential order. Will be used to detect gaps in transmission.
TransactionType	Yes	Char(1)	This field is used to denote the type of transaction. Transactions come in three varieties: Toll transactions: B – Barrier – Single Point of Tolling C – Ticketed Complete – A system which requires an Entry transaction and an Exit Transaction to determine the toll; could be a single entry and single exit; or multiple tolling point with a start (entry) and end (exit) X – Ticketed Unmatched Exit – This is the same a 'C' above except that only the end point is known (similar to a "lost" ticket – charge a determined price)
EntryPlazaID	Yes	SmallInt	Entry PlazaId of this transaction. Must match Plaza ID used by VDOT CSC. If Transaction Type = B or X, then set this field to "" (blank)
EntryLaneID	Yes	Tinyint	Entry LaneId of this transaction. Must match Lane ID used by VDOT CSC. If Transaction Type = B or X, then set this field to "" (blank)
EntryDateTime	Yes	Char(19)	EntryDateTime of this transaction. Formatted as

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			YYYY-MM-DD HH:MM:SS If Transaction Type = B or X, then set this field to “” (blank)
EntryLaneSeqNo	Yes	Int	Lane Sequence Number for the Entry Event If Transaction Type = B or X, then set this field to “” (blank)
ExitPlazaID	Yes	Smallint	Exit PlazaId of this transaction. Must match Plaza ID used by VDOT CSC.
ExitLaneID	Yes	Tinyint	Exit LaneId of this transaction. Must match Lane ID used by VDOT CSC.
ExitDateTime	Yes	Char(19)	ExitDateTime of this transaction. Formatted as YYYY-MM-DD HH:MM:SS
ExitLaneSeqNo	Yes	Int	Lane Sequence Number for the Exit Event
PricingDateTime	No	Date	PricingDateTime of this transaction. Optional field indicates the Date/Time using to determine the toll. Formatted as YYYY-MM-DD HH:MM:SS
TagNumber	Yes	Bigint	TagNumber of this transaction. Max length 10 digits.
TagAgencyID	Yes	Int	Tag Agency ID of this transaction. Max value 9999 per IAG V1.6 spec
TagStatus	Yes	Char(6)	Tag status, as known by lane/plaza system at time of transaction (see section 4 of the Black Box Interface specifications for the tag status format).

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			The tag status information from the tag status file in use. For example: A tag that is low balance (001), revenue (0), discount bit not set (0), IAG bit not set (0), an internal tag (0), and an HOV tag (1) would be show in binary as follows: 0000000010000001 would be shown in the XML string in hex as: 0x0081
TagFileAgency	Yes	Int	Facility ID from the Tag file containing this Tag Status. Tag File Agency is equal to Home Agency ID from IAG v.1.6 spec. (max value 9999)
TagFileDateTime	Yes	Char(19)	Date/Time of the Tag file containing this Tag Status. Formatted as YYYY-MM-DD HH:MM:SS
Switchable	Yes	Tinyint	HOV Status of Tag: 0 = Normal 1 = HOV Selected
FareAxle	No	Smallint	Forward Axle count. Default should be 0.
VehicleClass	Yes	Smallint	Vehicle Classification from lane/plaza processing. Based on lane sensors, tag class, collector input, etc. according to business rules specific to the facility.
Nomination	Yes	TinyInt	Nomination Method code for AVI: 0 = Normal AVI 1 = HOV-AVI – Switchable Tag

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			2 = HOV-AVI – HOV Nomination
DraftTransactionFlag	No	Char(1)	Y = Draft Transaction (Check for positive account balance but do not post transaction) N = Attempt to post transaction
ExpectedRevenue	Yes	Decimal	Transaction Amount – shall be zero for Draft Transactions

2.4.4 Footer

Each file will contain a footer record with no required data elements.

