

1 **APPENDIX 4.0 TOLL TECHNICAL REQUIREMENTS**

This page intentionally left blank.

1
2
3
4
5
6
7

Table of Contents

APPENDIX 4.0 TOLL TECHNICAL REQUIREMENTS	4-I
4.1 INTRODUCTION	4-1
4.2 SYSTEM OVERVIEW	4-2
4.3 TOLL TECHNICAL REQUIREMENTS.....	4-3
4.4 SECURITY REQUIREMENTS	4-26

This page intentionally left blank.

1 **4.1 INTRODUCTION**

2 **4.1.1 DOCUMENT OVERVIEW**

3 Appendix 4 is divided into four major sections. Section 4.1 explains the scope of the
4 appendix as a whole. Section 4.2 provides an overview of the RTS and the concept of
5 operations. Section 4.3 describes the System requirements in detail for the Roadway Toll
6 Systems (RTS). Finally, Section 4.4 describes the security requirements for the System.

7 **4.1.2 DOCUMENT SCOPE**

8 The requirements set forth herein describe the RTS that WSDOT desires to procure for the
9 Roadway Toll Systems Contract. These toll technical requirements will be used as a
10 baseline from which the Vendor will develop a more detailed System Design Document.

11 **4.1.3 ABBREVIATIONS AND DEFINITIONS**

12 All capitalized terms and abbreviations used in this Appendix, but not expressly defined
13 herein, have the respective meanings set forth in Appendix 1 – Definitions.

14 **4.1.4 NAMING CONVENTIONS**

15 Toll technical requirements are individually labeled with an abbreviated general descriptor
16 and a requirement number. For example, the label “RTS-4.1” refers to the first toll
17 technical requirement for the RTS in Appendix 4.

1 **4.2 SYSTEM OVERVIEW**

2 The Roadway Toll Systems (RTS) described herein will provide a means for Washington
3 State Department of Transportation (WSDOT) to collect tolls in various configurations via
4 radio frequency identification (RFID) and Image Capture technologies. The System will
5 include all Toll Zone Hardware and Software and the facility administration systems
6 required to support operations, administration, and maintenance. The RTS will not include
7 customer service, customer account maintenance, or similar functionality.

8 The overall RTS concept for this Project shall consist of several key elements including the
9 Roadway Toll Equipment, the Facility Management and Administration System (FMAS),
10 interface to the WSDOT Traffic Management Center (TMC), WSDOT Customer Service
11 Center (CSC), and other outside interfaces.

1 **4.3 TOLL TECHNICAL REQUIREMENTS**

2 **4.3.1 GENERAL**

3 RTS-4.1 The design of the Work shall be completed and documented in English units of
4 measure.

5 RTS-4.2 User interfaces and reports shall use local Daylight Savings Time, unless
6 otherwise directed by WSDOT.

7 **4.3.2 SYSTEM ARCHITECTURE**

8 RTS-4.3 The RTS shall operate where no single equipment failure will result in complete
9 loss of revenue collection.

10 RTS-4.4 The System Architecture shall meet or exceed the current security policies and
11 standards. See Section 4.3.6 herein and Appendix 22 for greater detail.

12 RTS-4.5 The RTS shall be scalable to accommodate one additional adjacent lane of
13 similar operations, or 50 percent per Toll Zone, whichever is greater.

14 RTS-4.6 The RTS shall be capable of scaling each Toll Zone from an Express Toll Lane
15 configuration to full-width tolling or vice versa.

16 **4.3.3 ROADWAY TOLL SYSTEM**

17 **4.3.3.1 DESCRIPTION**

18 RTS-4.7 The RTS shall be modular in design, allowing for expedited removal and
19 replacement during maintenance activity.

20 RTS-4.8 All components that perform the same function shall be interchangeable.

21 RTS-4.9 All software and firmware that performs the same function shall be the same
22 version.

23 RTS-4.10 Any changes to Software and firmware in one or many components shall be
24 implemented in all similar Hardware within 90 Calendar Days.

25 RTS-4.11 The RTS shall detect, classify, and identify vehicles and capture images in
26 environmental and lighting conditions within the Project area.

27 RTS-4.12 Installed components of the RTS will include a commercially available bird
28 exclusion solution, when applicable, that does not interfere with the RTS or the
29 traveling public to discourage birds from nesting.

30 RTS-4.13 Enclosures installed by the Vendor shall have at least 50 percent expansion
31 capacity to accommodate added boards, components, equipment, and software
32 for future expansion.

33 **4.3.3.2 ZONE CONTROLLER**

34 **4.3.3.2.1 General**

35 RTS-4.14 The Zone Controller and its peripheral systems shall be capable of full toll
36 operations without connection to the FMAS.

- 1 RTS-4.15 Under normal conditions, the Zone Controller and its peripheral systems shall be
2 fully automated and perform all toll operations activities without manual
3 intervention.
- 4 RTS-4.16 The Zone Controller shall transmit all data to the FMAS when network
5 connections allow.
- 6 RTS-4.17 The Zone Controller shall verify with the FMAS upon start-up that it has the
7 latest configuration files, application Software, and any other files required to
8 support lane operations.
- 9 RTS-4.18 The Zone Controller shall record to a log file the verification result of data
10 referenced in RTS-4.16.
- 11 RTS-4.19 The Zone Controller shall detect failure/problems with itself and its subsystems
12 and reports alarms and recovery message to Maintenance Online Management
13 System (MOMS).
- 14 **4.3.3.2.2 Data Storage**
- 15 RTS-4.20 The Zone Controller shall record and retain all data transmitted from its
16 peripheral systems, including all Transactions, toll rates, images, and
17 maintenance data for a period of at least 30 Calendar Days.
- 18 **4.3.3.2.3 Communications**
- 19 RTS-4.21 Upon reestablishment of communications between the FMAS and Zone
20 Controller, the Zone Controller shall transmit all spooled data to the FMAS in the
21 order it was received.
- 22 RTS-4.22 The RTS shall utilize an error-checking protocol to ensure accurate data
23 transmission between the Zone Controller and subsystems.
- 24 **4.3.3.3 VEHICLE DETECTION**
- 25 RTS-4.23 The Vehicle Detection subsystem shall measure the speed of all vehicles
26 traveling from 5 mph up to and including 100 mph to within ± 5 mph.
- 27 RTS-4.24 The Vehicle Detection subsystem shall be capable of creating a distinct
28 separation between vehicles spaced as closed as 2 feet apart, from head to tail.
- 29 RTS-4.25 The Vehicle Detection subsystem shall correctly discriminate what lane a vehicle
30 is traveling in.
- 31 RTS-4.26 The Vehicle Detection subsystem shall correctly correlate the vehicle and
32 transaction to the toll lane the vehicle is traveling in.
- 33 RTS-4.27 The Vehicle Detection subsystem shall recognize when a vehicle is traveling in
34 the wrong direction.
- 35 **4.3.3.4 VEHICLE CLASSIFICATION**
- 36 RTS-4.28 The Automatic Vehicle Classification (AVC) subsystem shall count the number
37 of axles on each vehicle and perform axle-based classification.
- 38 RTS-4.29 The AVC subsystem shall correctly distinguish between individual vehicles and
39 vehicles towing one or more trailers.

