

**APPENDIX B  
TRANSPONDER BASED TOLLING TECHNOLOGY  
TECHNICAL REQUIREMENTS**

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## 1. INTRODUCTION

The objective of this solicitation is to establish one or more contracts for the purchase of transponders transponder readers, ancillary equipment, and related support services. Based upon the results of this procurement, WSDOT shall determine, at its sole discretion, which combination of transponder technologies best meet the programmatic, customer, operational, and technical needs of the tolling program in a cost effective manner.

Specifically, WSDOT is seeking transponders that conform to the following DSRC protocol:

- ISO 18000 6C in the 900 MHz frequency range

Transponders shall provide single or multiple protocol capabilities as supplied by the Vendor.

Transponders are desired in the following form factors, as available from the Vendor:

- Interior Mounted Sticker Transponder
- Interior Mounted Hard Case Transponder
- Interior Mounted Hard Case HOV Self Declare Transponder
- Exterior Mounted Transponder
- Any other form factor suitable for tolling

WSDOT is seeking readers that can read and write to transponders using one or more of the following DSRC protocols:

- ISO 18000 6C in the 900 MHz frequency range
- California Title 21 in the 900 MHz frequency range
- Other protocols used in tolling in North America

For the all equipment supplied by the Vendor, the Vendor shall provide certificates of factory testing, warranties, and documentation concerning installation, operation and maintenance.

## 2. GENERAL TRANSPONDER TECHNOLOGY REQUIREMENTS

### 2.1 Ready to Manufacture and Deliver

All supplied equipment shall have been already designed, developed, tested, and tooled for immediate manufacture and delivery. The supplied equipment shall be currently deployed on or designed specifically to enable non-stop, high-speed electronic toll collection.

### 2.2 Radio Frequencies

The transponders and readers shall utilize such FCC allocated radio frequencies as appropriate for this application. The transponder and readers shall operate in the:

- 902 MHz to 928 MHz radio frequency band; or

Transponders and readers shall be resistant to Radio Frequency (RF) interference present in the toll lane due to other toll lane equipments; equipment carried personally, such as cellular phones; or other RF devices operating in the 900 MHz band whether these devices are licensed or not.

## 2.3 Toll Lane Configurations

The technology shall enable electronic toll collection in a variety of toll lanes including conventional toll plaza lanes and high-speed open road tolling lanes. These lane types may be stand-alone configurations or adjacent to other lane types. Lanes may vary from 10 to 15 feet in width and 10 to 21 feet in height.

- *Toll Lanes:* A traditional toll lane is part of a toll plaza where tolls may be collected by toll collectors in booths, including a variety of antenna placement areas in compact spaces. Lanes dedicated to electronic toll collection in a toll plaza environment are considered toll lanes even if they do not require the vehicle to slow down.
- *Open Road Tolling Lanes:* An open road tolling lane is a lane where a toll is collected but there are no toll booths or other toll collection equipment beyond that needed for electronic toll collection, allowing the vehicle to continue at highway speeds at any lateral position across the travel lanes or shoulder.
- *Reversible Lanes:* A reversible lane is a lane where tolls may be collected from vehicles traveling in either direction during different periods of the day.
- *Dedicated Lanes:* A dedicated lane is a lane where only one form of payment is accepted such as a lane where only transponder equipped vehicles can pass without triggering a violation enforcement system.
- *Mixed Mode Lanes:* A mixed mode lane is a lane where multiple forms of payment are accepted. For example, it could consist of any combination of manual toll collection, Automatic Coin machines as well as electronic toll collection.
- *High Occupancy Toll (HOT) Lanes:* HOT lanes are highway lanes that provide free or reduced cost access to qualifying High Occupancy Vehicles (HOVs), and also provide access to other paying vehicles not meeting passenger occupancy requirements.

## 2.4 Transponder Technology Performance Requirements

### 2.4.1 DETECTION RATE

Vehicles properly equipped with transponders passing through the toll point shall be detected and read completely at least 99.90 percent of the time (no more than ten missed reads or incorrect detects in 10,000 equipped vehicle passages).