3 Transaction Reconciliation File

3.1 Transaction Reconciliation File Content

The following detail fields are included in Transaction Reconciliation File:

- Unique sequence ID
- TransSeqID
- TransPostingDate
- The Collected Revenue amount
- The posting status

3.2 Transaction Reconciliation File Naming

The Transaction Reconciliation File is named according to the following convention:.

R[FacilityID]_[FileDateTime]_TRR.XML
R – Is the Transaction Reconciliation File
FacilityID – Is the Facility ID of the original transaction file
FileDateTime – Is the FileDateTime of the original transaction file
TRR – Is the transaction reconciliation file.

Example: For a Transaction Reconciliation File created to respond to a Transaction File created by Facility 002 at 00:43:21 on November 31, 2006, the name of the file would be R002_20061131004321_TRR.XML.

3.3 Transaction Reconciliation File Layout

Transaction Reconciliation File uses XML formatting as defined below.

```
<TransactionReconciliationFile_2.0>
        <Header          FacilityID=""
                         FacilityName=""
                         FileDateTime=""
                         TransactionCount=""
                         TransactionSum="" />
        <DetailData>
                <TransactionReconciliation   UniqueSequenceNo=""
                                             TransSeqID=""
                                             TransPostingDate=''
                                             CollectedRevenue=""
                                             PostingStatus/>
        …
        </DetailData>
        <Footer />
</TransactionReconcilationFile_2.0>
```

3.4 Transaction Reconciliation File Data Elements

3.4.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <TransactionReconciliationFile_2.0> .

3.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 3-1 are the data elements for the <Header> record in a Transaction Reconciliation File.

Table 3-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	Smallint	Facility ID from the original Transaction File.

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			Match to the number used by the VDOT CSC.
FacilityName	No	Char(50)	Name of facility from the original Transaction File. Match to the name as used in the VDOT CSC.
FileDateTime	Yes	Date	Date/Time from the original Transaction File. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	Int	Number of Transaction records in the file.
TransactionSum	Yes	Decimal	Total summation of all Transaction records in this file.

3.4.3 Detail Data

Each transaction record will be contained within a <TransactionReconciliation> record. Listed in Table 3-2 are the data elements for the <TransactionReconciliation> record.

Table 3-2 Data Elements for the <TransactionReconciliation> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
UniqueSequenceNo	Yes	Bigint	Unique sequence number of this transaction. This is assigned by the sending agency.
TransSeqID	Yes	Int	TransactionSeqID assigned by the CSC.
TransPostingDate	Yes	Int	TransPostingDate assigned by the CSC. Formatted as YYYYMMDD
CollectedRevenue	Yes	Decimal	Amount of the revenue collected, if the transaction has a POST status. Any other posting status will have Collected Revenue of 0.
PostingStatus	Yes	Char(4)	POST – Toll transaction posted successfully via tag. INSU – Rejected, account has insufficient funds INSR – Rejected, Unregistered Retail Tag has insufficient funds OLD1 - Rejected, old transaction.

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			ACCB – Rejected, account in bad status (revoked, closed, etc.) RINV - Rejected, the transaction contains invalid data (e.g., invalid agency, invalid plaza, etc.). TAGB – Rejected, tag in bad status (e.g., lost, stolen, etc.) RJDP - Rejected, duplicate transaction. RNRT – Rejected, Non zero toll attempted posting to Non revenue account DPST – Draft VTOLL would POST DISF – Draft VTOLL would be Insufficient DBAD – No Match, Closed Account or Lost\Stolen

3.4.4 Footer

Each file will contain a footer record with no required data elements.

4 VTOLL File

4.1 VTOLL File Content

The following detail fields are included in VTOLL File:

- Unique sequence ID
- Transaction Type
- The transaction Entry Plaza Id
- The transaction Entry Lane Id
- The transaction Entry Date/Time
- The transaction Entry Lane Sequence Number
- The transaction Exit Plaza Id
- The transaction Exit Lane Id
- The transaction Exit Date/Time
- The transaction Exit Lane Sequence Number
- The Pricing Date/Time (optional)
- The transaction License Plate
- The transaction License State
- The license Plate Type
- Image Available Flag
- Fare Axle Count
- Vehicle Classification
- Guaranteed Status Flag
- Draft Transaction Flag
- The Expected Revenue amount

4.2 VTOLL File Naming

The VTOLL File is named according to the following convention:.

