CENTRAL TEXAS REGIONAL
MOBILITY AUTHORITY

March 27, 2024
AGENDA ITEM #5

Discuss and consider approving revisions to Amendment No. 3 to the First Amended and Restated Maintenance Services Contract for the Central Texas Regional Mobility Authority Toll Collection System to clarify that Kapsch TrafficCom USA, Inc. will continue to provide intelligent transportation systems maintenance services for the MoPac Express Lane

Strategic Plan Relevance:	Service & Stewardship
Department:	Operations
Contact:	Greg Mack, Director of IT & Toll Systems
Associated Costs:	Reduction of $22,670.06 to the Kapsch TrafficCom toll system monthly maintenance cost
Funding Source:	Operating Budget
Action Requested:	Consider and act on draft resolution

Background: Kapsch TrafficCom USA, Inc. serves as the Mobility Authority's system integrator. In this role, Kapsch is tasked with installing and maintaining the Authority's toll system equipment hardware, software, and intelligent transportation systems (ITS). Kapsch also provides license plate image review and transcription services necessary to facilitate the billing of the Authority's Pay By Mail toll transactions as well as traffic management operations support.

In January 2023 the Mobility Authority issued a Request for Proposal for an Intelligent Transportation System (ITS) performance-based maintenance services agreement to cover all existing and future ITS elements on the Mobility Authority's system. Three firms submitted proposals in response to the RFP - Kapsch TrafficCom USA, Inc., Lumin8 Transportation Technologies, LLC, and SICE Inc.

After an evaluation of the responses and pricing, Kapsch TrafficCom USA, Inc. received

the highest rating. The *Intelligent Transportation System (ITS) Performance Based Maintenance Services Agreement* between Kapsch TrafficCom USA, Inc. and the Mobility Authority was executed on October 31, 2023.

Action Requested: Last month the CTRMA Board considered an amendment to remove the ITS and scope for all roadways from Kapsch's toll system maintenance agreement given the new ITS performance-based maintenance services agreement. Before that amendment's execution it was discovered that those changes were too broad. The MoPac Express Lane relies on ITS items such as closed-circuit television (CCTV) cameras, microwave vehicle detectors (MVDs) and variable toll message (VTMS) signs to manage traffic and respond to incidents; calculate the variable toll rate; and communicate the appropriate toll rate to customers. Therefore, only ITS elements not related to the MoPac Express Lane should be removed from the Kapsch Toll System Maintenance Services Agreement.

Therefore, staff proposes the following changes to the *Kapsch Restated Maintenance Agreemen*t to remove ITS-related contract scope not related to MoPac Express Lane facilities and operations:

- Section M12.0 of the Scope of Work Summary – modify key performance indicator #8 (MVD) to apply to Express Lane facilities and remove key performance indicators #15 (Availability), #16 (Availability), and #18 (Availability).
- The KPI Reporting and Management Plan - modify key performance indicator #8 (MVD) to apply to Express Lane facilities and remove key performance indicators #15 (Availability), #16 (Availability), and #18 (Availability).
- Schedule 1.5 Maintenance Services Contract for Toll Collection System – remove pricing for ITS Maintenance and the related ITS bill of quantities for non-Express Lane facilities and operations.

The total decrease to the Kapsch toll system monthly maintenance cost from these changes is $22,670.06.

Previous Actions: The Central Texas Regional Mobility Authority executed a contract with Caseta Technologies, Inc. on April 27, 2005, for the design, procurement, and installation of a toll collection system on the Authority's turnpike system. Kapsch TrafficCom USA, Inc. is the successor in interest to the contract with Caseta Technologies, Inc.

In November 2019 the Mobility Authority's Board approved a Restated Maintenance Agreement with Kapsch TrafficCom for enhanced toll system maintenance services for the roadside lane equipment, project host system, intelligent transportation systems (ITS), wrong way detection and communication infrastructure installed by Kapsch TrafficCom USA for all CTRMA toll facilities.

The first amendment to the Restated Maintenance Agreement was approved in November 2020. This amendment altered the hours of the traffic & incident management operations staff. Amendment No. 2 to the Kapsch Restated Maintenance Agreement acknowledged a change in transaction processing responsibilities from Kapsch to ETC.

Financing: Not Applicable

Staff Recommendation: Staff recommends the approval of revisions to Amendment No. 3 to the First Amended and Restated Maintenance Services Contract for the Central Texas Regional Mobility Authority Toll Collection System to clarify that Kapsch TrafficCom USA, Inc. will continue to provide intelligent transportation systems maintenance services for the MoPac Express Lane.

Backup provided: Draft Resolution
Amendment No. 3 to the First Amended and Restated Maintenance Services Contract for the Central Texas Regional Mobility Authority Toll Collection System
Kapsch-CTRMA Toll Maintenance Agreement M-1 Scope of Work (Revised 03.18.24)
Kapsch-CTRMA Maintenance Agreement – Schedule 1.5 Price Schedule (Revised 03.18.24)
Kapsch-CTRMA KPI Reporting and Management Plan (Revised 03.18.24)

GENERAL MEETING OF THE BOARD OF DIRECTORS
OF THE
CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

RESOLUTION NO. 24-0XX

APPROVING REVISIONS TO AMENDMENT NO. 3 TO THE FIRST AMENDED AND RESTATED MAINTENACE SERVICES CONTRACT WITH KAPSCH TRAFFICCOM USA, INC.

WHEREAS, by Resolution No. 24-009 dated February 24, 2024, the Central Texas Regional Mobility Authority Board of Directors (Board) approved Amendment No. 3 to the Amended and Restated Maintenance Services Contract (Maintenance Services Contract) with Kapsch TrafficCom USA, Inc. (Kapsch) to remove scope of work and pricing related to intelligent transportation system (ITS) performance-based maintenance services; and

WHEREAS, Prior to execution of Amendment No. 3, Mobility Authority Operations staff realized that the Mobility Authority still needs Kapsch to provide ITS performance-based maintenance services for the Mopac Express Lane pursuant to the Maintenance Services Contract; and

WHEREAS, the Executive Director requests the Board to approve an updated version of Amendment No. 3 to the Maintenance Services Contract to containing revisions that allow Kapsch to continue providing ITS performance-based maintenance services for the Mopac Express Lane which is attached hereto as Exhibit A.

NOW THEREFORE BE IT RESOLVED that the Board of Directors hereby approves the revised Amendment No. 3 to the Amended and Restated Maintenance Services Contract to allow Kapsch TrafficCom USA, Inc. to continue providing ITS performance-based maintenance services for the Mopac Express Lane in the form or substantially the same form attached hereto as Exhibit A.

Adopted by the Board of Directors of the Central Texas Regional Mobility Authority on the 27th day of March 2024.

Submitted and reviewed by:

_____
James M. Bass
Executive Director

Approved:

_____
Robert W. Jenkins, Jr.
Chairman, Board of Directors

Exhibit A

CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

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REVISED AMENDMENT NO 3 TO THE FIRST AMENDED AND RESTATED MAINTENANCE SERVICES CONTRACT FOR THE CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY TOLL COLLECTION SYSTEM

THIS AMENDMENT No. 3 TO THE AMENDED AND RESTATED MAINTENANCE SERVICES CONTRACT ("Amendment No. 3") is made to be effective as of the 1st day of December 2023, (the "Effective Date") by and between the Central Texas Regional Mobility Authority ("the Authority" or "CTRMA"), a political subdivision of the State of Texas, and Kapsch TrafficComm USA, Inc. ("Contractor" or "Kapsch") with offices located at 8201 Greensboro Drive, Suite 1002, McLean, Virginia 22102002, McLean, VA 22102.

WHEREAS, by Resolution No. 19-072 dated November 20, 2019, the Central Texas Regional Mobility Authority approved an Amended and Restated Maintenance Services Contract with Kapsch TrafficCom USA, Inc. ("Maintenance Services Contract"); and

WHEREAS, by Resolution No. 20-077 dated November 20, 2020, the Board of Directors of the Authority approved a Second Amendment to the Maintenance Services Contract to update the hours for TIM operations; and

WHEREAS, by Resolution No. 22-030 dated June 29, 2022, the Board of Directors of Authority approved an Amendment to the Maintenance Services Contract to update certain Key Performance Indicators; and

WHEREAS, pursuant to Resolution No. 24-009 dated February 28, 2024, the Board of Directors of Authority authorized Amendment No. 3 to the Maintenance Services Contract for the removal of scope of work and pricing related to ITS performance-based maintenance services but it was not executed.

WHEREAS, pursuant to Resolution No. 24-0XXX dated March 27, 2024, the Board of Directors of Authority authorized this revised Amendment No. 3 to the Maintenance Services Contract to modify the scope of work and pricing related to ITS performance-based maintenance services.

NOW, THEREFORE, for and in consideration of the mutual covenants and conditions herein contained, and other good and valuable consideration the receipt and sufficiency of which are hereby acknowledged, the CTRMA and the Contractor hereby agree as follows:

Section M12.0 of the Scope of Work Summary is amended to modify key performance indicator #8 (MVD) to apply to Express Lane facilities and remove key performance indicators #15 (Availability), #16 (Availability), and #18 (Availability) in

recognition of the Authority's separate Intelligent Transportation Systems (ITS) Performance Based Maintenance Contract executed October 31, 2023.