### 2.4.2 DSRC COMMUNICATION BIT ERROR RATE (BER)

The DSRC communication bit error rate between transponder and reader shall be less than 0.0001 percent of the time (no more than one error in 1 million) from the transponder in a range of one to thirty-three feet and at zero to one hundred mile per hour.

### 2.4.3 WRITE ACCURACY

All data fields related to a properly, transponder equipped vehicle passage shall be transmitted from the transponder reader and written to the correct transponder without error 99.90 percent of time (no more than ten missed or incorrect writes in 10,000 equipped vehicle passages) in a range of one to thirty-three feet.

## 2.5 Working Environment

The supplied transponder and reader technology shall meet the performance requirements specified in Section 2.4 under the following conditions:

- Vehicles traveling up to 100 miles per hour.
- “Stop and go traffic” with continuous intermittent acceleration and deceleration between 0 and 15 miles per hour.
- Vehicles traveling as close as ten (10) feet when traveling at 45 mph or greater in non-stop tolling lanes.
- Vehicles traveling as close as eight (8) feet when traveling less than 45 mph in non-stop tolling lanes.
- Different mixes of all vehicle types encountered on North American roads including but not limited to cars, trucks, tractor-trailers, recreation vehicles, motorcycles, buses, and delivery vans.
- Vehicles changing and straddling lanes.
- Environmental conditions that may be encountered in the Washington State region, including, but not limited to:
  - Rain – one quarter inch of rain per minute
  - Fog – 10 feet of visibility
  - Ice – one quarter inch thickness between the transponder and the antenna
  - Heavy or Blowing Snow – 2 inches of snow per hour
  - All forms of driving precipitation (sleet, hail, blizzard, etc.)
  - Mud, dust, sand, and any other debris or contaminant as might be found at open road tolling sites

## 2.6 Security

The transponders and readers shall minimize the possibility of something or someone compromising and corrupting the security integrity of the supplied technology. The transponder technology shall incorporate safeguards that would prevent unauthorized access to and recording of and downloading of any data both stored and transmitted from the transponder or reader. Instances of the security integrity to be addressed include, but are not limited to:

- Toll payment is avoided

- Less than the required toll payment is charged
- Unique transponder identification number is cloned or spoofed
- Unauthorized writing to or reading of transponders

The Vendor shall document their security scheme and present options, if available.

## 2.7 Regulatory Compliance

The transponders and readers shall comply with applicable federal, state and local licensing and regulations for transponder technology. Transponder testing shall be certified by an OmniAir Certification Services laboratory or other approved laboratory. Vendors shall document all related licensing and regulations associated with their equipment.

## 2.8 Safety Requirements

The transponders and readers shall meet all applicable safety and environmental requirements related to the technology and its applications in addition to any requirements of this document. The transponders and readers shall not pose either a short-term safety risk or a long-term health risk to drivers, toll collector, technicians, other people who may frequently be in the vicinity of the transponder technology, or any other people.

Safety labels shall be placed on Equipment as appropriate based on prevailing laws, regulations, and standards.

The Vendor shall provide the Material Safety Data Sheet for any materials or equipment utilized within any supplied product that has a Material Safety Data Sheet. The Vendor shall provide any information regarding any other materials that may be considered hazardous or require special handling or disposal.

The Vendor shall document any potential hazards to drivers, toll collectors, or other people from incorrectly mounted transponders, incorrectly installed transponders, or malfunctioning equipment.

## 2.9 Compliance with Requirements

The Vendor shall certify and document that the transponder technology complies with the requirements in the Contract. The Vendor shall conduct testing, as needed, to demonstrate compliance with the requirements. Testing shall generate statistically valid results which unambiguously demonstrate compliance with requirements and specifically address, but are not limited to:

- Compliance with supplied DSRC protocol(s)
- Performance requirements
- Working environment requirements
- Security requirements

The Vendor shall submit documentation to WSDOT describing:

- Testing methods and protocols

- Statistical methodologies applied
- Test results from testing conducted at test facilities and testing which has been documented in a production environment for RFID and/toll facilities

Test results from previous installations at other high speed toll facilities and independent third-party certification shall be acceptable.