V[FacilityID]_[FileDateTime]_VTL.XML
V – Is the VTOLL File
FacilityID – Is the Facility ID
FileDateTime – Is the FileDateTime
VTL – Is the VTOLL file.

Example: For a VTOLL File created by Facility 002 at 00:43:21 on November 31, 2006, the name of the file would be V002_20061131004321_VTL.XML.

4.3 VTOLL File Layout

VTOLL File uses XML formatting as defined below.

```
<VTOLLFile_2.0>
        <Header          FacilityID=""
                         FacilityName=""
                         FileDateTime=""
                         TransactionCount=""
                         TransactionSum="" />
        <DetailData>
                <VTOLL           UniqueSequenceNo=""
                                 TransactionType=""
                                 EntryPlazaID=""
                                 EntryLaneID= ""
                                 EntryDateTime=""
                                 EntryLaneSeqNo=""
                                 ExitPlazaID=""
                                 ExitLaneID= ""
                                 ExitDateTime=""
                                 ExitLaneSeqNo=""
                                 PricingDateTime=""
                                 LicensePlate=""
                                 LicenseState=""
```

```
                                    LicensePlateType=""
                                    ImageAvailable=""
                                    FareAxle=""
                                    VehicleClass=""
                                    GuaranteedStatusFlag=""
                                    DraftTransactionFlag=""
                                    ExpectedRevenue="" />
        …
        </DetailData>
        <Footer />
</VTOLLFile_2.0>
```

4.4 VTOLL File Data Elements

4.4.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <VTOLLFile_2.0> .

4.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 4-1 are the data elements for the <Header> record in a VTOLL File.

Table 4-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	Smallint	Facility ID providing this data file. . Match to the number used by the VDOT CSC.
FacilityName	No	String	Name of facility. Match to the name as used in the VDOT CSC.
FileDateTime	Yes	Date	Date/Time this file was created. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	Int	Number of Transaction records in the file.
TransactionSum	Yes	Decimal	Total summation of all Transaction records in this file.

4.4.3 Detail Data

Each transaction record will be contained within a <VTOLL> record. Listed in Table 4-2 are the data elements for the <VTOLL> record.

Table 4-2 Data Elements for the <VTOLL> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
UniqueSequenceNo	Yes	Bigint	Unique sequence number of this transaction. This is assigned by the sending agency.
TransactionType	Yes	Char(1)	This field is used to denote the type of transaction. Transactions come in three varieties: Toll transactions:

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			B – Barrier – Single Point of Tolling C – Ticketed Complete – A system which requires an Entry transaction and an Exit Transaction to determine the toll; could be a single entry and single exit; or multiple tolling point with a start (entry) and end (exit) X – Ticketed Unmatched Exit – This is the same a 'C' above except that only the end point is known (similar to a "lost" ticket – charge a determined price)
EntryPlazaID	Yes	SmallInt	Entry PlazaId of this transaction. Must match Plaza ID used by VDOT CSC. If Transaction Type = B or X, then set this field to "" (blank)
EntryLaneID	Yes	TinyInt	Entry LaneId of this transaction. Must match Lane ID used by VDOT CSC. If Transaction Type = B or X, then set this field to "" (blank)
EntryDateTime	Yes	Char(19)	EntryDateTime of this transaction. Formatted as YYYY-MM-DD HH:MM:SS If Transaction Type = B or X, then set this field to "" (blank)
EntryLaneSeqNo	Yes	Int	Lane Sequence Number for the Entry Event If Transaction Type = B or X, then set this field to "" (blank)
ExitPlazaID	Yes	Smallint	Exit PlazaId of this transaction. Must match Plaza ID used by VDOT CSC.
ExitLaneID	Yes	Tinylint	Exit LaneId of this transaction. Must match Lane ID used by VDOT CSC.
ExitDateTime	Yes	Char(19)	ExitDateTime of this transaction. Formatted as YYYY-MM-DD HH:MM:SS
ExitLaneSeqNo	Yes	Int	Lane Sequence Number for the Exit Event