Schedule 1.5 Maintenance Services Contract for Toll Collection System is amended to remove pricing for ITS Maintenance and the related ITS bill of quantities for non-Express Lane facilities and operations.

The KPI Reporting and Management Plan appended to the Restated Maintenance Services Contract is amended to modify key performance indicator #8 (MVD) to apply to Express Lane facilities and remove key performance indicators #15 (Availability), #16 (Availability), and #18 (Availability).

IN WITNESS WHEREOF, the parties hereto have executed this Amendment No. 3 to the Maintenance Services Contract as of the date first above written.

CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

By: _____
James Bass, Executive Director

KAPSCH TRAFFICCOM USA, INC.

By: _____

Name: _____

Title: _____

ATTACHMENTS:

Attachment M-1 Scope of Work_rev31824
KPI Reporting and Management Plan_rev0318.24
Schedule 1.5 Maintenance Services Contract for Toll Collection System_rev031824

Attachment M-1
Revised February 2024

TOLL COLLECTION SYSTEM MAINTENANCE SERVICES

SCOPE OF WORK

(Reflects ITS scope changes not related to Express Lane operations per March 2024 amendment)

CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

TOLL COLLECTION SYSTEM MAINTENANCE SERVICES

SCOPE OF WORK

M1.0 General

M1.01. Background

The Central Texas Regional Mobility Authority (CTRMA) designated the US183-A Turnpike Project as the first priority for implementation in conjunction with the TxDOT plans for development of the Central Texas Turnpike Project (CTTP). Subsequent to the implementation of the design/build process for the US183-A Turnpike Project, the Capital Area Metropolitan Planning Organization (CAMPO) approved the implementation of the proposed Toll Implementation Plan to construct additional capacity on various segments of highway network in the CAMPO Long-Range Plan as toll road facilities as part of the CTRMA Turnpike System. Several of the toll road segments are in various stages of project development, in design or construction by TxDOT, and it is intended that these proposed segments as identified in ***Attachment D*** also will be implemented by the CTRMA as parts of its Turnpike System. The Toll Collection System for the various segments of the CTRMA Turnpike System as shown in ***Attachment D*** includes various combinations of Electronic Toll Collection (ETC), and Express ETC.

M1.02. Summary Scope of Work

The Contractor shall maintain the portions of the Toll Collection System that have received Acceptance as they come on line until Project Acceptance at which time the entire CTRMA Toll Collection System shall be under the Maintenance Services Agreement ("the Maintenance Contract"). For the purpose of scoping the work and the fee structure, the two phases of the Project are considered separate.

M2.0 Scope of Work Elements

M2.01. Scope of Work

The Contractor's responsibilities shall include preventive, predictive, corrective and emergency maintenance of the entire CTRMA Toll Collection System.

1. **Lane Systems**
   - In-lane Toll Collection System Software
   - Lane Controllers
   - AVI System
   - AVC System
   - VES Equipment and Computers
   - Equipment in road-side cabinets

2. **Plaza System**
   - Toll Collection System Software
   - Plaza Computer Systems (Operating System, Database, Disks, etc)
   - Plaza Workstations
   - Emergency Generators
   - UPS
   - Communications Equipment

3. **Host System**
   - Toll Collection System Software including MOMS and Security Access Software
   - Host Computer Systems (Operating System, Database, Tape Library, Disks etc.)
   - Security Access System
   - Communications Equipment
   - Host Workstations
   - Host Printers and other Toll Collection Equipment

M3.0 MoPac Express Lane Operations and Staffing

The following overview outlines the basic concept of the MoPac Operations, Image Review and Maintenance and Support of the MoPac Express Lanes Project (Express Lanes). Once the project is in revenue collection The Express Lanes are Intended to serve as a reliable north-south travel option along MoPac from Parmer Lane to Lady Bird Lake.

This Scope of Work includes the services, provided by Kapsch TrafficCom USA (formerly known as Schneider Electric) as the Tolls Systems Integrator (TSI), associated with maintenance and operation of the MoPac Managed Lanes project which Includes the Express Lanes Command Center (ELCC), Image Review, Trip Building and monitoring and maintenance of the Express Lanes. The TSI is responsible for the operation and maintenance of the variable tolling system (Toll System) and related Intelligent Transportation Systems in support of the Toll Management System (TMS) described in Toll System and Toll-related ITS

Design, Installation, and Testing, Work Authorization 10 (WA#10). The TMS components include, but not limited to closed circuit television (CCTV) cameras, traffic detection system (TDS), variable toll message signs (VT'MS), VTMS cameras and VTMS Automatic Vehicle Identification (AVI) equipment. The TSI shall meet the Service Level Agreements and Key Performance Indicators provided in Exhibit 5-1: Service level Agreements and Key Performance Indicators within WA#10. For Maintenance, the TSl's duties, Responsibilities and Liabilities in regard to Performance Measurements are contained within the Maintenance Contract, executed March 3, 2007; Sections 7 Contractor Representations and Warranties and 10.0 Performance Measurement.

The Express Lanes will be in operation and collecting tolls 24 hours a day, 7 days a week, 365 days a year based on current approved business rules, with the exception of limited periodic maintenance intervals.

The Mobility Authority will be responsible for operations of the EXPRESS LANES.

M3.01. Scope of Work Summary

This Scope of Work covers two tasks outlined below:

Task 1 – Operations: Manage and operate the Express Lanes Command Center (ELCC) located at 104 North Lynnwood Trail, Cedar Park, Texas 78613, for the purposes of monitoring, supporting Austin Public Safety staff in returning the Express Lanes to normal operational flow, image review and trip building. The term of the Operations Contract shall be for an initial period of one (1) year (the "Initial Term"), commencing on the Effective Date of Day One of Toll Revenue Collection. The Initial Term shall be extended automatically for successive periods of one (1) year each unless and until terminated otherwise. The Operations Contract may be terminated by either party upon the expiration of the Initial Term or any subsequent one-year extension of this Operations Contract, provided that at least ninety (90) days' written notice is given to the other party prior to the expiration of the Initial Term and any additional subsequent terms.

Task 2 – Maintenance: Provide monitoring, operations and maintenance support for roadside and Intelligent Transportation (ITS) Equipment identified in WA #10, Exhibit A; Section A3.04, to monitor and validate the accurate operations of the Express Lanes, the Project Host and the Toll System

M3.01.01. Task 1 - Operations

- The TSI shall staff the ELCC during peak hours and in operations from 5:30 am – 8 pm, 5 days a week excluding holidays in accordance with the Work Breakdown Structure and Staffing Plan (Exhibit B). In no event shall the TSI operator leave the ELCC unstaffed during an emergency, active event or incident, even at the end of a shift.

- This task consists of work necessary to provide on-site monitoring of the ELCC and the systems, variable pricing engine, toll rates, performance of manual tasks necessary for the system's effective operation, and the operations of the ELCC.
- TSI shall provide on-site monitoring and traffic control device operation. TSI shall provide the required level of personnel necessary to cover shifts. Shifts can be split or modified, as long as the appropriate staffing levels are maintained
- TSI shall provide continuous monitoring of the variable pricing engine results, participate and lead toll rate discussions, provide tuning and configuration updates to the parameters required to meet the CTRMA goals.
- TSI shall provide on-site monitoring of closed-circuit television, police radio channels, public safety computer-aided dispatch terminals, Internet-based information sources and software programs
- The Express Lanes will be operated with variable pricing. Operators will strive to maintain reliable travel conditions through the use of variable tolls, established to proactively monitor demand on the facility. Reliable travel conditions are defined as Level of Service (LoS) C or better, with average speeds of 53 mph or higher.
- Express Lanes operations will be monitored, and pricing may be adjusted manually if necessary, to achieve the desired effect on traffic. However, it is the intent the system will operate in an automated manner, to the extent possible, under normal traffic conditions. Traffic sensors will be used to monitor continuously the operating conditions of the EXPRESS LANES and a variable toll rate will be calculated to manage demand, in order to maintain an acceptable LoS.

Operations Staffing

TSI shall provide the services including, but not limited to, management, administrative and technical aspects of the Operations Contract. All activities are required to be tracked, meeting minutes produced, and coordination activities documented.

TSI shall provide CTRMA with Operations Manager for the life of the Contract, as well as an Operations Supervisor for the Operations staff. Any changes to the TSI Operations Manager or any of the other indicated personnel in this Contract shall be subject to review and approval by CTRMA in writing. The hiring and training timeline of these personnel is referenced in the Work Breakdown Structure and Staffing Plan (Attachment A)

A3.2 ELCC Supervisor and Operators

TSI shall provide the names and resumes for all management positions. TSI shall provide the names for all non-management positions. Operations staff classifications will include the following TSI positions, as a minimum:

1. ELCC Shift Supervisor
2. ELCC Operators (2)

In addition to a ELCC Shift Supervisor, initially it is anticipated that there will be 2 full-time equivalent ELCC Operators covering the following shifts, 13 hours per day and five (5) days per week:

1. Morning shift: 5:30 AM to 1:30 PM
2. Afternoon shift: 12:00 Noon to 8:00 PM

Purpose

The primary purpose of the Operations Staffing is to provide a weekday AM and PM peak staff to operate the EXPRESS LANES, which includes:

1. Monitor, direct, and administer the personnel designated to operate and support the Tolling, TMS, and Managed Lanes system.
2. Perform traffic incident detection and verification using the TMS and available tools.
3. Provide reporting and announcement of roadwork, incidents and events.
4. Support the CTECC by reporting incidents when detected, as well as support First Responders in incident management and recovery.
5. Coordinate operations & roadwork information with various partner agencies.
6. Provide training of staff and updates of procedures to facilitate the improvement of operations and day-to–day interaction.
7. Provide support during emergencies, storms, and other significant events.
8. Support the development of continuous improvement processes through performance measures and self-assessments.
9. Furnish materials, supplies, tools, equipment, labor, and other incidentals necessary for the work in accordance with project documents.