### 3. GENERAL TRANSPONDER REQUIREMENTS

#### 3.1 Read and Write Capabilities

All transponders shall have the ability to transmit all of the unique transponder identification data and other data contained on the transponder when read by the reader when passing through the toll point.

If enabled on the transponder, the reader shall have the ability to store “writeable” information on a transponder passing through toll point.

#### 3.2 Power

The transponder shall not require the use of the vehicle’s power supply. The Vendor shall document how each transponder type is powered.

#### 3.3 Consumer Product Safety

All components used in the transponder shall be approved for use in consumer products in terms of safety. The transponder shall not give off dangerous substances at any time including when damaged.

#### 3.4 Size

Interior mounted transponders shall be as small as possible and fit behind the rear view mirror. Interior mounted transponders shall not obstruct the driver’s field of vision.

#### 3.5 Environmental Requirements

The transponder shall operate as required while subjected to temperature, shock, vibration, direct sunlight, dust, impacts, working environment conditions, radio frequency emissions as encountered in the mounting location of the transponder.

#### 3.6 Bar Code

Each transponder shall include a bar code. The transponder bar code information shall match the transponder identification number.

#### 3.7 Transponder Branding

All transponders delivered under this Contract shall be branded “Good To Go!” or any other branding that WSDOT may require in the future, and shall not carry any visible manufacturer or

vendor brand names. WSDOT will provide all required and appropriate “Good To Go!” logos and artwork.

### 3.8 Shipping

All transponders shall comply with any and all current U.S. and international safety standards to permit unrestricted shipment by mail and commercial carriers with appropriate documentation and in the recommended packaging.

### 3.9 Disposal

If there are environmental restrictions on disposal of any type of supplied transponder, the Vendor shall document the proper disposal procedures and the reason for the restrictions.

## 4. TRANSPONDER TYPES TO BE SUPPLIED

The Vendor shall comply with the following requirements for the specific form factors of the transponder types that they provide under this Contract. The Vendor is not required to provide all transponder types requested in this section. Transponder types shall accommodate all types of vehicles including automobiles, trucks and motorcycles.

### 4.1 Interior Sticker Transponder

The Sticker Transponder shall be a programmable, radio wave powered, windshield mounted, RFID transponder that is packaged as a flexible self adhesive sticker. Once the transponder is mounted to the windshield, any attempt to remove the transponder from its mounting location will result in it becoming permanently unusable. The Sticker Transponder must be designed in such a manner that will not cause damage to the surface to which it is attached.

Sticker Transponder shall be designed for operation from -40° F to +185° F.

### 4.2 Interior Hard Case Transponder

The Hard-Case Transponder shall be a programmable, radio wave or battery powered, windshield mounted RFID transponder that is packaged in a monolithic plastic case. The Hard-Case Transponder shall be able to be unattached from vehicle windshield and reattached back to the vehicle windshield without the use of any tools.

Hard Case Transponder shall be designed for operation from -40° F to +185° F.

### 4.3 Interior High Occupancy Vehicle (HOV) Self Declaration Transponder

The High Occupancy Vehicle (HOV) Self Declaration Transponder shall be a programmable, battery powered (if required), windshield mounted RFID transponder that is packaged in a monolithic plastic hard case.

The transponder shall include a push button that when depressed or a switch that when moved causes the transponder to transition from one HOV status to another. The transponder shall support at least two statuses: single occupant vehicle (SOV) and a high occupant vehicle (HOV 2+/3+). Transponders shall include some type of driver feedback.

The transponders shall have the ability transmit the unique transponder identification data and HOV status associated with the transponder when read by the reader when passing through a toll point.

The transponder shall be able to be unattached from vehicle windshield and reattached back to the vehicle windshield without the use of any tools.

The Self Declaration Transponder shall be designed for operation from -40° F to +185° F.

## 4.4 Exterior Transponder

The Exterior Transponder shall be a programmable, radio wave or battery powered RFID transponder that is packaged in a monolithic plastic hard case or a flexible self adhesive sticker. Both form factors shall be for installation on surfaces outside of the passenger compartment of motor vehicles.