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
PricingDateTime	No	Char(19)	Pricing Date/Time of this transaction. Optional field indicates the Date/Time using to determine the toll. Formatted as YYYY-MM-DD HH:MM:SS
LicenseNumber	Yes	Char(10)	License Plate Number of this transaction. (Max length of the field is 10)
LicenseState	Yes	Char(2)	License Plate State of this transaction.
LicensePlateType	No	Char(30)	License Plate Type. The license plate type. Filled with asterisks (*) if unavailable/unused. License Plate Type Business Rules for posting license plate transactions using plate type: 1. If the Toll facility has captured license plate type, then: a. Find a match on LIC_STATE, LIC_NUMBER and LIC_TYPE b. If no match found, find a match on LIC_STATE, LIC_NUMBER and a LIC_TYPE of asterisks. 2. If the Toll Facility did not capture license plate type, then: a. Find a match on LIC_STATE, LIC_NUMBER and a LIC_TYPE of asterisks
ImageAvailable	Yes	Char(1)	Y if image is available at sending agency; N if image is not available at sending agency
FareAxle	No	Smallint	Forward Axle count
VehicleClass	Yes	Tinyint	Vehicle Classification from lane/plaza processing. Based on lane sensors, tag class, collector input, etc. according to business rules specific to the facility.
GuaranteedStatusFlag	Yes	Char(1)	Y = Guaranteed Payment **(Can only be set if E-ZPass account balance has been manually reviewed by the**

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			toll facility for sufficient funds to post this transaction – see business rules section 7.5) N = Not Guaranteed
DraftTransactionFlag	No	Char(1)	Y = Draft Transaction (Check for positive account balance but do not post transaction) N = Attempt to post transaction
ExpectedRevenue	Yes	decimal	Transaction Amount – shall be zero for Draft Transactions

4.4.4 Footer

Each file will contain a footer record with no required data elements.

5 VTOLL Reconciliation File

5.1 VTOLL Reconciliation File Content

The following detail fields are included in VTOLL Reconciliation File:

- Unique sequence ID
- TransSeqID
- TransPostingDate
- The Collected Revenue amount
- The posting status

5.2 VTOLL Reconciliation File Naming

The VTOLL Reconciliation File is named according to the following convention:.

R[FacilityID]_[FileDateTime]_VTR.XML
R – Is the Reconciliation File
FacilityID – Is the Facility ID of the original transaction file
FileDateTime – Is the FileDateTime of the original transaction file
VTR – Is the VTOLL reconciliation file.

Example: For a VTOLL Reconciliation File created to respond to a VTOLL File created by Facility 002 at 00:43:21 on November 31, 2006, the name of the file would be R002_20061131004321_VTR.XML.

5.3 VTOLL Reconciliation File Layout

VTOLL Reconciliation File uses XML formatting as defined below.

```
<VTOLLReconciliationFile_2.0>
        <Header          FacilityID=""
                         FacilityName=""
                         FileDateTime=""
                         TransactionCount=""
                         TransactionSum="" />
        <DetailData>
                <VTOLLReconciliation     UniqueSequenceNo=""
                                         TransSeqID=""
                                         TransPostingDate=''
                                         CollectedRevenue=""
                                         PostingStatus/>
        …
        </DetailData>
        <Footer />
</VTOLLReconcilationFile_2.0>
```

5.4 VTOLL Reconciliation File Data Elements

5.4.1 Top Level (Root) Tag

The file description used in the top-level xml tag will be <VTOLLReconciliationFile_2.0> .