1 RTS-4.30 The AVC subsystem shall accommodate a minimum of 11 vehicle classes, as
2 identified by WSDOT.

3 **4.3.3.5 VEHICLE IDENTIFICATION**

4 RTS-4.31 The automatic vehicle identification (AVI subsystem shall read eGo® Plus and
5 ISO 18000 6C Transponders).

6 RTS-4.32 The AVI subsystem shall assign priority for transponders in the following order:

- 7 • Valid/Low Balance Status – ISO 18000 6C Transponder
- 8 • Valid/Low Balance Status – eGo® Plus Transponder
- 9 • All other statuses – ISO 18000 6C Transponder
- 10 • All other statuses – eGo® Plus Transponder

11 RTS-4.33 The AVI subsystem shall detect and read properly installed Transponders on
12 vehicles straddling adjacent lanes.

13 RTS-4.34 The AVI subsystem shall authenticate the Transponder.

14 **4.3.3.6 ELECTRONIC ENFORCEMENT BEACON**

15 RTS-4.35 The Zone Controller shall activate the enforcement beacon based on user
16 configurable parameters including transponder type and status to be determined
17 during system development.

18 RTS-4.36 Successive activations of the enforcement beacon for closely spaced successive
19 vehicles traveling at the posted speed limit shall be visibly discernable to the
20 naked eye.

21 RTS-4.37 The enforcement beacon shall become inactive when the lanes are not collecting
22 tolls.

23 RTS-4.38 The enforcement beacon shall include a viewing angle of 10 to 25 degrees with a
24 minimum viewing distance of 1,000 feet, or to the end of the nearest downstream
25 enforcement area, whichever is less and in dry and clear weather conditions
26 during sunlight hours.

27 RTS-4.39 The location of the enforcement beacon shall be determined by WSDOT during
28 the Preliminary Design Phase of work.

29 RTS-4.40 The color of the enforcement beacon shall be determined by WSDOT during the
30 Detailed Design Phase of the Work.

31 RTS-4.41 A single enforcement beacon shall be installed for each associated lane or
32 shoulder.

33 **4.3.3.7 LICENSE PLATE IMAGE CAPTURE**

34 **4.3.3.7.1 General**

35 RTS-4.42 The license plate image capture (LPIC) subsystem shall comply with Revised
36 Code of Washington (RCW) 46.63.160 7(a), which limits photo enforced images
37 to the vehicle and vehicle license plate only (for more information see
38 <http://apps.leg.wa.gov/rcw/default.aspx?cite=46.63.160>).

- 1 RTS-4.43 The LPIC subsystem shall capture front and rear images of all vehicles that pass
2 through the Toll Zone, regardless of whether they are in one lane, straddling two
3 lanes, straddling the buffer (if any), or driving on the shoulder in the vehicle
4 region of interest. WSDOT prefers color images although black and white
5 images may be used.
- 6 RTS-4.44 All images that contain any portion of the license plate shall be stored in
7 accordance with Section 4.3.4.8.3 herein for retrieval if necessary.
- 8 RTS-4.45 The Image File naming convention for image files included as part of
9 Transaction information sent to the CSC shall meet the Interface Control
10 Document guidelines and requirements.
- 11 RTS-4.46 Image storage and transmission shall meet the Roadway Toll System Interface
12 Control Document (ICD) guidelines and requirements.
- 13 **4.3.3.7.2 Optical Character Recognition**
- 14 RTS-4.47 The optical character recognition (OCR) subsystem shall process all vehicle
15 images through one or multiple OCR engines.
- 16 RTS-4.48 Regardless how many images are captured for a photo toll transaction, the OCR
17 subsystem shall determine the plate jurisdiction of issue, plate type, and plate
18 characters for at least one front and one rear captured image that contains a
19 license plate.
- 20 RTS-4.49 The OCR subsystem may create a composite OCR value based on multiple
21 images and vehicle or plate fingerprinting data.
- 22 RTS-4.50 The OCR subsystem shall assign a confidence rating to each OCR result for each
23 of the following three elements: plate characters, type, and jurisdiction.
- 24 RTS-4.51 A composite OCR value shall include a confidence rating and meet all other
25 applicable OCR requirements.
- 26 RTS-4.52 The OCR subsystem shall append the determined OCR value for the plate with
27 the highest confidence to the Transaction when the OCR values for the front and
28 rear plate of a 2-axle vehicle do not match.
- 29 RTS-4.53 The OCR subsystem shall append the determined OCR value for the front plate
30 to the Transaction when the OCR values for the front and rear plate of a 3-axle
31 vehicle or larger do not match.
- 32 **4.3.3.7.3 Supplemental Lighting**
- 33 RTS-4.54 Supplemental lighting for vehicle LPIC shall not distract, startle or otherwise
34 impair or interfere with motorists driving in either direction of traffic.
- 35 RTS-4.55 Supplemental lighting shall be nearly non-visible, resulting in minimal additional
36 light reaching the surrounding environment.
- 37 **4.3.3.8 TOLL RATE SIGN POSTING**
- 38 RTS-4.56 The RTS shall obtain toll rates and other messages in real-time from the TMC in
39 accordance with the Traffic Data ICD developed by the Vendor
- 40 RTS-4.57 The RTS shall post in real-time the toll rates and messages to the correct toll rate
41 sign.

- 1 RTS-4.58 The RTS shall receive confirmation or some form of acknowledgement following
2 the posting of a toll rate or message to a toll rate sign.
- 3 RTS-4.59 The RTS shall continually poll the toll rate sign at a user configurable frequency
4 to verify the toll rate or message posted to the sign.
- 5 RTS-4.60 The RTS shall be capable of overriding the toll rate sign’s toll rate or message
6 through the use of a graphical user interface (GUI).
- 7 RTS-4.61 The RTS shall post the toll rate or message to the toll rate sign using the WSDOT
8 version of NTCIP at a user configurable frequency, with a minimum of every 30
9 seconds.