Exterior Transponders shall withstand ice, snow, steam, dirt, mud, any solutions used in the lanes, as well as stones and other projectiles such as sand particles and gravel.

The Exterior Transponder shall be designed for operation from -40° F to +150° F.

## 4.5 Mounting Bracket and Strips

### 4.5.1 INTERIOR MOUNT TRANSPONDERS

An interior transponder models shall be held stationary in their location by means sufficient to provide reliable attachment. The attachment methods shall be sufficient to prevent inadvertent displacement or projectile motion in case of rough road surfaces or accident. If the transponder model is transferable, the attachment methods shall allow removal without risk of damage to the transponder or vehicle. Any strips, tabs, cups or other mounting device used to meet these requirements shall be completely removable without damaging or marring the vehicle in any way. The transponder models proposed shall be marked in a manner that incorrectly orienting the transponder upon installation or reinstallation is unlikely.

The Vendor shall supply the required strips, tabs, cups or other mounting devices with all supplied transponder models.

The Vendor shall document the means of attachment and mounting devices used by all supplied transponder models.

### 4.5.2 EXTERIOR MOUNT TRANSPONDERS

License plate-mounted transponders shall be mounted using the top license plate mounting holes and their design shall incorporate bolt holes spaced for the holes in a license plate in the transponder casing or attachment bracket. When mounted, transponders shall not obscure the license plate numbering (numbers and letters) information. Transponders shall be readily moved using common tools when the owner replaces his or her vehicle. The mounting method shall allow removal without risk of damage to the transponder or vehicle.

If an exterior transponder is not mounted on the license plate frame, the transponder shall have sufficient marking to ensure that the correct orientation shall always be selected by the user. The attachment methods shall be sufficient to prevent inadvertent displacement or projectile motion in case of rough road surfaces or accident. The mounting method shall allow removal without risk of damage to the transponder or vehicle.

The Vendor shall supply the required mounting material or hardware with all supplied transponder models.

The Vendor shall document the means of attachment and mounting devices used by all transponder models.

## 4.6 Battery (As Applicable)

For each supplied transponder model incorporating a non-replaceable battery life expectancy shall not be less than five (5) years from the first use with the exception of the HOV Self Declaration Transponders. For HOV Self Declaration Transponders, the Vendor shall document the expected battery life if the transponder is used twice a day.

For each supplied transponder model incorporating a replaceable battery life expectancy shall not be less than four (4) years from the first use with the exception of the HOV Self Declaration Transponders. For HOV Self Declaration Transponders, the Vendor shall document the expected battery life if the transponder is used twice a day. The supplied battery shall be commercially available by the general public.

The Vendor shall supply the battery with the delivery of all supplied transponder models incorporating a battery.

## 4.7 Transponder Storage Bags

For each supplied transponder model incorporating a battery, the Vendor shall provide one metallic bag that will not allow a transponder to be read while the transponder is in the bag.

## 4.8 Number of Protocols Supported

The reader shall be able to support at least one of required DSRC protocols.

If the reader can support multiple protocols, the Vendor shall document which DSRC protocol and the number of DSRC protocols that the reader can process in the same lane at the same time in an open road tolling environment. The multiple protocol reader shall be able to at least read one vehicle equipped with a transponder of one DSRC protocol and read the next vehicle equipped with a transponder of another DSRC protocol in the same lane. The Vendor shall document any conditions and restrictions, including timing considerations that must be observed when using multiple protocols.

## 4.9 FCC Requirements

The reader shall be compliant with following Federal Communications Commission (FCC) requirements as applicable:

- FCC 47 CFR part 15
- FCC 47 CFR part 90

## 4.10 Reader Software and Firmware

The reader software and firmware shall have the ability to be upgraded or modified to accommodate future changes in DSRC protocols.

Vendor shall make available to WSDOT all changes, updates or modifications to the firmware and software of the reader at no additional cost for the duration of the Contract. It shall be at WSDOT's sole discretion whether to install such changes, updates and modifications onto the reader.

## 4.11 Storage Capacity

The reader shall include programmable read-only memory for program storage and non-volatile memory for storing configuration and long-term data.