Duties

- The duties for Task 1 consist of all work necessary to manage all of the Personnel included, but not limited to, general oversight of ELCC operators, Quality Assurance and Quality Control, operational assistance during emergencies; weather-related storms, and other significant events as well as general contract administration. It also includes participation in meetings by the TSI.
- TSI personnel shall be scheduled to work Monday through Friday from 5:30am – 8:00pm. In no event shall the TSI operator leave the ELCC unstaffed during an emergency, active event or incident, even at the end of a shift.

Sub-Task Descriptions for Task 1 - Operations:

a. TSI shall employ, train, supervise, and schedule ELCC operators. The hiring and training timeline of these personnel is referenced in Exhibit B, MoPac Staffing Plan. This shall include accommodating vacations, sick leave, and other absences of CTRMA Operations personnel by providing adequate training and supervision of relief operators, and on-call personnel.

b. TSI Operations personnel shall be responsible for issuing a work order for equipment repair and helping to establish priorities for repair of failed equipment shall also be considered part of this task.

c. TSI shall attend regular meetings with CTRMA to cooperatively identify and prioritize work to be performed.

d. TSI shall maintain records and documentation as directed to support the overall operations of the ELCC and provide data for documenting performance measures and progress.

e. TSI shall participate in post-incident debriefings with all appropriate Agencies involved in managing such major traffic incident, to determine whether existing operating procedures should be changed.

f. TSI personnel assigned to this task shall be available to respond to electronic notifications within one hour during off-duty hours to provide assistance as appropriate. In the event of a significant incident or situation outside of the scope of the Standard Operating Procedures.

g. TSI shall provide adequate staff and resources for all tasks and activities throughout the duration of the contract, including planned and unplanned staff absences, emergencies, storms, and other significant events.

h. TSI shall prepare and submit monthly invoices and progress reports in accordance with applicable CTRMA requirements. Clerical/Administrative support staff will prepare consultant invoices, reports, forms, letters, and any other official project related correspondences, as well as hiring of staff and or other personnel related duties. The Clerical/Administrative support staff are not expected to have ELCC-related activities as a full-time task nor are they to be based at the TIMC.

i. During peak periods, on holiday weekends, special events, and/or emergency conditions, greater levels of staffing may be required by CTRMA. If CTRMA deems additional TSI personnel are necessary to operate the expanded functions of the MoPac project, the TSI shall provide extra staff (provided a minimum of four-hour notice is provided) for the short-term. In no event shall the TSI operator leave the ELCC unstaffed during an emergency, active event or incident, even at the end of a shift. If CTRMA determines the additional ELCC staff will be a permanent position requirement, the staffing level shall be adjusted via supplemental agreement. Additional pricing estimates shall be provided upon request.

j. TSI shall participate in the monitoring of traffic incidents by issuing appropriate notifications to the CTECC and activating motorist information resources from the ELCC during the previously given hours of operation. All other times the CTECC will be monitoring for incidents. Problems encountered with any of the systems must be reported immediately to the appropriate systems support personnel as described in the Standard Operating Procedures. TSI shall update social media as defined in the Standard Operating Procedures on behalf of the CTRMA.

k. TSI shall provide coordinated monitoring of incidents with CTRMA and outside agency personnel. Incident monitoring shall be performed in accordance with the Standard Operating Procedures.

l. TSI shall answer phone inquiries and coordinate incident-related activities with operational partners and provide them with the necessary information about traffic conditions. Telephone calls from the media shall be referred to appropriate CTRMA Personnel.

m. TSI shall perform Trip verification activities, inspection of queued images within 48 hours to verify posting of toll rates and charges for trips.

n. TSI shall perform Trip verification activities, including visual inspection and verification of toll charges for Trips within 72 hours as described in the Image Review Operational Procedures.

o. TSI will provide Image Reviewed plates for trip building purpose and image-based tolling that will be sent directly to Image Billing vendor as described in the Image Review Operational Procedures.

M3.01.02. <u>Task 2 - Maintenance</u>

- TSI shall provide monitoring, support and maintenance for all items installed and integrated as part of the MIP. These items include, but not limited to items identified in WA #10, Exhibit A, Appendix F and Exhibit H: four (4) gantry locations for toll system installation, Variable toll message signs (VTMS) and VTMS cameras, traffic detection systems, CCTV cameras, Project Host, servers, generators, uninterruptable power supplies, toll collection equipment, cameras, switches, cabling, Violation Enforcement System, software and configuration items for Automatic Vehicle Identification, Automatic Vehicle Detection System, Image Capture and Processing System, Digital Video Audit System.
- TSI shall ensure the MoPac Express Lanes system meets the Service Level Agreements and Key Performance Indicators identified and agreed to in Work Authorization #10, Section 5 Performance Requirements.

Sub-Task Descriptions for Task 2 – Maintenance:

a. Four toll collection points are defined on the MoPac Expressway. TSI will be responsible for maintaining the entirety of the Express Lanes, including all components provided directly by the system integration contract with Kapsch TrafficCom.

b. On-site monitoring of traffic control device operation, managed lanes, and variable message sign system of the systems includes monitoring of and dialog with, but not limited to:

i. The relevant software program and the associated/related field equipment; and
ii. The software computer programs that allow operators to create/activate/deactivate messages on variable message signs. Each of these sets of computer programs provides for operator dialogue using computer terminals.

M3.02. <u>Contract Support</u>

This task covers work by TSI to update Standard Operating Procedure manuals for use in day-to-day operations and to provide necessary training. CTRMA shall review and approve proposed training procedures. TSI shall provide materials to CTRMA documenting the training of personnel. This task also includes proactively assisting CTRMA in minimizing the impact of construction, maintenance, and other activities on the motoring public.

5.1 Sub-Task Descriptions for Support Task:

a. TSI shall work with CTRMA to develop and update the Standard Operating Procedures (SOP) Manuals for use. Due to the nature of operations, this shall be an ongoing task that will take place at any time an SOP needs to be updated. TSI shall, at a minimum, review all SOPs on a semi-annual basis and provide CTRMA with recommendations for changes to address current operational conditions.

b. TSI shall provide training to new operations personnel and in-service training to existing staff. The training shall be based on the current CTRMA SOP manuals. Training shall be provided on an as-needed basis as TSI staff is transitioned into the project; when new or significant changes are applied to SOPs or software programs; or when individual operator performance indicates the need for remedial training. Training shall include formal classroom style exercises and hands-on training. The training shall provide for knowledge checks to ensure they are competent prior to their being assigned to the operations tasks. Training shall also include side-by-side mentoring in

the form of assignment to the operations tasks for at least one week under the supervision of a Supervisor. This applies to both new operators and operators for whom remedial training is required.

c. In order to keep the staff current with their abilities, TSI shall conduct "in-service" training to all staff. This shall be in the form of written exercises, or other CTRMA approved methods, and shall take place at least once per month.

d. Maintenance Personnel and other entities with approved, planned lane closures on State Highways will send information to the TMC describing the details of the activities and lane closures in advance of the closure. TSI personnel will enter this information into the TMS software, prepare DMS plans for the work, and forward non-maintenance work and DMS plan information to appropriate CTRMA personnel, in accordance with Standard Operating Procedures.

e. On a daily basis, TSI personnel shall review systematically the roadwork information received at the ELCC and identify those locations competing needs for lane closures exist. TSI personnel shall notify the appropriate parties when a conflict is identified. It will be the responsibility of the competing parties to resolve the conflict.

f. On a daily basis, and in accordance with Standard Operating Procedures, TSI personnel shall prepare and distribute a summary report of the scheduled roadwork and send roadwork notifications to CTRMA personnel.

M3.03. PERFORMANCE MANAGEMENT

TSI shall carry out all Work in accordance with the Project Schedule and in a prompt, skillful and careful manner, using qualified personnel and in accordance with the "Standard of Care" defined as that level of care and skill ordinarily exercised by other employees currently practicing in the same locality under similar conditions. Employees shall perform the Work in a manner that is coordinated with contractor activities on the Project, and in accordance with the terms and conditions of this Work Authorization and the Agreement.

TSI will ensure that operators are compliant with established corporate policy regarding performance evaluation, training, and mentoring. Performance reviews and improvement will also be in accordance with established corporate guidelines.

M3.04. Staffing Management

TSI shall ensure employees meet the following minimum requirements:

1) Current driver license or Texas Identification (ID) card in accordance with the Texas Statutes.
2) Minimum age of eighteen (18) years old.
3) Proof of education, certifications, diploma(s), degree(s), professional affiliation(s).
4) Document the minimum of the last five (5) employment positions unless having worked less after graduating high school or college.