10 **4.3.4 FACILITY MANAGEMENT AND ADMINISTRATION SYSTEM**

11 **4.3.4.1 GENERAL**

- 12 RTS-4.62 The Facility Management and Administration System (FMAS) shall receive all
13 Transactions, images, and other associated data from each Zone Controller.
- 14 RTS-4.63 The FMAS shall transmit all Transactions, images (when requested), and other
15 associated data to the WSDOT CSC as defined within the Roadway Toll System
16 ICD.
- 17 RTS-4.64 Within 30 minutes of receipt of Transponder status data from the CSC, the
18 FMAS shall transmit the data to all Zone Controllers.
- 19 RTS-4.65 Where a Zone Controller is offline, the FMAS shall retry a user-configurable
20 number of times at a user-configurable frequency, to transmit the Transponder
21 status data to the Zone Controller.
- 22 RTS-4.66 The FMAS shall only transmit the most up-to-date transponder validation lists
23 (TVL) when the Zone Controller comes online.
- 24 RTS-4.67 The FMAS shall receive the complete TVL file from the CSC at least every day.
- 25 RTS-4.68 The FMAS shall receive updates to the TVL data from the CSC at least every
26 hour.
- 27 RTS-4.69 The FMAS shall store data to non-volatile memory upon receipt or generation to
28 minimize the loss of data in the event of a power failure or other RTS failure.
- 29 RTS-4.70 In the event of data loss at the FMAS due to Product failure and in accordance
30 with Section 4.3.4.8.3 herein, the FMAS shall have the ability to retrieve the lost
31 data from the Zone Controller.
- 32 RTS-4.71 The FMAS shall be monitored by separate Software or Hardware (e.g., a
33 watchdog) that will notify maintenance staff when the FMAS or supporting
34 services lock up, reboot, fail, or lose network connectivity.

35 **4.3.4.2 TIME SYNCHRONIZATION**

- 36 RTS-4.72 The FMAS shall automatically adjust the date and time to conform to local
37 Daylight Savings Time.
- 38 RTS-4.73 The FMAS shall synchronize the date and time by the master clock at
39 <http://tycho.usno.navy.mil/>, or another WSDOT-approved time source at least
40 once every 30 minutes.

- 1 **4.3.4.3 TRANSACTION MANAGEMENT**
- 2 **4.3.4.3.1 General**
- 3 RTS-4.74 The RTS shall include a filter to account for duplicate Transaction data.
- 4 **4.3.4.3.2 Transaction Creation**
- 5 RTS-4.75 The RTS shall create a unique transaction for each and every vehicle passing
6 through the Toll Zone.
- 7 RTS-4.76 The RTS shall assign a unique and sequential transaction ID to each transaction.
- 8 RTS-4.77 Transactions shall include all associated data related to each vehicle passing
9 through the Toll Zone.
- 10 RTS-4.78 If a vehicle passes through the Toll Zone with a Transponder of any transponder
11 status code as defined within the Roadway Toll System ICD other than “valid” or
12 “low balance,” the Zone Controller shall create a photo-enforced Transaction.
- 13 RTS-4.79 All transaction data, whether complete or incomplete, and regardless of
14 characteristics, shall be recorded and stored for retrieval and or transmittal to the
15 FMAS or other RTS subsystems.
- 16 RTS-4.80 The RTS shall prevent Transponder reads from being assigned incorrectly to
17 leading or trailing vehicles (tailgating).
- 18 RTS-4.81 The RTS shall prevent an AVI reader in a lane from assigning to that lane the
19 Transponder of a vehicle traveling in an adjacent lane.
- 20 RTS-4.82 The RTS shall assign to each transaction the toll rate or message which was
21 observed by the driver at the time the vehicle passed under the adjacent upstream
22 toll rate sign. This assignment shall be based on both logic within the RTS and a
23 user configurable toll rate assignment time delay.
- 24 **4.3.4.3.3 Trip Building**
- 25 RTS-4.83 Based on individual transactions created at each Toll Zone, the RTS shall be
26 capable of creating trips by compiling transactional information.
- 27 RTS-4.84 The RTS shall assign a unique and sequential trip ID to each trip.
- 28 RTS-4.85 Trips shall include all associated Transaction data related to each vehicle’s
29 passage through one or multiple Toll Zones and the toll rates associated with the
30 Toll Zone(s).
- 31 RTS-4.86 Trip formation shall take into account single Toll Zone transactions constituting a
32 single trip or multiple sequential Toll Zone transactions constituting a single trip.
- 33 RTS-4.87 The RTS shall have the capability of identifying when there is a missing Toll
34 Zone transaction between sequential transactions and determine whether or not
35 there should be a single trip built or multiple trips.
- 36 RTS-4.88 A trip shall be capable of including both transponder and photo toll transactions.
- 37 RTS-4.89 The RTS shall contain logic with configurable parameters for discerning trips
38 including single or multiple transactions.

1 **4.3.4.4 TOLL RATE MANAGEMENT**

2 RTS-4.90 The FMAS shall record and retain all toll rates for a minimum of 3 months.

3 RTS-4.91 Utilizing historical dynamic toll rates created by the TMC, the FMAS shall
4 continually calculate, build and maintain a rolling static (time-of-day) back-up
5 toll rate schedule based on the previous 3 months.

6 RTS-4.92 Upon loss of communications between the FMAS and the TMC for a user
7 configurable period of time, the Vendor shall post the static back-up toll rate
8 schedule until communications are restored.

9 RTS-4.93 Upon loss of communications between the RTS and the toll rate sign, a user
10 configurable default toll rate or message will be posted.

11 **4.3.4.5 MAINTENANCE ONLINE MANAGEMENT SYSTEM**

12 **4.3.4.5.1 General**

13 RTS-4.94 During the Vendor-provided Operation and Maintenance Period, the
14 Maintenance Online Management System (MOMS) shall be the primary
15 application for all RTS maintenance activities, including preventive maintenance,
16 emergency maintenance, real-time monitoring, repair calls, and report generation.

17 RTS-4.95 During a Shared Maintenance term (if applicable), MOMS shall operate in a
18 supplemental role to Signal Inventory Maintenance Management System
19 (SIMMS); however, WSDOT retains the right to utilize MOMS as the primary
20 application for all RTS maintenance activities.

21 RTS-4.96 In the event a third party MOMS is provided, reports required to support
22 maintenance reporting shall be consolidated by the Vendor.

23 RTS-4.97 The MOMS shall utilize a graphical user interface (GUI) in accordance with
24 Section 4.3.7 herein that allows Authorized Users to perform view, update, and
25 query functions.

26 RTS-4.98 The MOMS shall monitor and control Product failures within the RTS in near
27 real-time.

28 RTS-4.99 The Vendor shall provide a list of all monitored components of the RTS and last
29 known status.

30 RTS-4.100 The Vendor shall provide a list of all monitored processes and services of the
31 RTS.

32 RTS-4.101 The Vendor shall define and develop ticket escalation parameters during the
33 system development phase of the Project.