In the event the reader is unable to communicate with the lane controller, the reader shall buffer a minimum of 50,000 transponder transactions in addition to error messages per lane in a toll plaza environment and a minimum 100,000 transponder transactions in addition to error messages for each travel lane that is connected to the reader that processes and records transponder information in an open road tolling environment. The reader shall be expandable through the addition of memory modules to buffer additional transponder reads and error messages.

Transponder transactions stored in memory shall be retained for at least one week after power is removed from the reader.

In any case where the reader resumes communications with the lane controller after an interruption, the reader shall transmit saved data to the lane controller in the order in which it was received (first in, first out). This transmission shall not interfere with the processing and communications of real-time transactions. Real-time transactions shall have greater priority than saved data.

## 4.12 Mean Time Between Failures

The Mean Time Between Failures (MTBF) for the reader shall be 30,000 hours or greater.

## 4.13 Diagnostic Capabilities

The reader shall have diagnostic capabilities and the ability to automatically report reader status and failures to the lane controller

## 4.14 Interface to Reader

The reader shall provide industry standard interfaces to the lane controller for the transmission of electronic data between lane controller and reader. The interface shall be configurable to communicate to a lane controller using Ethernet, RS-232 and/or RS-422 (RS-485). The Ethernet connection is preferred.

## 4.15 Location

The reader shall be able to be located and mounted outdoors in suitable weatherproof enclosures and indoors (e.g., inside toll booths, the toll plaza tunnel, and the toll plaza building).

## 4.16 Cabling

The Vendor shall document a preferred cable and any limitation on cable lengths and types for two communication connections: between the reader and the antenna and between the reader and the lane controller.

## 4.17 Power Requirements

The reader shall operate from a single 95V to 135V, 60 ±2 Hz, conditioned power connection in each lane or group of lanes. The Vendor shall document all reader related power requirements.

## 4.18 Environmental Requirements

The reader must operate without degradation in performance in all weather conditions including extreme hot or cold weather, rain, snow, high humidity, high wind conditions (120 mph), and vibrations caused either by wind or vehicles.

- Operating Temperature: -40° F to +158° F
- Storage Temperature: -40° F to +185° F
- Humidity:
  - 95% condensing for indoor modules
  - 100% condensing for outdoor modules

## 4.19 Lightning Protection

The reader and all other connected components shall allow for proper grounding and protection against lightning strikes.

## 4.20 Shipping

All readers shall comply with any and all current U.S. and international safety standards to permit unrestricted shipment by mail and commercial carriers with appropriate documentation and in the recommended packaging.

## 4.21 Disposal

If there are environmental restrictions on disposal of any type of supplied readers, the Vendor shall document the proper disposal procedures and the reason for the restrictions.

## 4.22 Reader Enclosure

The Vendor shall provide NEMA 4x rated enclosure for the reader. Each enclosure shall be securable by means such as cylinder lock or hasp and padlock.

In case of antennas integrated with the reader, The Vendor shall provide NEMA 6P rated enclosure for the reader.

All reader enclosure cabinets shall be solid, lightweight, made of non-toxic material and have no sharp edges.

External cable ports shall be easily accessed for installation and maintenance.

## 4.23 Handheld Reader

The handheld readers shall be of ergonomic design and powered by a chargeable battery. The handheld readers shall be able to be carried, moved and operated by one person.

The handheld readers shall be able to read and/or write data to all compatible transponders.

The microwave energy radiated from the handheld reader shall be well below the limits set by health and telecommunication authorities of United States, and these units shall be allowed for continuous use in an operational environment.

## 5. ANTENNA (AS APPLICABLE)

The Vendor shall provide range of antennas that are suitable for use with the supplied readers and associated RF signal.

The Vendor shall provide NEMA 6P rated antennas.

The antennas shall operate at a temperature of between: -40° F to +158° F and 100% condensing humidity.

## 6. WARRANTY

Vendor shall warrant and represent that all equipment provided shall meet the requirements and specifications set forth in this document. Vendor shall warrant that items identified in Appendix K be free of defects in design, workmanship and materials.