5.4.2 Header

Each file will contain a header record containing data applicable to all detailed records and providing summary data to be used to verify file integrity. Listed in Table 5-1 are the data elements for the <Header> record in a VTOLL Reconciliation File.

Table 5-1 Data Elements for the <Header> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
FacilityID	Yes	Int	Facility ID from the original VTOLL File.

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			Match to the number used by the VDOT CSC.
FacilityName	No	Char(50)	Name of facility from the original VTOLL File. Match to the name as used in the VDOT CSC.
FileDateTime	Yes	Char(19)	Date/Time from the original VTOLL File. Formatted as YYYY-MM-DD HH:MM:SS
TransactionCount	Yes	Int	Number of Transaction records in the file.
TransactionSum	Yes	Decimal	Total summation of all Transaction records in this file.

5.4.3 Detail Data

Each transaction record will be contained within a <VTOLLReconciliation> record. Listed in Table 5-2 are the data elements for the <VTOLLReconciliation> record.

Table 5-2 Data Elements for the <VTOLLReconciliation> Record

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
UniqueSequenceNo	Yes	Bigint	Unique sequence number of this transaction. This is assigned by the sending agency.
TransSeqID	Yes	Int	TransactionSeqID assigned by the CSC.
TransPostingDate	Yes	Int	TransPostingDate assigned by the CSC. Formatted as YYYYMMDD
CollectedRevenue	Yes	Decimal	Amount of the revenue collected, if the transaction has a PPST status. Any other posting status will have Collected Revenue of 0.
PostingStatus	Yes	Char(4)	PPST – Toll transaction posted successfully via plate. If the transaction was a draft transaction, this status indicates the transaction would have posted, i.e. the account has a balance above $0.00. NPLT – No Plate Match INSU – Rejected, account has insufficient funds

DATA ELEMENT NAME	MANDATORY	XML DATA TYPE	COMMENTS
			OLD1 - Rejected, old transaction ACCB – Rejected, account in bad status (revoked, closed, etc.) RINV - Rejected, the transaction contains invalid data (e.g., invalid agency, invalid plaza, etc.). RJDP - Rejected, duplicate transaction. RNRT – Rejected, Non zero toll attempted posting to Non revenue account DPST – Draft VTOLL would POST DISF – Draft VTOLL would be Insufficient DBAD – No Match, Closed Account or Lost\Stolen TBAD – Plate type does not match a record where plate characters and plate state do match. This will occur if the plate in an account/ICLP file has a plate type defined and either a different plate type was submitted in the VToll file or *s were submitted in the plate type field. Transactions rejected with this code can be resubmitted once plate type is corrected if desired by the toll facility

5.4.4 Footer

Each file will contain a footer record with no required data elements.

6 General File Requirements

1) All files shall be compressed (ZIPped) using a standard Lempel-Zif compression algorithm which should yield a compression rate of at least 75% (meaning a file will be reduced so that it is only 25% of its original size).
2) When compressed, file names shall be converted from {FILE_NAME}.{FILE_TYPE} to {FILE_NAME}_{FILE_TYPE}.ZIP and all files names shall be created using uppercase characters only. Therefore, when file “R002_20061131004321_VTR.XML” is compressed, the compressed file shall be named “R002_20061131004321_VTR_XML.ZIP”.
3) Files will be fully created, and zipped before being made available on an FTPS server.
4) The FTPS account space for each agency using this service is divided into ‘IN’ and ‘OUT’ subdirectories.
5) All files being delivered by the using Agency will be dropped off into the ‘IN’ subdirectory.
6) When transferring the .ZIP files to the FTPS server, rename the extension from .ZIP to .ZAP before transferring the file. Then transfer the file to the FTPS site. The .ZAP extension tells the receiving code that a file transfer is in progress and do not process this file.
7) When the file transfer has been completed, change the file extension back to .ZIP for the file just delivered to the FTPS server. This lets the receiving code know that the file can now be processed.
8) The process described in 6) and 7) are also used by the CSC when delivering response files to the ‘OUT’ subdirectory. Never pick up a file with the .ZAP extension.
9) If a file has been delivered to the ‘IN’ subdirectory, and the receiving code determines that there is a problem between the header data and the contents of the file, the original file will have a .bad extension added to it, and will then be placed in the ‘OUT’ subdirectory.
10) The CSC receiving code will be responsible for keeping the ‘IN’ subdirectory cleaned out of all processed files.
11) The using Agency is responsible for cleaning out the ‘OUT’ subdirectory after receiving the response and bad files.
12) The number of transactions in each file shall be limited to 10000 transactions.
13) If multiple files are required for a given day, the Agency shall ensure unique file names such as, for example, incrementing the FileDateTime by one second if their system were to locally generate two files with the same FileDateTime.
14) The connection made to the FTPS server is made with FTP with TLS/SSL Explicit Encryption to host ftps.ezpassva.com (ftps-uat.ezpassva.com for testing) over port 21. The communication will be secured on the transport layer via *.ezpassva.com publicly valid certificate. The FTPS server will have a white-list of ip addresses which it will accept connections from, each roadway is required to provide a list of IP addresses.