34 RTS-4.102 At a minimum, the MOMS shall provide the following information to its users:

- 35 • Current system status (level defined by user)
- 36 • Current Toll Zone operation status (system health for each Toll
37 Zone)
- 38 • Current toll component status
- 39 • Failure and/or malfunction location/time

- 1 RTS-4.114 The Work Order shall record the source of the Work Order, either as
2 automatically triggered by MOMS monitoring, or the person reporting the failure
3 (Vendor maintenance technician, WSDOT staff member, or both).
- 4 RTS-4.115 The MOMS shall build ad hoc Work Orders for unusual occurrences of
5 maintenance activities as requested by WSDOT.
- 6 RTS-4.116 A Work Order shall include, but not be limited to, the following required
7 information:
- 8 • Date/time of Work Order generation
 - 9 • Date/time/location of repair or maintenance call
 - 10 • Work Order number (sequential)
 - 11 • Work Order priority
 - 12 • Work Order status
 - 13 • Work Order assignment details
 - 14 • Failure or malfunction description
 - 15 • Repair/diagnosis details
 - 16 • Usage of spare parts
- 17 RTS-4.117 All Work Orders shall create a unique, sequential number.
- 18 RTS-4.118 The MOMS shall provide a search feature which allows users to search for Work
19 Orders either through the use of or in combination with text entry, pull down
20 menus, and data range entry by:
- 21 • Date/time of Work Order generation
 - 22 • Date/time/location of repair or maintenance call
 - 23 • Date/time of Work Order completion
 - 24 • Work Order number (including Wildcard operators)
 - 25 • Work Order priority
 - 26 • Work Order status
 - 27 • Work Order assignment details
 - 28 • Repair/diagnosis details
 - 29 • Usage of spare parts
 - 30 • Failure or malfunction description
- 31 RTS-4.119 The MOMS shall provide a drill down feature; where it begins with a listing of
32 Work Orders by category, to be agreed upon by WSDOT in the system
33 development phase, and the ability to drill down to the detail level for individual
34 Work Orders.
- 35 RTS-4.120 The MOMS shall monitor the toll rate sign for successful posting of the toll rate
36 or message and poll the actual posted toll rate or message at a user configurable
37 frequency.

- 1 RTS-4.121 The MOMS shall track and provide reporting for Functional Availability,
2 MTTRespond, and MTTRepair.
- 3 **4.3.4.5.4 Notification**
- 4 RTS-4.122 The MOMS shall provide an automatic ticket generator for automated
5 notification of maintenance issues.
- 6 RTS-4.123 The MOMS shall allow for automatic notification of technicians once a Work
7 Order has been generated.
- 8 RTS-4.124 The MOMS shall allow for users to set parameters for all error notifications,
9 status changes, and escalation rules.
- 10 RTS-4.125 The MOMS shall allow for user-configured thresholds that will automatically
11 notify technicians of changes in the Transaction counts and performance of the
12 OCR.
- 13 RTS-4.126 The MOMS shall provide the capability to notify technicians, at a minimum,
14 through the use of SMS text and e-mail.
- 15 RTS-4.127 E-mail-based notifications shall include a unique and descriptive subject line
16 related to the failure or malfunction and location (e.g., Zone Controller A failed
17 in Zone #1, Lane #1).
- 18 RTS-4.128 The RTS shall notify maintenance technicians when summary data as monitored
19 and defined in requirement RTS-4.111 deviates from historical rolling previous
20 3-month averages during the same time 30-minute time period according to user
21 configurable parameters.
- 22 RTS-4.129 The preventive maintenance schedule shall be integrated with the MOMS to
23 generate automatic Work Orders at scheduled times.
- 24 RTS-4.130 The MOMS shall create a ticket when a complete TVL file is not received within
25 a user-configurable period but no longer than at least once a day.
- 26 **4.3.4.5.5 Spare Parts Management**
- 27 RTS-4.131 The MOMS shall provide an integrated spare unit and spare parts inventory
28 control function.
- 29 RTS-4.132 The MOMS shall integrate inventory control with the Work Order generation
30 function, which shall automatically update and maintain the RTS and spare parts
31 inventory based on Work Orders and technicians recording of parts used during
32 Work Order close-out.
- 33 RTS-4.133 The MOMS shall create automatic notifications when new parts are required due
34 to changes in inventory, established by user-configurable thresholds.
- 35 RTS-4.134 Spare parts required information includes any parts entered into inventory and
36 shall include details such as, but not limited to:
- 37 • OEM serial number
 - 38 • WSDOT-specific serial number, if any
 - 39 • Purchase date
 - 40 • Time and date part entered into inventory

- 1 • Warranty information
- 2 • Current status
- 3 • Current location of the spare part
- 4 • Time and date part was removed from inventory
- 5 • Any relevant tracking/shipping information

6 **4.3.4.5.6 Availability Tracking**

7 RTS-4.135 Availability calculations shall consider the following subsystems:

- 8 • License Plate Image Capture
- 9 • Vehicle Classification
- 10 • Vehicle Detection
- 11 • Automatic Vehicle Identification
- 12 • Digital Video Audit System
- 13 • Optical Character Recognition
- 14 • Toll Rate Sign Posting

15 RTS-4.136 A subsystem shall be considered available when (a) at least one device of that
16 subsystem per lane replies to a ping sent by the FMAS at a configurable
17 frequency, and (b) when the Software or Hardware solution referenced in
18 requirement RTS-4.71 notifies the FMAS at a configurable frequency that the
19 associated services are running.

20 RTS-4.137 If one of the seven subsystems as listed in requirement RTS-4.134 is unavailable,
21 the entire RTS shall be considered unavailable.

22 RTS-4.138 Every unavailable incident (outage) during each month shall be tracked by the
23 MOMS and reported.

24 RTS-4.139 During Shared Maintenance, the Availability calculations shall consider the
25 responsible party, as mutually agreed upon between WSDOT and the Vendor if
26 Shared Maintenance.

27 RTS-4.140 The MOMS Availability calculations shall be performed automatically whenever
28 the Availability report is run.

29 **4.3.4.6 MEAN TIME TO RESPOND AND REPAIR**

30 RTS-4.141 The MTTRespond and MTTRepair calculations shall be performed automatically
31 whenever the MTTRespond/Repair report is run.

32 RTS-4.142 The MOMS shall denote all deductions to MTTRespond and MTTRepair
33 individually.

34 **4.3.4.7 REPORTING**

35 RTS-4.143 The RTS shall provide the capability for users to generate and produce reports
36 based on predefined and ad hoc report criteria.

37 RTS-4.144 No black out period shall exist for running reports.

- 1 RTS-4.145 The RTS shall allow the user to edit and view the report selection parameters.
- 2 RTS-4.146 The RTS shall generate scheduled and ad hoc reports automatically and e-mail
3 and/or save them as defined by the user.
- 4 RTS-4.147 The ability to support inquiries and the generation of reports shall be available 24
5 hours per day, seven days per week.
- 6 RTS-4.148 Reporting shall include daily, weekly, monthly, yearly, day of week, day of year,
7 week of month, and week of year recurrence criteria.
- 8 RTS-4.149 Reporting shall be output, saved, or printed in the following formats including,
9 but not limited to: on-screen, PDF, comma-separated values (text), and Microsoft
10 Excel.
- 11 RTS-4.150 The RTS shall have the capabilities of retrieving data for:
- 12 • Any given date/time Transaction
- 13 • Any given lane or Toll Zone
- 14 • Entry/exit location
- 15 • Any given classification
- 16 • Transaction type
- 17 • Toll rate sign information
- 18 RTS-4.151 The RTS reports shall provide relevant overall information, such as column and
19 row totals, percentage splits, and basic statistics, such as minimum, maximum,
20 and average.
- 21 RTS-4.152 The RTS shall have the capability to report on power information such as power
22 fluctuations, on/off state changes, and other anomalies.
- 23 **4.3.4.7.1 Defined Reports**
- 24 RTS-4.153 The RTS shall generate a range of reports, for user-configurable periods of time,
25 but at least monthly, of which the content and form shall be submitted to
26 WSDOT for approval. The reports shall include, but not be limited to:
- 27 • Users and user groups
- 28 • Toll fare schedule and toll rate sign display history
- 29 • Misclassifications
- 30 • Non-associated and extra transponder reads
- 31 • Transactions detail to include, but not limited to, transaction type
- 32 • Dailey reconciliation report
- 33 RTS-4.154 The MOMS shall generate operational, management, and performance reports, of
34 which the content and form shall be submitted to WSDOT for approval,
35 including but not limited to:
- 36 • Summarized and detailed component failure history
- 37 • Maintenance paging and response history