The warranty period shall be at least:

1. Transponders– five (5) years
2. Reader – one (1) year
3. Antenna (as applicable) – one (1) year

The warranty period shall begin on the date the equipment was delivered to the designated delivery location.

During the warranty period, Vendor shall adjust, repair, or replace all equipment that is defective or not performing in conformance with these technical requirements. All costs for such adjustments, repairs, or replacements, including all costs for replacing parts or units and any transportation and delivery fees, shall be at Vendor's expense. Any defective equipment shall be repaired or replaced for WSDOT so that it conforms to the specifications.

All warranty service provided hereunder shall be performed by manufacturer-trained, certified, and authorized technicians.

Vendor shall provide Help Desk Services for reporting warranty issues and for troubleshooting problems. Vendor's Help Desk Services shall be accessible via e-mail or via one or more toll-free telephone lines. Vendor shall act as the sole point of contact for warranty service.

The terms and conditions of the warranty shall be incorporated into the Contract.

## 7. DOCUMENTATION

### 7.1 Regulator Compliance

Vendor shall provide documentations stating that all provided equipment is in compliance with appropriate regulations and standards.

### 7.2 Reader

The Vendor shall provide documentation on the operation and maintenance of the supplied readers. Use of this documentation shall be unrestricted by WSDOT or its designated representatives for any WSDOT project.

#### 7.2.1 OPERATING INSTRUCTIONS MANUAL

The operating instructions manual shall include but not be limited to diagrams and illustrations for ease of understanding of the subject matter; a table of instructions and precautions to be taken for safe operation of the equipment; instructions on how to access and operate every control and command; a list of all operator commands with a description of each command, the reason for it, and its recommended use; instructions for operator level diagnostics; programming instructions; setting security parameters; and instructions for reader start-up and shutdown.

#### 7.2.2 INTERFACE CONTROL DOCUMENT (ICD)

The Interface Control Document (ICD) shall include but not be limited to detailed messages and timing description including interface between reader and transponder as well as interface between reader and lane system.

#### 7.2.3 RADIO COMMUNICATION FOOTPRINT

The Vendor shall provide a typical radio communication footprint diagram for a single lane (Toll Plaza) installation and for an open road tolling installation respectively.

#### 7.2.4 MAINTENANCE MANUAL

The maintenance manual shall be prepared by personnel familiar with the maintenance of the supplied equipment. This manual shall include a general description, theory of operation, operator instructions, mechanical functions, installation, test and troubleshooting procedures, preventive and corrective maintenance procedures and schedules, diagrams, schematics, layouts and parts lists required to service each piece of all Vendor supplied equipment. The manual shall permit properly trained technical personnel with reasonable general knowledge of electrical and computer equipment to operate, trouble shoot, diagnose, maintain, perform basic repair, and replacement of the supplied transponder readers. Standard service manuals for commercial products used for the equipment will be acceptable if they contain sufficient information to service the equipment.

### 7.3 Security Scheme

The transponders and readers shall be designed to minimize the possibility of something or someone compromising and/or corrupting the integrity of the toll collection system. The Vendor shall document the safeguards its equipment provides that would prevent unauthorized access to, recording of, and/or downloading of, any data, stored or transmitted, from the transponder, and transponder reader.

### 7.3.1 TRANSPONDER MEMORY MAP

The Vendor shall provide a bit level description of the transponder memory map including transponder identification number, Read-Only Memory, Read/Write Memory (as applicable) and access condition.

### 7.3.2 TRANSPONDER PASSWORD (AS APPLICABLE)

The Vendor shall provide a description of the creation and the usage of transponder password(s), as applicable.

### 7.3.3 AUTHENTICATOR CALCULATION (AS APPLICABLE)

The Vendor shall provide a description of the creation and the usage of authenticator(s) as applicable.

## 8. MANDATORY SERVICES

The Vendor shall provide the services listed below to WSDOT or its designated representative for the duration of the Contract

### 8.1 Transponder Technology Testing and Certification

The Vendor shall demonstrate that both the readers and the transponders are certified (or currently being certified) as compliant with Version 1.0.7 of the ISO 18000-6C Interoperability Requirements through OmniAir Certification Services (OCS).