TSI shall conduct reference checks on all TSI personnel proposed to be used on/during this Contract and will keep all reference records on file and available to CTRMA for the Contract period.

TSI, during the Contract period, shall, prior to hiring, have resumes of all proposed staff and all new hires along with copies of Driver's Licenses or State of Texas issued ID on file for CTRMA review.

M4.0 Maintenance Plan

The Contractor shall create a Maintenance Plan that covers all aspects of the CTRMA Toll Collection System pertinent to the Scope of Work.

The Maintenance Plan will be updated periodically by mutual agreement of the parties as they deem reasonably necessary.

M4.01. Coverage

The Contractor will provide maintenance services on a seven (7) day a week/twenty-four (24) hours a day basis with the following response and repair times depending on severity of incident, except where otherwise specified in an approved roadway maintenance manual.

- A Priority 1 Maintenance Event is defined as any malfunction or fault that will result in the immediate loss of revenue and/or hazard to personnel.
- Priority 2 Maintenance Event is defined as any malfunction or fault that will not result in immediate loss of revenue but will/may impact operational performance.
- A Priority 3 Maintenance Event is defined as any action or event reported that will/may impact operational performance, has potential of degrading the System performance, and has no impact to revenue collection.

For purposes of the above, response time is defined as the period beginning when the Contractor is notified of a problem and ending when the Contractor's maintenance technician creates a ticket. Repair time is defined as the period beginning when the

Contractor's ticket is acknowledged and ending when the fault is corrected. Response and repair time for every maintenance event will be recorded and made available to the CTRMA.

For all remote Express Toll Locations on the State Highway System, the Contractor shall work with CTRMA in scheduling and coordinating any maintenance, adjustments, and repair activities involving active traffic lanes for setting up the lane and accessing the equipment in the lane. All maintenance, adjustments, and repair activities within State highways will be subject to the review and approval by TxDOT and the CTRMA.

M4.02. Notification Procedures

The Contractor may be notified of Toll Collection System malfunctions, problems, and discrepancies in several different ways. There can be verbal notification from a CTRMA employee, written notification from an authorized CTRMA employee, verbal notification from CSC/VPC staff, and MOMS messages from the MOMS or other MOMS notification system (i.e., automatic paging, etc.).

In all cases, it shall be the responsibility of the Contractor to log all reported problems with all pertinent information concerning the problem into MOMS. After receiving notification, the Contractor shall confirm the problem directly with the reporting individual or other CTRMA personnel at the location of the problem. The Contractor shall then dispatch the appropriate maintenance personnel to resolve the problem.

M4.02.01. Verbal Notification

Verbal notification of a maintenance call shall be defined as in-person, telephone, or pager call, and subsequent return telephone call by the Contractor. In all cases, the first conversation with or page of the Contractor shall signify the start of response time for purposes of measuring the Contractor's response time.

M4.02.02. Written Notification

Written notification shall be defined as a written description of a problem, typically provided by the CTRMA or the VPC.

M4.02.03. MOMS Notification

MOMS notification shall consist of the MOMS software identifying a problem with the system. MOMS message information shall be provided in the maintenance reports, as described elsewhere in this document.

M5.0 Spare Parts

Spare parts prior to Project Acceptance will be procured through the Toll Collection System Contract. Notwithstanding anything to the contrary in this specification, the Contractor shall purchase on behalf of the CTRMA (and at the CTRMA's expense) an initial stock of spare parts and equipment for the Toll Collection System at such time as the CTRMA and the Contractor shall mutually agree at the cost of such spare parts and equipment without any 10% mark-up.

M5.01. Procurement

The Contractor shall purchase all spares on behalf of the CTRMA in a manner to ensure that the CTRMA obtains the benefit of all warranties associated with such spares. The cost of the spare parts shall not include any mark up and shall be agreed to prior to the Effective Date. The Contractor shall maintain and track the inventory of all spares and consumables for the CTRMA using the MOMS and shall provide the CTRMA with a list itemizing all spares and consumables in the CTRMA's inventory as reasonably requested, but not more frequently than once a month. All of the CTRMA's spares and consumables shall be maintained by the Contractor free and clear of all liens and encumbrances of any kind whatsoever at locations to be agreed upon between the CTRMA and the Contractor. The CTRMA shall have the right to inspect the spares and consumables inventory during normal business hours and shall give the Contractor written notice any time the CTRMA removes any of its spares or consumables.

M5.02. Inventory Management

The Contractor's performance of the Maintenance Services is predicated on there being an adequate spares inventory available. The Contractor shall provide no less frequently than annually a list of recommended spares quantities, and it is the CTRMA's responsibility to approve the purchase of the spares to be made. The CTRMA will hold harmless the Contractor in the event spares are not available as a consequence of the CTRMA's not accepting the Contractor's recommended quantity of spares. The Contractor shall hold harmless the CTRMA in the event spares and/or consumables are not available as a consequence of the Contractor's failure to purchase the spares and/or consumables ordered by the CTRMA.

The Contractor shall be responsible for providing all miscellaneous repair parts and materials costing less than $20 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. The Contractor will provide normal shop consumables (e.g., solder, lubricants, cleaning rags, etc.) and spares costing less than $20 per item, excluding toll system consumables (e.g., magnetic media, batteries, receipt printer paper, light bulbs, etc.), at no additional cost to the CTRMA.

The Contractor shall cooperate with and assist the CTRMA as reasonably necessary to ensure that all spare parts, equipment and other CTRMA owned property stored or

otherwise located on the Contractor's leased property shall not be subject to any risk of being confiscated, claimed, attached, or withheld by the Contractor's landlord, any of the Contractor's creditors or any similar risk. This cooperation shall include, but not be limited to, affixing appropriate labeling to all such property. The Contractor's Maintenance Facility and/or any location where CTRMA equipment is stored shall be secured and connected to the Security Access System. It is also recommended that the Contractor's Maintenance Facility be part of the CTRMA network and all Contractor access to the CTRMA System be made through this network. It is the Contractor's responsibility to ensure that the Contractor Maintenance Staff have access to the MOMS and all the required connections are established.

M6.0 Staffing

As of the Effective Date, the Contractor shall have the following full-time personnel situated in Austin. Changes in the scope of work, including, but not limited, to the addition or subtraction of lanes and/or equipment may cause changes in the staffing levels.

- Maintenance Manager (who shall be responsible for overseeing the performance of the Service)
- Maintenance Technicians
- Network/System Engineer (can be remote)

An office housing the administrative functions and the central repair depot (including the spares warehouse) will be located in the Austin metropolitan area.

A senior employee of the Contractor shall be identified with overall responsibility for overseeing the performance of the Maintenance Contract and managing the Maintenance Services.

The Contractor shall ensure that the field maintenance team has technical support in the areas of radio frequency, hardware, systems, communications and software.

M7.0 Personnel Training

The Contractor's field technicians shall have completed training courses, as evidenced by the resumes provided by the Contractor to the CTRMA, prior to being assigned to work on the CTRMA Toll Collection System. The Contractor shall provide for any necessary supplemental training of all maintenance technicians for the Toll Collection System, which shall be scheduled such that it will be completed no later than one (1) week prior to field installation of the any new lane configurations. The training shall consist of a minimum of two (2) weeks of both hands-on classroom instruction and on-the-job training.

M7.01. Staff Assignments

Maintenance staff shall be part of the Contractor's field installation team to obtain first-hand experience with the equipment.

The Contractor's Maintenance Technicians responsible for the field repairs shall be trained for major module/PC board swap-out. The Contractor's Technicians, because of experience at the bench level, shall also be trained to repair equipment at the component level as needed.

M7.02. Training Materials

Training materials shall consist of maintenance manuals, vendor manuals and other documentation that may be provided by the Contractor or by the CTRMA, as well as classroom training materials to be developed by the Contractor.

M7.03. Training Program

The content of the training course shall contain but not be limited to the following:

- Use of maintenance documentation such as maintenance manuals, drawings, parts lists and vendor manuals
- A maintenance program showing personnel assignments, transportation requirements and communications
- Systems overview
- Theory, use, preventive maintenance, troubleshooting, diagnostics, repair and testing of the lane to plaza to host interaction ("System"), lane to plaza interaction ("Sub-system"), and repairs to equipment or components (assembly/ sub-assembly/ component), and lane operations
- System preventive maintenance at the host, plaza and lane levels, including schedules
- Maintenance facilities (including equipment)
- Corrective and emergency maintenance procedures (troubleshooting, diagnostics, repair, testing and post-maintenance)
- Spare parts and spare equipment provisioning
- Use of maintenance tools
- Response times, expected repair times
- Maintenance facility procedures
- Maintenance forms and maintenance reports

The Contractor's Maintenance Manager shall attend the training course with the Maintenance Technicians and the CTRMA staff shall also attend the training. The Contractor shall establish procedures for training new-hire or replacement personnel

and shall provide refresher training for the existing maintenance force. New hire or replacement personnel shall receive the same hands-on classroom and on-the-job training as specified in this section before being assigned official maintenance duties.

The Contractor shall keep training records on all maintenance personnel. The CTRMA shall be allowed to audit maintenance personnel qualifications and training records at any time during this Contract.