4.3.4.8 SYSTEM TECHNOLOGY AND APPLICATION REQUIREMENTS

- 1 **4.3.4.8 SYSTEM TECHNOLOGY AND APPLICATION REQUIREMENTS**
- 2 RTS-4.168 The RTS shall be compatible with the current WSDOT-approved version of
3 Microsoft SQL Reporting Services at the time of submission of the draft Detailed
4 Design Document.
- 5 RTS-4.169 The RTS shall be supported by Commercial Off-the-Shelf (COTS), general-
6 purpose Software that will provide standard system utilities, for example:
- 7 • Computer operating systems
 - 8 • System database
 - 9 • System reporting
 - 10 • System backup, archive, and restore functions
- 11 RTS-4.170 The RTS shall provide access to Toll Zone and FMAS transaction and audit data
12 to authorized RTS users.
- 13 RTS-4.171 RTS data access shall not adversely affect the processing and/or any other
14 function of the RTS.
- 15 RTS-4.172 The online database(s) shall be protected from corruption due to any user access
16 to the data.
- 17 RTS-4.173 The FMAS shall provide the following features:
- 18 • GUI
 - 19 • Server redundancy to prevent down-time and protect data
 - 20 • Automatic archiving
- 21 RTS-4.174 A Relational Database Management System (RDBMS) shall be utilized to store
22 data collected throughout the RTS. Data tables, such as AVI Transactions,
23 image-based Transactions, RTS events, maintenance events, etc., shall be
24 maintained within the database.
- 25 RTS-4.175 The RDBMS shall be provided to meet the functionality described throughout
26 this Appendix and be compatible with the Network (LAN), server, and
27 workstation environments described in this Appendix.
- 28 RTS-4.176 The RDBMS shall provide the common functionality, elements, and capabilities
29 encountered in commercially available RDBMSs.
- 30 RTS-4.177 The access of data by users shall be through a GUI.
- 31 RTS-4.178 The access of data is controlled by user privileges.
- 32 RTS-4.179 Any Vendor-provided Ethernet Product to be used in connection with the RTS
33 network, unless requested for exclusion and approved by WSDOT shall utilize
34 connectors and cable, rated and capable of connecting at speeds of 1 Gbps.
- 35 **4.3.4.8.1 Data Protection**
- 36 RTS-4.180 The Vendor shall protect all data in accordance with the security policies and
37 standards found in Appendix 22.

- 1 RTS-4.181 The Vendor shall consider all RTS data classified as Category 2 (see the security
2 policies and standards in Appendix 22). The classification category dictates the
3 security level requirements.
- 4 RTS-4.182 The Vendor shall provide data and anti-malware protection throughout the RTS,
5 including, but not limited to, the following environments:
- 6 • FMAS
 - 7 • Workstations
 - 8 • External system interfaces
 - 9 • Remote access locations (Vendor controlled)
 - 10 • Internet
- 11 RTS-4.183 Data and anti-malware protection shall include, but not be limited to:
- 12 • Password data security at workstation login
 - 13 • Data backup subsystems
 - 14 • Boot record and memory virus scanning
 - 15 • Disk and tape virus scanning
 - 16 • Communication link and data packet virus scanning
 - 17 • Import and export file virus scanning prior to standard file opening
18 and/or transfer
- 19 RTS-4.184 The Vendor shall, at a minimum, provide the following:
- 20 • The latest version of anti-malware at the time of System
21 Acceptance
 - 22 • Update service within 15 Calendar Days of update issuance for the
23 malware dictionary and/or malware scanning Software throughout
24 the warranty, maintenance period and any optional maintenance
25 periods
 - 26 • Anti-malware operational procedures
- 27 **4.3.4.8.2 Back-Up and Recovery**
- 28 RTS-4.185 The RTS shall back up data to Linear Tape-Open generation four (LTO-4)
29 compatible tapes accessible by Computer Associates' ARCserve version 11.
- 30 RTS-4.186 Backup tapes shall be stored offsite by the Vendor a minimum of 50 miles from
31 the Project.
- 32 RTS-4.187 Back-up tapes shall be stored at the offsite location no later than 30 Calendar
33 Days following the data event.
- 34 RTS-4.188 The Vendor shall provide the full back-up data on tape drives to be used by
35 WSDOT in the event of a recovery.
- 36 RTS-4.189 The Vendor shall deliver full back up data to WSDOT within 48 hours of the
37 request and at a pre-determined site.

- 1 RTS-4.190 The databases shall include Software that allows the user to configure the
2 scheduling of the back-ups.
- 3 RTS-4.191 The RTS back-up processes shall be designed to minimize the potential loss of
4 data.
- 5 RTS-4.192 Back-up processes shall not interfere with normal operation of the RTS or
6 running of reports.
- 7 RTS-4.193 Data shall be staged and archived at a user-configurable interval to ensure
8 maximum RTS performance.
- 9 RTS-4.194 The RTS shall allow the archived data to be reloaded on the RTS for possible
10 future examination, processing, or printing.
- 11 RTS-4.195 Back-ups shall be performed no less than once per day.
- 12 **4.3.4.8.3 Data Retention**
- 13 RTS-4.196 The RTS shall retain out-dated TVL files for 30 Calendar Days.
- 14 RTS-4.197 Image files shall be retained on the file server for at least 90 Calendar Days as
15 per the Roadway Toll System ICD.
- 16 RTS-4.198 The FMAS shall retain all Transaction data online for a period of 360 Calendar
17 Days.
- 18 RTS-4.199 The DVAS shall retain data for 90 Calendar Days.
- 19 RTS-4.200 The RTS shall retain raw event data for the life of the Contract.
- 20 RTS-4.201 The RTS shall retain offline Transaction data and images for a period of one
21 year.
- 22 RTS-4.202 The RTS shall retain offline summarized daily traffic data for a period of five
23 years.
- 24 RTS-4.203 The RTS shall provide confirmation of successful data archival before deletion.
- 25 **4.3.5 DIGITAL VIDEO AUDIT SYSTEM**
- 26 **4.3.5.1 GENERAL**
- 27 RTS-4.204 The Vendor shall provide one or more cameras mounted at each tolling point to
28 provide a continuous video feed of the traffic passing through the Toll Zone.
- 29 RTS-4.205 The Transaction details taking place in the Toll Zone shall be viewable with the
30 video image so as to enable the viewer to associate vehicles with Transaction
31 data and judge the overall apparent “health” of the RTS.
- 32 RTS-4.206 The viewable data shall include all Transaction data captured for each vehicle
33 passing through the Toll Zone.
- 34 RTS-4.207 At a minimum, the Digital Video Audit System (DVAS) shall store video data
35 during tolling hours.
- 36 RTS-4.208 The DVAS viewer shall ensure that a user can view a vehicle for at least one
37 second along with its associated transaction data.