#### 8.1.1 Compliance with DSRC Protocols

The Vendors shall provide proof of equipment DSRC protocol compliance. Test results from previous installations at other non-stop, high-speed toll facilities and independent third-party certification shall be acceptable.

Certification of compliance documentation shall be submitted to WSDOT for approval within three (3) months of the effective date of the Contract.

Approval by WSDOT of Vendor documentation for compliance with appropriate DSRC protocols will be required before payment for any Vendor supplied equipment or services will be made by WSDOT.

#### 8.1.2 Proof of Compliance

Within three months of Contract execution, the successful Vendor(s) shall submit proof of equipment DSRC protocol compliance and compliance with these requirements. Formal test results previously conducted at other toll facilities for other clients and independent third party certification entity shall be acceptable. The documentation provided by the Vendor(s) shall be cross referenced to these requirements.

The Vendor shall submit draft documentation of compliance for comment by WSDOT. WSDOT will require a minimum of ten (10) Business Days to review the documentation. WSDOT will provide the Vendor with a consolidated set of comments on the documentation. The Vendor shall respond in writing to all WSDOT comments. A comment resolution meeting may be conducted to clarify and resolve any remaining questions and issues concerning the comments provided by WSDOT to the

Vendor. Based on WSDOT comments and the results of the comment resolution meeting, the Vendor shall prepare a final version of the documentation of compliance for WSDOT approval.

Approval by WSDOT of Vendor documentation for compliance with protocol compliance and the technical requirements will be required before payment for any Vendor supplied equipment or services will be made by WSDOT.

## 8.2 Integration Support

The Vendor shall provide technical support and advice to WSDOT or its designated representative, during the integration and duration of the Contract of the Vendor supplied transponders, readers, and ancillary equipment into Toll Collection Systems at any WSDOT Toll Transportation Facility at no additional cost. The Vendor shall be required to acknowledge requests for information within one (1) business day and respond in timely manner to all requests for information and questions from WSDOT or its designated representative.

## 8.3 Maintenance Support

The Vendor shall provide on-going maintenance support and advice to WSDOT or its designated representative for equipment not under warranty at no additional cost for the duration of the Contract.

Vendor shall provide help desk services for addressing maintenance troubleshooting problems and questions from WSDOT or its designated representative. The Vendor's help desk services shall be accessible via e-mail or via one or more toll-free telephone lines on a 24 hour, 7 day basis should technical assistance be necessary. The Vendor shall respond to inquiries from WSDOT or its designated representatives within four (4) hours.

## 8.4 Firmware and Software Updates

Vendor shall make available to WSDOT or its designated representative, all changes, updates or modifications to the firmware and software of the transponder reader at no additional cost for the duration of the Contract. The Vendor shall provide assistance and instructions on the installation of such changes, updates and modifications to the transponder reader software and firmware. It shall be at WSDOT's sole discretion whether to install such changes, updates and modifications to the transponder reader software and firmware.

## 8.5 Training

The Vendor shall develop a training program and training material for review and approval by WSDOT.

The training program shall describe in detail all recommended training functions, test equipment, certifications, licenses and other support functions that the Vendor considers necessary to ensure proper installation, tuning and maintenance of the readers and ancillary equipment provided by the Vendor under the Contract.

The training material shall provide an overview of design, operations, and maintenance of the transponder readers and other ancillary equipment provided by the Vendor under the Contract. The training materials shall include instruction in proper maintenance, monitoring and diagnostics of the equipment and software either supplied or incorporated into transponder readers and other ancillary

equipment provided by the Vendor under the Contract. Training shall be sufficiently detailed and intensive to enable WSDOT maintenance staff to undertake all routine maintenance beyond the end of the Warranty Period.

Training shall include both classroom training and hands-on or in-the-field training and accommodate up to ten (10) persons.

The Vendor shall conduct two (2) training sessions at WSDOT's discretion over the duration of the Contract in Washington State at a facility provided by WSDOT. The Vendor shall provide a price for additional training courses.

The Vendor shall make updates to the training program and materials whenever necessary due to equipment or software changes that affect any maintenance or installation procedures.