The Contractor shall supply training procedures for maintenance personnel for CTRMA approval not less than 60 days prior to the training start date.

M8.0 Safety

The Contractor shall adhere to the CTRMA's safety procedures set forth in the Maintenance Plan.

M9.0 Reporting Requirements

The CTRMA and its Representatives shall always have access to all service records.

M9.01. Field/Shop Maintenance Records

The Contractor shall maintain current and accurate records for all field and shop maintenance work. The Contractor shall prepare a service report every time service is performed for corrective or emergency work and such information shall be entered MOMS. The report shall include, but not be limited to notification time, notification procedure (verbal, written, or MOMS), plaza ID and lane number (if in-lane equipment) or equipment location, toll collector's ID number (if a collector is in the lane), equipment description, work or service performed, reported fault, parts used and the time the service was started and completed. One copy of all service reports and records shall be forwarded to the CTRMA once every month. All preventive and predictive maintenance activities shall be reported in the same manner as corrective and emergency maintenance work.

M9.02. Summary Reports

Monthly maintenance summary reports shall be prepared and submitted to the CTRMA. These reports shall include, but not be limited to, average repair times, failure statistics, spare parts and spare equipment used, spare parts and spare equipment disposition (i.e. returned to manufacturer for repair, in maintenance shop for repair, etc.), total down time of the equipment and other summary information for all classes of equipment.

M10.0 System Documentation

The Contractor shall maintain one full set of all Toll Collection System documentation including, but not limited to, as-built drawings, toll equipment service manuals, computer manuals, software documentation, parts lists and other data as may be required for record purposes at the toll

maintenance shop. In addition, one (1) versioned set of complete documentation shall be maintained by the Contractor in a documentation management system.

The Contractor shall furnish all maintenance personnel with appropriate System documentation as may be required to perform their respective duties.

All System documentation shall be recorded at the toll maintenance shop. The documentation provided and/or assembled under the Maintenance Contract shall be considered proprietary and confidential. The Contractor's employees shall not reproduce the documentation or discuss the contents of the documentation with the CTRMA toll collectors or other unauthorized personnel.

M11.0 Performance Measurement

The CTRMA will review the Contractor's performance on a monthly basis, utilizing the monthly summary reports provided by the Contractor, in addition to input from the CTRMA staff. Performance will be measured by:

- Comparing response times and repair time in each "Priority" category described under "Coverage" in Subsection M3.01 for the current month, year to date, and since Notice to Proceed for this Maintenance Contract with the requirements specified in the Technical Requirements.
- Failure to keep accurate records or otherwise improperly reporting maintenance activities.
- Review of spare parts and spare equipment availability

As described in the Restated Maintenance Agreement, the Contractor will be notified in writing of deficient performance and shall take corrective actions.

M12.0 Key Performance Indicators

Kapsch proposes the following Key Performance Indicator (KPI) measurements for Maintenance services. These KPIs are measurable values that demonstrate achievement of key business objectives, while also including either liquidated damages for missed targets or lost revenue.

Audits conducted by CTRMA or its third party vendor will be completed according to the schedule set forth below or at CTRMA's discretion.

KPI ID	KPI Name	Key Performance Indicator Description	KPI	Maximum Liquidated Damages (per calendar month)	Testing Frequency
1	AVD	The vehicle detection subsystem shall detect 99.90% of vehicles passing through the Toll Zone once and only once under all conditions within the	99.90%	$200 per gantry location, per each 0.1% below threshold	Audits by CTRMA, and executed by CTRMA, shall be evenly

		Design specification described in the requirements, including vehicles in the shoulders and straddling the lane and shoulder. Kapsch will reconcile discrepancies from CTRMA audits. Variance may be dependent on vehicle volume.			spread over the course of 12-months (e.g., approximately 1/12th of locations audited each month), with minimum transaction count of 3,000, as determined by 90% audit confidence as a threshold.
2	AVC	The AVC subsystem shall correctly classify 99.50% of all detected vehicles at speeds from 5 mph up to and including 100 mph, including vehicles straddling the lanes. Shoulders are excluded from this calculation. Kapsch will reconcile discrepancies from CTRMA audits. Variance may be dependent on vehicle volume.	99.50%	$200 per gantry location, per each 0.1% below threshold	Audits by CTRMA, and executed by CTRMA, shall be evenly spread over the course of 12-months (e.g., approximately 1/12th of locations audited each month), with minimum transaction count as determined by 90% audit confidence as a threshold.
3	AVI	The AVI subsystem will correctly detect, read and assign to the correct vehicle 99.90% of all properly installed Transponders on all detected vehicles at speeds from 5 mph up to and including 100 mph, including vehicles in the shoulders and straddling the lanes.	99.90%	$200 per gantry location, per each 0.1% below threshold	Audits by CTRMA, and executed by CTRMA, shall be evenly spread over the course of 12-months (e.g., approximately 1/12th of locations audited each month), with minimum transaction count of 5,500, as determined by 90% audit

					confidence as a threshold.
4	LPIC	The LPIC subsystem will capture one front human readable license plate image or one rear human readable license plate image and associated to the correct vehicle for 99.00% of all detected vehicles traveling at speeds from 5 mph up to and including 100 mph, including vehicles straddling the lane and shoulder.	99.00%	Estimated revenue loss (calculated using liquidation rate), per gantry location, for performance below threshold.	Monthly
5	IR	For transactions rejected by the manual review process, less than 1.00% shall have incorrect code-off results.	<1.00%	$200 per each 0.1% below threshold	Quarterly performance audit, to be executed by Kapsch, with minimum transaction count of 1,500 per Code-Off category, as determined by audit confidence as a threshold.
6	Trip	99.50% of all transactions shall be correctly assembled into trips.	99.50%	$200 per roadway direction, per each 0.1% below threshold	Monthly
7	Trip Processing	100% of all trips shall be transmitted to the CTRMA Data Platform System (DPS) within six (6) calendar days of the exit transaction of the trip.	100%	1. For lost or uncollectable transactions: a) Actual revenue above $5,000 AND b) any direct damages associated with the loss. 2. For transactions transmitted >6 days and <=30 days, AND result in revenue generation: a) 10% of actual revenue AND b) any direct damages associated with the delay. 3. For transactions older than 30 calendar days: a) Actual revenue above $5,000 AND b) any direct damages associated with the loss.	Monthly

8	MVD	The volume provided by Express Lane Traffic Detection Systems (MVD) ~~related to non-Express Lane facilities~~ shall be 95.00% accurate.	95.00%	$200 per MVD, per each 0.1% below threshold	Annual performance audit, to be executed by Kapsch, for a minimum of 5 minutes and minimum vehicle count of 30, per MVD, as determined by audit confidence as a threshold.
9	Non-EL Transaction Processing	100% of all non-EL transactions shall be transmitted to the CTRMA Data Platform System (DPS) within three (3) calendar days of the transaction date.	100%	1. For lost or uncollectable transactions: a) Actual revenue above $5,000 AND b) any direct damages associated with the loss. 2. For transactions transmitted >3 days and <=30 days, AND result in revenue generation: a) 10% of actual revenue AND b) any direct damages associated with the delay. 3. For transactions older than 30 calendar days: a) Actual revenue above $5,000 AND b) any direct damages associated with the loss.	Monthly
10	IR	For transactions requiring a manual review process, 99.50% shall be completed, AND returned, within 72 hours from the time the image review request was received.	99.50%	1. For Image Reviews completed >72 hours and <= 10 days: a) $200 per each 0.1% below threshold. 2. For Image Reviews completed >10 days and <= 30 days, AND result in revenue generation: a) 10% of actual revenue AND b) any direct damages associated with the delay.	Monthly

				3. For lost or uncollectable Image Review transactions: a) Actual revenue above $5,000 AND b) any direct damages associated with the loss 4. For transactions older than 30 calendar days: a) Actual revenue above $5,000 AND b) any direct damages associated with the loss	
11	Reports	1. Monthly Maintenance Report, accurately detailing system performance relative to all Project KPIs, shall be submitted to CTRMA each month. 2. Monthly Inventory Report, to be exported directly from MOMs, accurately detailing the location, count, and serial numbers of all the CTRMA hardware, including retired hardware (if applicable), spares and Return Material Authorization (RMA) hardware for the previous calendar month. 3. Contractor to provide complete reports, cover page, table of contents, and summaries, format to be agreed upon by Contractor and CTRMA.	By the 15th of the following month	Cannot invoice for monthly maintenance without submitting these reports.	Monthly
12	Availa bility	Each ETC lane shall be available 99.50% of the time. An available lane is defined as a lane with the ability to collect revenue either through image capture or tag read and association.	99.50%	Lost or delayed transactions as a result of ETC lane unavailability shall be included in, and calculated per, KPI #7 (Trip Processing) or KPI #9 (Non-EL Transaction Processing).	Monthly
13	Availa bility	The Host Level system shall be available 99.50% of the time. An available host is defined as a fully operating host such that Reports, ROMS, and transaction processing are online (with the exception of	99.50%	$200 per each 0.1% below threshold	Monthly