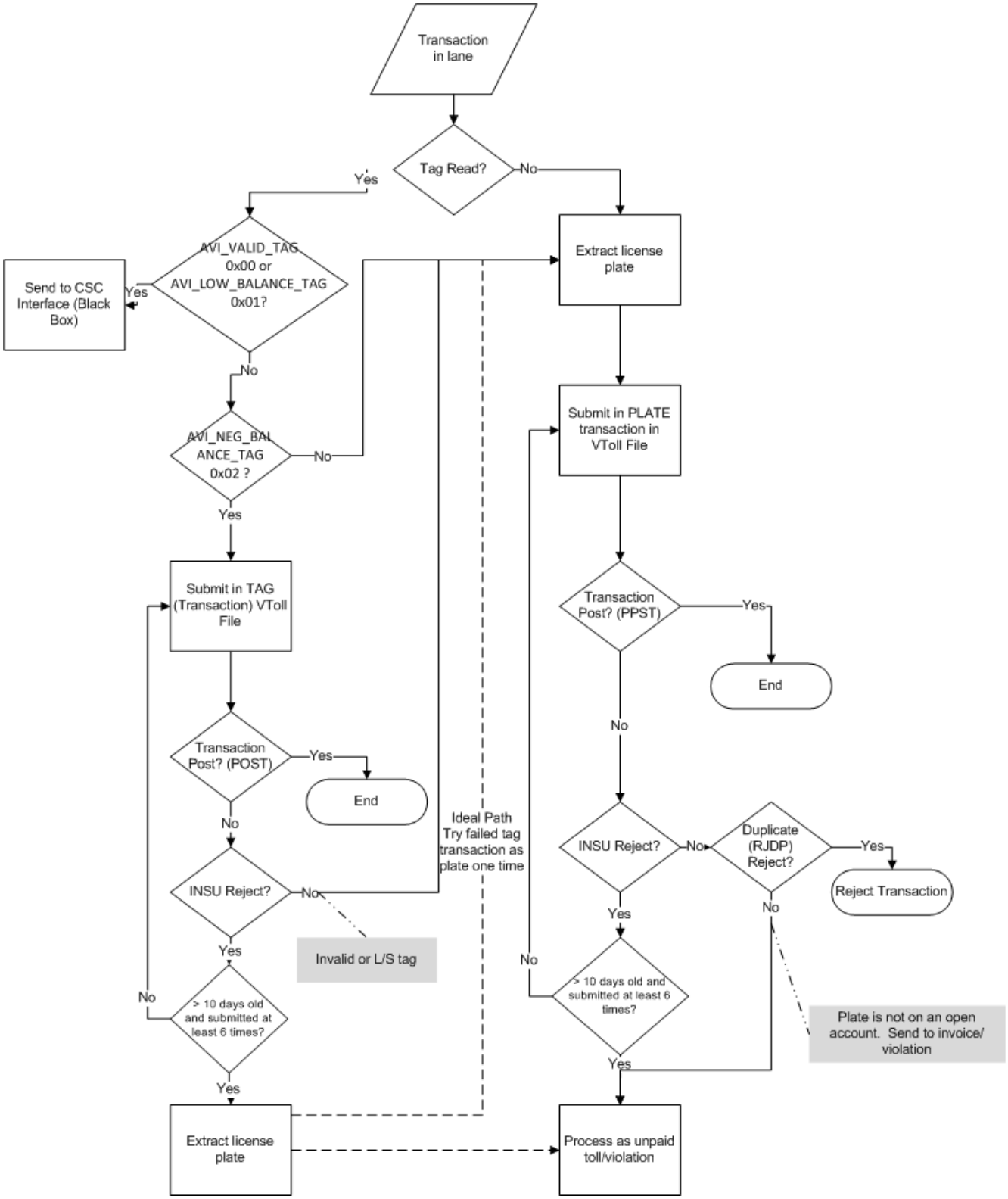
7 Business Rules for VTOLL by Daily VTOLL Files