- 1 RTS-4.209 The viewable data shall be formatted on the screen in such a manner that the
2 viewer can easily correlate the vehicle on the screen with the Toll Zone lane the
3 RTS believes the vehicle traveled on.
- 4 RTS-4.210 The viewable video and text shall be human readable, and not contain any
5 flickers or fluctuations in the display image.
- 6 RTS-4.211 This camera shall serve to provide images for use in visually determining vehicle
7 class, including visual shape or axle count verification.
- 8 RTS-4.212 A sufficient DVAS video feed shall be captured to assure a usable image of the
9 vehicle is obtained for vehicles traveling from 5 mph up to and including 100
10 mph.
- 11 RTS-4.213 The camera location shall be chosen so as to minimize the probability of
12 obstructions due to other vehicles.
- 13 RTS-4.214 The DVAS shall stream the monitoring video signal in MPEG 2 or MPEG 4
14 format (or any format that is compatible with current and future WSDOT
15 systems).
- 16 RTS-4.215 The DVAS shall capture, stream, and store video at 15 or greater images per
17 second.
- 18 RTS-4.216 The Vendor shall supply the Products to record and view the real-time and
19 archived data.
- 20 RTS-4.217 The DVAS shall enable the viewer to display a single Toll Zone’s monitoring
21 video or to view at least two Toll Zones simultaneously.
- 22 RTS-4.218 Video shall be indexed and searchable for easy location of a specific time, date,
23 location, payment type, tag status and unusual occurrences.
- 24 RTS-4.219 The DVAS shall have an interface that allows for the user to view live data or
25 search and view archived data.
- 26 RTS-4.220 The DVAS shall allow for screen capture of the entire DVAS display.
- 27 **4.3.6 COMMUNICATION**
- 28 **4.3.6.1 GENERAL**
- 29 RTS-4.221 When provided by WSDOT, the RTS shall operate within the WSDOT-
30 communications network.
- 31 RTS-4.222 To the extent possible all RTS Hardware or components shall be IP addressable.
- 32 RTS-4.223 The RTS shall redundantly store Transaction data in the Zone Controller and the
33 FMAS.
- 34 RTS-4.224 The RTS and subsystems shall utilize a fully automatic, redundant fail-over
35 process that ensures minimal downtime and does not require user intervention to
36 facilitate the fail-over.
- 37 RTS-4.225 The RTS shall ensure that all records are transferred from the Zone Controller to
38 the FMAS.
- 39 RTS-4.226 In the event transaction and image data cannot be transmitted to the CSC as
40 required for a period of longer than one day (24 hours), the Vendor shall transfer

1 transaction and image data to the CSC at least daily by other means until normal
2 processes can be restored.

3 RTS-4.227 In the event TVL data cannot be transmitted to the FMAS as required for a
4 period of longer than one day (24 hours), the Vendor shall transfer TVL data to
5 the FMAS at least daily by other means until normal processes can be restored.

6 RTS-4.228 The Vendor shall connect to the WSDOT provided switch to connect from the
7 WSDOT provided network.

8 RTS-4.229 The WSDOT provided switch will connect to a firewall in order to protect the
9 Toll Facility network from the Internet.

10 **4.3.6.2 NETWORK INFRASTRUCTURE**

11 RTS-4.230 The Vendor shall ensure that all network infrastructure equipment consists of
12 Cisco hardware and software, unless otherwise approved and/or supplied by
13 WSDOT.

14 RTS-4.231 The Vendor shall coordinate all system design with WSDOT in order to allow for
15 correct integration into the WSDOT system architecture.

16 RTS-4.232 The Vendor shall provide for the remote management of all infrastructures by
17 WSDOT support personnel.

18 RTS-4.233 All Cisco equipment shall have a life cycle of no more than 5 years, unless
19 otherwise directed by WSDOT.

20 RTS-4.234 The Vendor shall purchase and maintain a Cisco Smartnet maintenance contract
21 for all Vendor purchased Cisco equipment.

22 RTS-4.235 Upon the fourth anniversary following equipment installation or from System
23 Acceptance, whichever is later, the Vendor shall coordinate with WSDOT to
24 perform a design review and analysis of all Cisco equipment.

25 RTS-4.236 The Cisco equipment evaluation, as referenced in requirement RTS-4.235, shall
26 be used to determine the replacement schedule of the Cisco equipment.

27 **4.3.6.3 NETWORK TOPOLOGY AND PROTOCOL SUPPORT**

28 RTS-4.237 The Vendor shall ensure that all Cisco devices support all Multi Protocol Label
29 Switching (MPLS) services and all traffic be transported via TCP/IP
30 (Transmission Control Protocol/Internet Protocol). The WSDOT network only
31 supports TCP/IP and is layered with MPLS services.

32 **4.3.6.4 REMOTE ACCESS PERSONNEL AUTHENTICATION**

33 RTS-4.238 Remote access for purposes of viewing and/or modifying data or running reports
34 shall use a secure web interface using HTTPS, via a Citrix interface, secure file
35 transfer protocol (SFTP), or via a SSL web-based proxy.

36 RTS-4.239 Remote access for purposes of remote monitoring shall use a secure web
37 interface using HTTPS, via a Citrix or remote desktop protocol (RDP) interface,
38 or via a SSL web-based proxy.

39 RTS-4.240 Remote access for purposes of administration or management of the RTS shall
40 use VPNs, secure web interface using HTTPS, via a Citrix or RDP interface, or
41 via a SSL web-based proxy.