		approved downtime for maintenance purposes).			
14	Availability	Express Lanes CCTV shall be available 99.50% of the time, excluding scheduled maintenance.	Express: 99.50%	$200 per each 0.5% below threshold	Monthly
~~15~~	~~Availability~~	~~Non-Express CCTV shall be available 95.00% of the time, excluding scheduled maintenance.~~	~~Non-Express: 95.00%~~	~~$200 per each 0.5% below threshold~~	~~Monthly~~
~~16~~	~~Availability~~	~~DMS shall be available 95.00% of the time, excluding scheduled maintenance.~~	~~95.00%~~	~~$200 per each 0.5% below threshold~~	~~Monthly~~
17	Availability	Express MVDs shall be available 99.50% of the time per segment, excluding scheduled maintenance.	Express: 99.50%	Express: $100 per each 0.5% below threshold per segment.	Monthly
~~18~~	~~Availability~~	~~MVDs shall be available 95.00% of the time per device, excluding scheduled maintenance.~~	~~Non-express: 95.00%~~	~~Non-Express: $100 per each 0.5% below threshold per device.~~	~~Monthly~~
19	VTMS Availability	The VTMS System will be available as outlined below, excluding scheduled maintenance. Availability of 99.95%, with a 15 minute grace period for emergency maintenance.	99.95%, 15 min. grace excluded	Actual revenue above $5,000 (calculated using liquidation rate).	Monthly
20	VTMS Accuracy	The System will post and maintain the correct toll rate to the VTMS 99.90% of the time per VTMS under all conditions within the Design specification described in the requirements.	99.90%	$200 per each 0.5% below threshold	Monthly
21	Time to Respond – Priority 1	All priority 1 tickets must be acknowledged within 1 hour of ticket creation. A Priority 1 Maintenance Event is defined as any malfunction or fault that will result in the immediate loss of revenue and/or hazard to personnel.	N/A	$100 per each event > 1 hour	Monthly
22	Time to Repair - Priority 1	All priority 1 tickets must be repaired within 4 hours of ticket acknowledgement.	N/A	$200 per each event > 4 hour	Monthly
23	Time to Respond – Priority 2	All priority 2 tickets must be acknowledged within 1 hour of ticket creation. Priority 2 Maintenance Event is defined as any malfunction or fault that will not result in immediate	N/A	$75 per each event > 1 hour	Monthly

		loss of revenue but will/may impact operational performance.			
24	Time to Repair - Priority 2	All priority 2 tickets must be repaired within 12 hours of ticket acknowledgement.	N/A	$150 per each event > 12 hour	Monthly
25	Time to Respond – Priority 3	All priority 3 tickets must be acknowledged within 1 hour of ticket creation. A Priority 3 Maintenance Event is defined as any action or event reported that will/may impact operational performance, has potential of degrading the System performance, and has no impact to revenue collection.	N/A	$25 per each event > 1 hour	Monthly
26	Time to Repair - Priority 3	All priority 3 tickets must be repaired within 36 hours of ticket acknowledgement.	N/A	$50 per each event > 36 hour	Monthly
27	Inventory	All CTRMA hardware, to include those currently installed, maintained as spares, and Return Material Authorization (RMA) (if applicable), shall be included in an Annual Physical Inventory Audit Program, as agreed upon by the contractor and CTRMA.	Due yearly with February MMR	Cannot invoice for monthly maintenance without submitting Inventory Audit.	Annually

M13.0 Confidentiality

The Contractor shall keep all information regarding its activities pursuant to this Contract confidential and will communicate such information only with authorized CTRMA personnel or CTRMA designated representatives.

[END OF SECTION]

REVISED MARCH 2024 IN AMENDMENT #3 TO REMOVE ITS SCOPE RELATED TO NON-EXPRESS LANE FACILITIES

SCHEDULE 1.5

MAINTENANCE SERVICES CONTRACT FOR TOLL COLLECTION SYSTEM

PRICE SCHEDULE

This section provides descriptions of the Method of Measurement and the Basis of Payment to complete the work for maintenance services on the toll collection systems on the CTRMA's Toll Road System.

1. Hourly Rates

The Hourly Rates proposed for Amendment No. 6 proposed are FY 2022 Fully Loaded Rates.

Item Description / Position Title	FY 2019	FY 2020	FY 2021	FY 2022
	2.00%	*N/A*	*3.00%*	***9.10%***
Software Engineer	$ 157.59	$ 157.59	$162.32	**$182.40**
System / Hardware Engineer	$ 172.52	$ 172.52	$177.70	**$199.69**
Technician	$ 120.90	$ 120.90	$124.53	**$139.94**
Database Administrator	$ 224.14	$ 224.14	$230.86	**$259.42**
Documentation Clerk	$ 161.66	$ 161.66	$166.51	**$187.11**
Testing Engineer	$ 171.17	$ 171.17	$176.31	**$198.12**
Project Manager	$ 224.14	$ 224.14	$230.86	**$259.42**
Network Administrator	$ 156.22	$ 156.22	$160.91	**$180.82**
Business Analyst	$ 157.59	$ 157.59	$162.32	**$182.40**

2. Amendment No. 6 Maintenance Contract Pricing

A. Monthly Maintenance Services for 183A Toll Phases I& II, 290 Toll Phase I - III, 71 Toll, MoPac Express Lane, 45 SW Toll, 183 South Toll Phases I - II

The monthly fee for maintaining 183A Toll, 290 Toll, 71 Toll, MoPac Express Lane, 45 SW Toll and 183 South Toll projects, including Plaza System; Host System; Communications Equipment: all ETC Toll Lanes ~~and related intelligent transportation systems (ITS); and~~ System Administration and Express Lane Intelligent Transportation Systems (ITS)~~and the complete Intelligent Transportation Systems (ITS)~~ as furnished and installed shall be measured on a per month basis. Each per month unit shall include furnishing all labor,

materials, and support services to perform Maintenance Services for that month in conformance with the requirements of the Specifications, the specified requirements of the ITS equipment for applicable roadways, and as accepted by the CTRMA.

Amendment No. 5 Maintenance Contract Pricing	Monthly	Annual
183-A, 290-E, TX-71, Mopac Express Lanes, 45SW and 183S	$474,623.17	$5,695,478.04

Amendment No. 6 Maintenance Contract Pricing	Monthly	Annual
183-A, 290-E, SH-71, Mopac Express Lanes, 45SW, 183S ~~and additional ITS~~	$486,726.51	$5,840,718.12

Monthly Support for Maintenance of 183-A, 290-E, TX-71, Mopac Express Lanes, 45SW, 183S and additional ITS	
Software Engineers	4 FTEs
Systems Administration	2 FTEs
Business Analyst	1 FTE
Maintenance Technicians	7 FTEs
TOTAL	14 FTEs

B. TMC Operations Support

Amendment No. 6 adjusts pricing for the TIM Center Operations to facilitate adding or removing staff as CTRMA expands. CTRMA anticipates the use of four (4) operators in fiscal year 2022. The monthly pricing per FTE is $9,782.48.

TMC Operations Support				
Description	**Unit** *(hrs.)*	**2022 CPI Adjusted Rate**	**TMC Operation**	
			Qty	*Per Month*
Operations Support	173	$56.55	4	$39,129.90

3. Out of Scope Services

The hourly rates for out of scope services pursuant to Section 11 of the Toll Collection System Maintenance Services Contract are reflected in the FY 22 fully loaded rates, outlined in Section 1.

4. Other Direct Costs

Other Direct Costs (ODCs) are the reasonable actual direct incremental costs incurred by the Contractor for the performance of the applicable Work that are directly attributable to such Work. ODCS may include leasing, fuel, repairs, tolls, etc. associated with maintenance vehicle costs. ODCs also cover consumables maintenance technicians may use in performing their duties.

Role	FY 2019	FY 2020	FY 2021	FY 2022
	2.00%	*N/A*	*3.00%*	***9.10%***
Technicians ODCs	$2,169.31	$2,169.31	$2,234.39	**$2,437.72**

5. ITS Maintenance

A. Cost Breakdown

Amendment No. 6 adjusts pricing for all furnished and installed ITS equipment to facilitate adding or subtracting of said equipment over the course of this Maintenance Services Contract. Costs per device are on a per month basis and included in Amendment No. 6 Maintenance Contract Pricing as outlined in Section 2.

ITS Cost per Device	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
	N/A	*N/A*	*N/A*	***9.10%***	
CCTV	$112.00	$112.00	$112.00	$122.19	$129.52
~~DMS *~~	~~$133.00~~	~~$133.00~~	~~$133.00~~	~~$145.10~~	~~$153.81~~
VTMS	$140.00	$140.00	$140.00	$152.74	
MVDs	$108.00	$108.00	$108.00	$117.83	$124.90

**** Updated to reflect 2023 pricing. DMS device deleted per revised Amendment #3 related to ITS scope removal for non-Express Lane facilities and operations***

B. ITS Bill of Quantities

ITS Project	CCTV	VTMS	DMS	MVDs
~~290 E~~	~~13~~	~~0~~	~~2~~	~~34~~
MoPac	30	5	0	58
~~SH71~~	~~1~~	~~0~~	~~0~~	~~0~~
~~45SW~~	~~10~~	~~0~~	~~2~~	~~11~~
~~183S~~	~~14~~	~~0~~	~~5~~	~~29~~
~~183A~~	~~42~~	~~0~~	~~2~~	~~11~~
Total	~~**110**~~ **30**	**5**	~~**11**~~ **0**	~~**143**~~ **58**

**** Deleted all ITS projects except MoPac per revised Amendment #3 related to ITS scope removal for non-Express Lane facilities and operations***

6. Toll System Maintenance

Amendment No. 6 adjusts the pricing of monthly fees for maintaining 183A Toll, 290 Toll, 71 Toll, MoPac Express Lane, 45 SW Toll and 183 South Toll projects. The pricing, displayed below as a per lane fee, includes all required systems to support transaction capture, transaction creation and transaction transmission. These systems include the Plaza System, Host System, Communications Equipment, ETC Toll Lanes and System Administration. The maintenance fee cost breakdown is to facilitate the adding or subtracting of ETC Toll Lanes over the course of this Maintenance Services Contract.