7.1 Basic processing and business rules

1) All files (tag transaction and license plate transaction) will be delivered to an account on an FTPS site at VDOT-EZPass.
2) All responses files will be picked up from the same FTPS site.
3) The files, for processing can be delivered anytime during the day, the response should be delivered within an hour.
4) To ensure duplicate transaction detection algorithms can function correctly, it is desirable that VToll transactions not be submitted until after the majority of standard E-ZPass toll transactions have been submitted via the CSC interface for the same exit date/time period. Typically ,if more than 1% of E-ZPass transactions are still to be submitted for a given time period, it would be optimal for the VToll files to be held until transaction posting has progressed.
5) The list of Plaza IDs will be provided separately during implementation.
6) Backlog transactions can be submitted to the CSC at a rate of 3 backlog days per one posting day or 6 transactions per transponder/License plate.

7.2 VTOLL processing flow

The following flow chart provides an overview of the typical VToll process from an agency perspective. Exceptions to this process are described in the following sections.



7.3 Tag transaction file processing and business rules

1) Only Agency 10 transactions can be processed. All agency 10 tag transactions that could not be posted to the Black Box interface may be submitted for attempted VToll regardless of the status of the tag. Alternatively, the submission may be limited to agency 10 tag transactions flagged with the status 3 Zero/Negative. Customer notifications will be triggered for tag transactions rejected for insufficient funds according to CSC business rules.
2) All IAG transactions in the tag transaction file will be rejected. IAG Agencies currently do not allow for reprocessing of invalid transactions.
3) All Lost/Stolen tags will be rejected. Tags marked as lost/stolen status may be excluded from the VToll process by the toll facility in order to more quickly pursue that customer via violation/video toll.

7.4 Tag transaction file validation rules - VDOT

1) The tag will be used to identify the account at the time of the transaction regardless of whether the tag has been moved off of the account.
2) There must be money on the account **at the time of posting** (not the time of transaction) in order to post the transaction. The balance check will be done before posting each transaction on the same tag.
3) The system will use the standard transaction processing rules for posting, including rejecting duplicate transactions.
4) There are legal requirements for license plate transaction submission as well as a time limit on how long the system will allow a license plate transaction to be posted to a VDOT account.
    a. Transactions shall be submitted in either draft or normal format no later than four days (ninety-six hours) from the transaction.
    b. Transactions shall be submitted for posting by day six from transaction if initially submitted as a draft transaction.
    c. Transactions submitted in accordance with a) and b) above that have been rejected with status “INSU” or “INSR” shall be resubmitted for posting each day until and including day ten (10) after the transaction.
    d. Transactions rejected as “INSU” or “INSR” that are not submitted within the time limits defined in a) and b) above shall be resubmitted daily for at least five (5) and up to nine (9) more days unless the toll facility has a documented notice/invoice leniency policy that has provided to and approved by VDOT in which case the toll facility may implement a reduced or zero number of retires for these delayed transactions.
5) There will be a time limit on how long the system will attempt to post a transaction. Transactions that are more than **60** days old from the transaction date will be rejected.
6) Draft transactions shall be used to notify the CSC of a pending potential VToll within the 96 hour legal timeline to enable customer notification within the 108 time limit if the VTFG toll facility requires additional time to internally process/confirm the transaction before posting. For draft transactions, the following rules apply:
    a. A PPST status in the reconciliation file shall only indicate that the transaction would have posted, i.e. the account balance is greater than $0.00.
    b. Other draft transactions shall be rejected according to the rules for the other statuses.
    c. The ExpectedRevenue field in the transaction file shall be set to $0.00.
    d. The CollectedRevenue field in the reconciliation file shall be $0.00 for draft transactions.