- 1 RTS-4.241 Remote access for purposes of administration or management of the RTS shall
2 use multi-factor authentication.
- 3 RTS-4.242 Multi-factor authentication shall use hardware/software security tokens or digital
4 X.509 certificates to augment username/passwords. WSDOT's preferred method
5 is the hardware token.
- 6 RTS-4.243 If X.509 certificates are chosen for multi-factor authentication, then X.509
7 certificates shall be used for all communication channels where multi-factor
8 authentication is required.
- 9 RTS-4.244 Each user shall have a unique account.
- 10 RTS-4.245 All access verification shall be logged.
- 11 **4.3.6.5 LAYERED SECURITY**
- 12 RTS-4.246 The Vendor shall use a layered security approach for all network traffic.
- 13 RTS-4.247 The layered security approach with integrated Cisco ASA (Adaptive Security
14 Appliance) firewalls shall comply with the security policies and standards found
15 in Appendix 22.
- 16 **4.3.6.6 NETWORK INFRASTRUCTURE MANAGEMENT**
- 17 RTS-4.248 The Vendor shall use an enterprise net management program, such as Solarwinds
18 or Nagios, to proactively manage devices and connections.
- 19 RTS-4.249 Each device that may be connected to the transaction network or used to
20 diagnose infrastructure shall be configured for SNMP (Simple Network
21 Management Protocol) V3 and contain the SNMP strings needed for
22 management.
- 23 RTS-4.250 For any device incapable of utilizing SNMP, the Integrator shall provide
24 justification and demonstrate a reasonable workaround does not exist.
- 25 RTS-4.251 The Vendor shall ensure that access to all network devices use RADIUS-based
26 Authentication Authorization and Accounting (AAA).
- 27 RTS-4.252 Each Network infrastructure device shall use appropriate authentication for
28 administrative access per the security policies and standards found in Appendix
29 22.
- 30 RTS-4.253 Access to all devices shall use AAA authentication.
- 31 RTS-4.254 All activities, exceptions, and information security events shall be logged (as per
32 Standard 141.10 Section 10 found in Appendix 22), including changes to
33 network devices.
- 34 **4.3.7 USER INTERFACES**
- 35 **4.3.7.1 GENERAL**
- 36 RTS-4.255 The GUI shall be a hierarchical, menu-driven system.
- 37 RTS-4.256 Access to functions and features shall be limited to Authorized Users based on
38 user accounts and roles developed by WSDOT and the Vendor during the system
39 design process.

- 1 RTS-4.257 All interfaces shall display time in local Pacific Standard Time, standard AM/PM
2 format, and be automatically adjusted for daylight savings time.
- 3 RTS-4.258 Any user interface in the Software shall not require elevated system privileges on
4 the user’s workstation.
- 5 RTS-4.259 User interfaces shall be Web-based, graphical in nature, and compatible with
6 WSDOT-deployed operating system and internet browser utilized at the time of
7 submission of the draft Detailed Design Document.
- 8 **4.3.7.2 FMAS**
- 9 RTS-4.260 The FMAS shall provide an interface facilitating the update and download of
10 modified, updated, or new vehicle classification and toll rate tables.
- 11 RTS-4.261 The FMAS shall provide a Web-based interface for authorized WSDOT users
12 over the WSDOT WAN.
- 13 RTS-4.262 The FMAS shall provide a user display and interface for the monitoring of lane
14 activities and Products installed at each Toll Zone.
- 15 RTS-4.263 The FMAS shall present data and information in a graphical manner.
- 16 RTS-4.264 The FMAS shall display the status of all lane Products and related
17 communications.
- 18 RTS-4.265 The FMAS shall display the last image captured for each camera.
- 19 RTS-4.266 The FMAS shall display the status of all computer Hardware and related
20 communications using a WSDOT-approved color scheme.
- 21 RTS-4.267 The FMAS shall display the AVI usage rate for all reader locations as they occur
22 and over user-defined time intervals.
- 23 RTS-4.268 The FMAS shall provide a user interface to the Zone Controller.
- 24 RTS-4.269 The FMAS GUI shall allow Authorized Users to view, modify, add, and remove
25 a wide range of database settings, configurations, and parameters.
- 26 RTS-4.270 At a minimum the GUI shall provide the following:
- 27
- 28
- 29
- 30
- 31
- 32
- 33
- 34
- 35
- 36
- 37
- 38
- 39
- Users and user groups—create and modify users and user information and assign users to a user group; defines a user group and its access level to program functions, nodes, and reports.
 - System functions—defines the make-up of the RTS nodes (e.g., Zone Controllers) and computers (workstations).
 - Toll classification table—defines the different vehicle declaration states and classifications.
 - Toll rate table—defines the toll rates for times, days, declaration states, and classification types. Also includes the graphical user interface (GUI) for viewing the current posted toll rate, the upcoming (if available) toll rate, historical toll rates, override functionality, and the back-up static (time-of-day) toll rate schedule information.
 - Global configuration—defines global parameters of the RTS.

1 4.3.7.2.1 System Administration

2 RTS-4.271 The FMAS shall control and manage the RTS administration for all aspects of
3 the RTS.

4 RTS-4.272 The FMAS shall support vehicle classification and toll rate table changes via an
5 effective date that specifies the date and time after which the old tables are no
6 longer used and the new tables go into effect.

7 RTS-4.273 Application restarts shall not cause a loss of Transaction information or loss of
8 log file data.

9 4.3.7.2.2 System Monitoring

10 RTS-4.274 The status display shall consist of graphics, symbols, text, and/or numerals
11 (which will be finalized during the design phase).

12 RTS-4.275 The RTS shall automatically refresh the screen or display to show the latest
13 status, image captured, and/or Transaction logged.

14 RTS-4.276 The user shall have the ability to view near real-time Transaction data from any
15 workstation on the network with the proper authorization.

16 RTS-4.277 The user shall have the ability to view near real-time images taken by the Image
17 Capture subsystem.

18 RTS-4.278 Each device and subsystem status shall be indicated by the GUI in color, e.g.,
19 green – “healthy”, yellow – “degraded” or “ailing”, red – “failed.”

20 RTS-4.279 The display shall indicate communication link status with each device, e.g.,
21 graying of the device upon communication loss.

22 RTS-4.280 The FMAS shall immediately receive the Transponder status file and all related
23 update files when it is available from the CSC, which will occur at least once a
24 day.

25 RTS-4.281 The FMAS shall immediately receive the incremental Transponder status file and
26 all related update files when it is available from the CSC, which will occur at
27 least once an hour.

28 RTS-4.282 The FMAS shall transmit the Transaction file to the CSC near real-time.

29 RTS-4.283 The FMAS shall store video images in an FTP server that shall transmit upon
30 request by the CSC.

31 RTS-4.284 The RTS shall log all anomalies in data transmission.

32 4.3.8 SYSTEM INTERFACES**33 4.3.8.1 CSC**

34 RTS-4.285 The FMAS shall interface with the CSC according to the WSDOT Roadway Toll
35 System ICD.

36 RTS-4.286 The Vendor shall provide a file server with SFTP access for use in file storage
37 and transfer to the CSC.

38 RTS-4.287 The Vendor shall send a reconciliation report on a periodic basis to the CSC as
39 per the Roadway Toll System ICD. See Appendix 13 for a sample report.

1 RTS-4.288 The RTS shall meet the compression standards in the Roadway Toll System ICD.

2 **4.3.8.2 TMC**

3 RTS-4.289 An ICD currently does not exist to determine how data should be exchanged
4 between the TMC and RTS. The Vendor develop, test and integrate a Traffic
5 Data ICD with WSDOT input.