Toll Project	Lanes	Fee per Lane	Toll System Maintenance	ITS Maintenance	Toll Project Maintenance	
					Monthly	Annually
290-E	43	$2,097.54	$90,194.22	~~6,237.98~~	$96,079.11	$1,152,949.32
MoPac	7	$8,166.85	$57,167.95	$11,263.54	$68,431.49	$821,177.88
SH71	6	$1,633.37	$9,800.22	~~$ 129.52~~	$9,922.41	$119,068.92
45SW	6	$2,450.06	$14,700.36	~~$ 2,976.72~~	$17,508.59	$210,103.08
183S	37	$4,083.41	$151,086.17	~~$ 6,204.42~~	$156,939.40	$1,883,272.80
183A	40	$3,278.18	$131,127.20	~~$ 7,121.41~~	$137,845.51	$1,654,146.12
Total	**139**		**$454,076.36**	~~**$32,650.39**~~ **$11,263.54**	**$486,726.51**	**$5,840,718.12**

**** Updated to reflect 2023 ITS maintenance cost per device and then deleted per revised Amendment #3 related to ITS scope removal for non-Express Lane facilities and operations***

REVISED MARCH 2024 IN AMENDMENT #3 TO REMOVE ITS SCOPE RELATED TO NON-EXPRESS LANE FACILITIES

Central Texas Regional Mobility Authority - Maintenance Open Road Tolling

KPI Reporting And Management Plan

KPI-RAMP

Doc No.: NAMCPRJ-1472315366-637

Version: 1.3

Document Control

Document Name	CTRMA Maintenance ORT - KPI Reporting And Management Plan
File Name	20220617_Kapsch_CTRMA_Maintenance Services_KPI-RAMP_v1.3
Contract #	16-31-043-00
Project Title	Maintenance Open Road Tolling
Client	Central Texas Regional Mobility Authority (CTRMA)
Project Manager	Mark Stewart
Author	Mark Stewart

Change Notice

Rev #	Change Reason	Quality Control	Quality Assurance	Completed
1.0	Initial Version	Mark Stewart	Samuel Herbert	03-10-2020
1.1	Revision	Mark Stewart	Samuel Herbert	05-25-2021
1.2	Comment Revision	Mark Stewart	Samuel Herbert	06-13-2022
1.3	Content Revision	Mark Stewart	Samuel Herbert	06-17-2022

Reference to the status- and version administration:

Status:

Draft	the document is being processed
Released	the document has been checked and released, it can only be modified if the version number is updated.
Final	the document is complete

Versions:

1.0, 1.1, etc.	"**Released**" versions
2.0	Accepted version with the status "**Final**"
2.1, 2.2, etc.	Minor revisions, supplements to version 2.0

Reference to the data classification	
Public	No restriction
Internal	Restricted to internal and external Kapsch employees (default)
Confidential	**Restricted to selected active directory and/or SharePoint groups,**
Secret	Restricted to selected employees, server encryption needed

Table of Contents

List of Tables

0 Introduction

This Key Performance Indicator (KPI) Reporting and Management Plan describes how performance indicators will be monitored, calculated, audited, and reported to support KPI Reporting and Liquidated Damage (LD) assessment.

0.1 Abbreviations

The following table contains a list of important abbreviations used within this document.

Abbreviation	Description
AVC	Automatic Vehicle Classification
AVD	Automatic Vehicle Detection
AVI	Automatic Vehicle Identification
CCTV	Closed Circuit Television
CTRMA	Central Texas Regional Mobility Authority
DB	Database
DMS	Dynamic Message Sign
DPS	Data Platform System
DVAS	Digital Video Audit System
DVR	Digital Video Recorder
ETC	Electronic Toll Collection
ICS	Image Capture Station
KPI	Key Performance Indicator
LD	Liquidated Damage
LPIC	License Plate Image Capture
MMR	Monthly Maintenance Report
MPH	Miles Per Hour
MVD	Microwave Vehicle Detection
PBM	Pay By Mail
RMA	Return Material Authorization
ROMS	Remote Operations and Maintenance System
SLA	Service Level Agreement
SNTPD	Simple Network Time Protocol Daemon

Abbreviation	Description
TB	Tag Based
TCS	Toll Collection System
TVL	Tag Validation List
VES	Violation Enforcement System
VMS	Video Monitoring System
VTMS	Variable Toll Message Sign
ZC	Zone Controller

Table 1 List of used Abbreviations

0.2 List of referenced documents

The following table contains a list of documents referenced by this document.

Ref. No.	Doc. No.	Doc. Type	Document Title
[1]	NAMCPRJ-149165766-142	PDF	12_1_FINAL_AIS_Kapsch_Restated_Maint_Agreement_KapschSigned_20191216

Table 2 List of referenced documents

0.3 Revenue Calculation Parameters

The following parameters guide the calculation of revenue;

- Actual revenue calculated using 100% of AVI and I-Toll transactions and Pay by Mail transactions at the liquidation rate
- Pay by Mail revenue value should be calculated as 10% of affected transactions calculated using the AVI rate (i-Toll transactions), and the remaining 90% is calculated using the current Pay by Mail toll rate factor (e.g. AVI toll rate *1.5)
- Liquidation rate (e.g. 0.5) to be evaluated at the beginning of each Fiscal Year based on the prior year's results and applied to the estimated Pay by Mail revenue loss amount
- For lost or uncollectable transactions, transactions older than 30 calendar days are considered ineligible for billing due to age

1 KPI #1 – Automatic Vehicle Detection (AVD)

1.1 Description

The vehicle detection subsystem shall detect 99.90% of vehicles passing through the Toll Zone once and only once under all conditions within the design specification described in the requirements, including vehicles in the shoulders and straddling the lane and shoulder. Kapsch will reconcile discrepancies from CTRMA audits. Variance may be dependent on vehicle volume.

1.2 KPI Goal

The KPI goal is 99.90%.

1.3 Maximum Liquidated Damages

Maximum liquidated damages are $200 per gantry location, per each 0.1% below threshold.

1.4 Testing Frequency

Audits by CTRMA and executed by CTRMA, shall be evenly spread over the course of 12-months (e.g. approximately 1/12th of locations audited each month), with a minimum transaction count as determined by 90% confidence and a statistically significant sample size, as shown in Table 3, to show KPI compliance.

Minimum Required Samples
3,000

Table 3 KPI#1 Minimum Required Samples

1.5 Testing Process

The current testing process is a monthly audit, where CTRMA will perform a manual review of host reports, matched against Digital Video Audit System (DVAS) footage or third-party video surveillance, to ensure all vehicles traversing the roadway are detected and have transactions created for them within the host reports.

1.6 Measurement Method

$$Measured\ Accuracy\ per\ Gantry\ Location = \left[1 - \left(\frac{Detection\ Errors}{Total\ Number\ of\ Vehicles\ at\ Audited\ Gantry}\right)\right] \times 100$$

1. System reports (e.g., Traffic Reports - Lane Image Tool Report) available for audit period.
2. Video of traffic through the gantry provides determination of vehicle presence.
3. Human review of gantry video determines detection errors and transaction count.
4. Excludes:

    a) Undetected motorcycles straddling lanes as known system deficiency.
    b) Vehicles traveling in the wrong direction.
    c) Vehicles in tow using rope, chains, or other unorthodox methods.

1.7 Example KPI Calculation

In this example scenario, assume that during the audit period, and at the audited gantry, there were 5,000 Total Number of Vehicles identified in the corresponding Traffic Report. During manual review of video footage, 37 Detection Errors were identified when comparing DVAS footage or third-party video surveillance to system reports (e.g., Traffic Reports).

- Total Number of Vehicles Through Audited Gantry = 5,000
- Detection Errors = 37

$$Measured\ Accuracy = \left[1 - \left(\frac{37}{5{,}000}\right)\right] \times 100 = 99.26\%$$

$$Liquidated\ Damages = \frac{(0.999 - 0.992)}{0.001} \times \$200 = \$1400$$

2 KPI #2 – Automatic Vehicle Classification (AVC)

2.1 Description

The AVC subsystem shall correctly classify 99.50% of all detected vehicles at speeds from 5 mph up to and including 100 mph, including vehicles straddling the lanes. Shoulders are excluded from this calculation. Kapsch will reconcile discrepancies from CTRMA audits. Variance may be dependent on vehicle volume.

2.2 KPI Goal

The KPI goal is 99.50%.