7.5 License Plate transaction file validation rules - VDOT

1) The license plate will be used to identify the account at the time of the transaction. If the license plate has been moved off of the account, we will still try to identify the account at the time of the transactions. If a license plate was not on an account at the time of the transaction and has been added to the account after the transaction has occurred that account will used for processing. If

the license plate has a start and or end value in the database the transaction will also be tested against these fields for validity.

2) In order to post the transaction to a VDOT account, there must be a positive balance on the account (**at the time of posting**, not the time of the original transaction).
3) The system will use the standard transaction processing rules for posting, including rejecting duplicate transactions.
4) There are legal requirements for license plate transaction submission as well as a time limit on how long the system will allow a license plate transaction to posted to a VDOT account.
    a. Transactions shall be submitted in either draft or normal format no later than four days (ninety-six hours) from the transaction.
    b. Transactions shall be submitted for posting by day six from transaction if initially submitted as a draft transaction.
    c. Transactions submitted in accordance with a) and b) above that have been rejected with status “INSU” shall be resubmitted for posting each day until and including day ten (10) after the transaction.
    d. Transactions rejected as “INSU” that are not submitted within the time limits defined in a) and b) above shall be resubmitted daily for at least five (5) and up to nine (9) more days unless the toll facility has a documented notice/invoice leniency policy that has provided to and approved by VDOT in which case the toll facility may implement a reduced or zero number of retires for these delayed transactions.
5) Transactions that are more than **60** days old from the transaction date will be rejected unless the guaranteed transaction flag is set according to business rules defined in 7 below.
6) If a license plate has been recently added to a VDOT account after the transaction datetime, then after a CSR has manually validated that the license plate is on the VDOT account, the Guaranteed Status Flag should be set to Y.

7) Guaranteed VTolls capabilities are intended to be used when a toll facility is handling a customer violation/video toll dispute and wishes to post the customer’s video/violation transactions to an E-ZPass account. A guaranteed transaction is only permitted to be sent if the VTFG toll facility has first manually confirmed that the customer’s account information is up-to-date and sufficient balance is available to post the toll at the time verification. Since the customer is directly requesting that the toll be posted to their account, guaranteed transactions may be sent up to 90 days after they occur in the lane and will be posted regardless of account balance.
8) Draft transactions shall be used to notify the CSC of a pending potential VToll within the 96 hour legal timeline to enable customer notification within the 108 time limit if the VTFG toll facility requires additional time to internally process/confirm the transaction before posting. For draft transactions, the following rules apply:
    a. A PPST status in the reconciliation file shall only indicate that the account balance is currently greater than $0.00.
    b. Other draft transactions will be rejected according to the rules for the other statuses.
    c. The ExpectedRevenue field in the transaction file shall be set to $0.00.
    d. The CollectedRevenue field in the reconciliation file shall be $0.00 for draft transactions.

7.6 Transaction resubmission rules

9) Transactions rejected with the following statuses can be resubmitted according to the above time restrictions:
    - INSU
    - INSR
    - RINV (after correcting the data)