6 RTS-4.290 The following fundamental data shall be exchanged between the RTS and CSC
7 and documented in the Traffic Data ICD:

- 8 • toll rate sign name and/or location
- 9 • toll rate value or message
- 10 • toll rate type (dynamic or static)
- 11 • beginning and ending time for toll rate, if any
- 12 • data received and processed information

13 RTS-4.291 WSDOT will provide the toll rate and message data following the Traffic Data
14 ICD.

15 RTS-4.292 The Vendor shall send reports to the TMC as per the Traffic Data ICD to indicate
16 successful receipt and transmission of data.

17 **4.3.8.3 SIMMS**

18 RTS-4.293 The MOMS shall interface with the WSDOT SIMMS to transmit and receive
19 failure alerts and notifications as they are generated.

20 RTS-4.294 This interface shall be activated no later than 90 Calendar Days before the
21 transfer of any maintenance responsibilities from the Vendor to WSDOT.

22 RTS-4.295 The Vendor shall use the SIMMS ICD as a baseline.

23 **4.3.8.4 DATA TRANSFER**

24 RTS-4.296 The Zone Controller shall provide the ability to electronically transfer
25 Transaction and maintenance data to a portable electronic media for delivery to
26 the FMAS.

27 RTS-4.297 The electronic transfer of data between the MOMS and SIMMS shall include a
28 mechanism for ensuring that the data transfer has successfully transmitted the
29 correct data and provide a daily reconciliation report on the information
30 transferred.

31 RTS-4.298 The configuration files, classification tables, etc., shall be transmitted to the
32 applicable system immediately upon update.

33 RTS-4.299 The electronic transfer of data between the FMAS and the TMC and CSC shall
34 include a mechanism for ensuring that the data transfer has successfully
35 transmitted the correct data and provide a daily reconciliation report on the
36 information transferred.

37 RTS-4.300 The FMAS shall provide the ability to electronically copy Transactions to a
38 portable electronic media for delivery to the CSC in the event of a
39 communication loss.

1 RTS-4.301 The RTS shall communicate with the toll rate signs using the National
2 Transportation Communications for ITS Protocol (NTCIP) standard sets.

3 **4.3.9 PERFORMANCE REQUIREMENTS**

4 RTS-4.302 The Vehicle Detection subsystem shall detect 99.9 percent of vehicles passing
5 through the Toll Zone, including vehicles in the shoulders and straddling the lane
6 on the edge of the Toll Zone.

7 RTS-4.303 The AVI subsystem shall correctly detect and read 99.9 percent of all properly
8 installed Transponders on vehicles driving through the Toll Zone from 5 mph up
9 to and including 100 mph.

10 RTS-4.304 The AVC subsystem shall correctly classify 99.8 percent of all detected vehicles
11 at speeds from 5 mph up to and including 100 mph.

12 RTS-4.305 The LPIC subsystem shall capture at least one front image and one rear image,
13 with a human readable license plate (including discernable plate characters, type
14 and jurisdiction), for at least 99 percent of the vehicles (excluding missing,
15 damaged, improperly mounted, temporary, or bus-mounted plates in a frame
16 region of the image that would not comply with (RCW) 46.63.160 7(a)),
17 including motorcycles, driving through the Toll Zone at speeds from 5 mph up to
18 and including 100 mph.

19 RTS-4.306 The OCR subsystem shall return a correct result for 90 percent of the human
20 readable license plate images captured by the RTS, including plate type and
21 jurisdiction.

22 RTS-4.307 99.99 percent of assigned OCR results with a confidence rating of 90 or greater
23 shall include a correct OCR result.

24 RTS-4.308 The RTS shall correctly correlate all Transaction data related to each vehicle into
25 a single Transaction for that vehicle for 99.95 percent of all detected vehicles that
26 pass through the Toll Zone.

27 RTS-4.309 The RTS shall correctly correlate 99.95 percent of all Transaction data into trips,
28 when necessary.

29 RTS-4.310 The enforcement beacon shall correctly signal for 99.9 percent of all vehicles that
30 pass through the Toll Zone.

31 RTS-4.311 The Vendor shall report all errors from the toll rate signs to WSDOT via MOMS
32 and shall identify the Priority Level of each toll rate sign error.

33 RTS-4.312 When a toll rate sign is available, the RTS shall post and maintain the correct toll
34 rate 99.99 percent of the time.

35 RTS-4.313 The RTS shall be available 99 percent of the month.

1 **4.4 SECURITY REQUIREMENTS**

2 **4.4.1 SYSTEM SECURITY**

- 3 RTS-4.314 The RTS shall use Lightweight Directory Access Protocol (LDAP) integrated
4 authentication.
- 5 RTS-4.315 The RTS shall permit only System Administrators access to the RDBMS
6 server(s) for system maintenance, Software upgrades, back-up, archiving,
7 restoration and performance monitoring and tuning.
- 8 RTS-4.316 All RTS user access shall be logged.
- 9 RTS-4.317 All actions conducted by System Administrator(s) shall be logged.
- 10 RTS-4.318 All System Administrator-related activities shall be performed through database
11 management system utilities and command files.
- 12 RTS-4.319 There shall be no direct user access to the FMAS RDBMS. All access to the
13 FMAS RDBMS shall be through FMAS middleware.
- 14 RTS-4.320 The authentication and access to the FMAS RDBMS shall be managed by the
15 middleware application services using generic or function-related database
16 connections.
- 17 RTS-4.321 All FMAS RDBMS scheduled jobs shall be executed under a non-interactive
18 account.
- 19 RTS-4.322 The FMAS RDBMS shall not permit any modifications or deletions of the
20 original Transaction records stored in the FMAS database exclusive of archive
21 functionality.
- 22 RTS-4.323 All FMAS RDBMS records shall support version control and record traceability
23 at the field level.
- 24 RTS-4.324 Each user shall be uniquely identifiable (e.g., user name, or user ID).
- 25 RTS-4.325 The RTS shall authenticate each user's identity with a password.
- 26 RTS-4.326 The RTS shall assign access rights to individual users.
- 27 RTS-4.327 The RTS shall define access for users and/or defined sets of users and objects
28 (e.g., files, database elements, and applications).
- 29 RTS-4.328 The RTS shall provide the capability to control access between named users
30 and/or defined sets of users and named objects (e.g., files, database elements, and
31 applications).
- 32 RTS-4.329 The RTS shall restrict access to objects based on the user's and/or defined sets of
33 users' identity and on access rights (e.g., read, write, execute).
- 34 RTS-4.330 The RTS shall provide the capability to restrict access to Transponder ID
35 numbers and license plate numbers to WSDOT-authorized individuals, which
36 shall be a parameter separate from any other access right parameter.
- 37 RTS-4.331 The RTS shall discontinue the user session if user input devices have been idle
38 for longer than a time period of “n” minutes, where “n” is configurable by the
39 System Administrator.
- 40 RTS-4.332 The RTS shall provide the capability to audit the following types of events:

This page intentionally left blank.