2.3 Maximum Liquidated Damages

Maximum liquidated damages are $200 per gantry location, per each 0.1% below threshold.

2.4 Testing Frequency

Audits by CTRMA and executed by CTRMA, shall be evenly spread over the course of 12-months (e.g. approximately 1/12th of locations audited each month), with a minimum transaction count as determined by 90% confidence and a statistically significant sample size, as shown in Table 4, to show KPI compliance.

Minimum Required Samples
3,000

Table 4 KPI#2 Minimum Required Samples

2.5 Testing Process

The current testing process is a monthly audit. In this audit, CTRMA will perform a manual review of host reports matched against DVAS and/or third-party video, to ensure all vehicles reported in the host are properly classified.

2.6 Measurement Method

$$Measured\ Accuracy\ per\ Gantry\ Location = \left[1 - \left(\frac{Axle\text{-}Based\ Classification\ Errors}{Total\ Number\ of\ Vehicles\ at\ Audited\ Gantry}\right)\right] \times 100$$

1. System report (Traffic Reports - Lane Image Tool Report) available for audit period.
2. Video of traffic through the gantry provides determination of vehicle classification via axle counts per vehicle.
3. Human review of gantry video determines classification errors and transaction count.
4. Excludes:

    a) Undetected motorcycles straddling lanes as known system deficiency.
    b) Vehicles traveling in the wrong direction.
    c) Vehicles in tow using rope, chains, or other unorthodox methods.
    d) Vehicles traveling in lanes not outfitted with classification hardware.
    e) Undetected vehicles (the system cannot classify a vehicle it does not detect)

2.7 Example KPI Calculation

In this example scenario, assume that during the audit period, and at the audited gantry, there were 5,000 Total Number of Vehicles identified in the corresponding Traffic Report. During manual review of video footage, 37 Axle-Based Classification Errors were identified when comparing DVAS footage or third-party video surveillance to system reports (e.g., Traffic Reports).

- Total Number of Vehicles Through Audited Gantry = 5,000
- Axle-Based Classification Errors = 37

$$Measured\ Accuracy\ = \left[1 - \left(\frac{37}{5{,}000}\right)\right] \times 100 = \ 99.26\%$$

$$Liquidated\ Damages\ = \frac{(0.995 - 0.992)}{0.001} \times \$200 = \ \$600$$

3 KPI #3 – Automatic Vehicle Identification (AVI)

3.1 Description

The AVI subsystem will correctly detect, read, and assign to the correct vehicle 99.90% of all properly installed transponders on all detected vehicles at speeds from 5 mph up to and including 100 mph, including vehicles in the shoulders and straddling the lanes.

3.2 KPI Goal

The KPI goal is 99.90%.

3.3 Maximum Liquidated Damages (per calendar month)

Maximum liquidated damages are $200 per gantry location, per each 0.1% below threshold.

3.4 Testing Frequency

Audits by CTRMA and executed by CTRMA, shall be evenly spread over the course of 12-months (e.g. approximately 1/12th of locations audited each month), with a minimum transaction count as determined by 90% confidence and a statistically significant sample size, as shown in Table 5, to show KPI compliance.

Minimum Required Samples
5,500

Table 5 KPI#3 Minimum Required Samples

3.5 Testing Process

For AVI Detect and Read Accuracy:

1. Kapsch provides a report that displays all vehicle transactions per gantry. From this data set, the transactions are filtered for tag reads and non-tag read vehicle transactions.
2. Another filter query removes transactions with an indicated vehicle speed between 5 MPH to 100 MPH.
3. From this data set, transactions with the same transponder are matched with other vehicle transactions that occurred on the same roadway, on the same day.
4. The accuracy is calculated by counting the number of vehicles charged as an iToll at a gantry that had a tag read on the same roadway, on the same day, as an error. This value is then divided by the total number of vehicles at that plaza on that day.
5. Kapsch provides a report that includes transactions and all images captured for each transaction occurring within a CTRMA selected time (audit period). Only AVI transactions will be used. All non-AVI transactions shall be removed.
6. Transactions are matched with other vehicle transactions that occurred on the roadway in the same audit period.

7. However, if the images from both initial transactions show different vehicles, images from a third transaction for the audited transponder are compared.

    a) If the images from this third transaction match the audited transaction, the audit will consider the audited transponder correctly correlated to the transaction.
    b) If the images from the third transaction do not match the audited transaction, the audit shall consider the audited transponder to have an AVI correlation error.
    c) If the transactions are spurious or buffered tags that are clearly correlation errors, they are counted (e.g., missed association or cross lane reads).

3.6 Measurement Method

$$Measured\ Accuracy\ per\ Gantry\ Location = \left\{1 - \left[\frac{(Detection\ and\ Read\ Errors) + (Correrlation\ Errors)}{(Detection\ and\ Read\ Audited\ Samples) + (Correlation\ Audited\ Samples)}\right]\right\} \times 100$$

1. The Number of Detection and Read Errors and Correlations Errors is the number of vehicles with an iToll transaction that was also identified to have a separate successful tag transaction at a minimum of one other gantry on the same roadway during the same day.
2. Detection and Read Audited Samples and Correlation Audited Samples are the total number of vehicles passing through the plaza.
3. Excludes vehicles:

    a) Traveling in the wrong direction
    b) Transactions with no images
    c) Transponders with only one transaction
    d) Transactions where cannot be reliably demonstrated to be the same or a different vehicle, due to such factors as image quality or obscured plate numbers

3.7 Example KPI Calculation

In this example scenario, assume that during the audit period, and at the audited gantry, there were 5,000 Total Number of Vehicles identified in the corresponding Detailed Transaction Report. An Ad-Hoc Query flagged 187 iTolls as Missed AVI Reads and Correlations as there were corresponding tag reads at another plaza on the same day.

- Total Number of Vehicles at Audited Gantry = 5,000
- Total Number of Missed AVI Reads and Correlations = 187

$$Measured\ Accuracy = \left[1 - \left(\frac{187}{5{,}000}\right)\right] \times 100 = 96.26\%$$

$$Liquidated\ Damages = \frac{(0.999 - 0.962)}{0.001} \times \$200 = \$7{,}400$$

4 KPI #4 – License Plate Image Capture (LPIC)

4.1 Description

The LPIC subsystem will capture one front, human-readable license plate image or one rear, human-readable license plate image and associate it to the correct vehicle for 99.00% of all detected vehicles traveling at speeds from 5 mph up to and including 100 mph, including vehicles straddling the lane and shoulder.

4.2 KPI Goal

The KPI goal is 99.00%.

4.3 Maximum Liquidated Damages

Estimated revenue loss is calculated using liquidation rate, per gantry location, for performance below the threshold.

4.4 Testing Frequency

Testing will occur monthly.

4.5 Testing Process

For LPIC Capture and Association:

1. View the Code Offs by Lane Report for the roadway and audit period that is being verified. Use the first day of the month as the start date, and the last day of the month as the end date. Repeat this process for all roadways.
2. View each report and isolate “Camera issue at lane” code off rows for each plaza/lane.
3. Record “Total TRX”, “Total Toll”, and “Total Pct” for all camera issues at the lane code off.
4. The Image Capture accuracy will be the reflected in the report and can be identified by the formula below.

4.6 Measurement Method

$$Measured\ Accuracy\ per\ Gantry = 100 - (\text{Camera Issue at Lane Code Off Total Pct})$$

Exclusions include the following:

1. Undetected motorcycles straddling lanes as a known system deficiency.
2. Vehicles traveling in the wrong direction.
3. Vehicles in tow using rope, chains, or other unorthodox methods.
4. Vehicles with missing, damaged, or obstructed license plates.
5. Vehicles with unreadable temporary license plates.
6. Motorcycles with unreadable license plates.

7. Out of State license plates that were unidentifiable.

Note: This metric only evaluates legally mounted license plates and plates that are deemed to be unidentifiable due strictly to camera issues. These are code-offs conditions and will remain in the sample set.

Camera issues include the following:

1. Blurred image
2. Cut-off image (timing)
3. Images with no vehicles (timing)
4. Over/under exposure
5. Camera angle

4.7 Example KPI Calculation

In this example scenario, assume that during the audit period, and at the audited gantry, there were 2,000 Camera Issue at Lane Code Offs, equaling a total toll value of $2,400, and a total percentage of 1.49%, as identified in the Code Offs by Lane report. The total transactions, prior to code offs, are included in the reports calculation; thus, the listed failure rate of 1.49% can be used independently to determine KPI achievement.

- Total Count of Camera Issue at Lane Code Off transactions = 2,000
- Total Toll of Camera Issue at Lane Code Off transactions = $2,400
- Total Percentage of Camera Issue at Lane Code Off transactions = 1.49%

$$Measured\ Accuracy\ = 100 - 1.49\% = 98.51\%$$

$$Transactions\ Below\ Threshold\ = \frac{\left[2{,}000\ x\ \frac{(1.49 - 1.00)}{100}\right]}{\left(\frac{1.49}{100}\right)} = 658$$

$$Total\ Toll\ Below\ Threshold\ = \left(\frac{\$2{,}400}{2{,}000}\right) x\ 658 = \$789.60$$

$$Average\ Toll\ per\ Transaction\ = \left(\frac{\$789.60}{658}\right) = \$1.20$$

$$Pay\ by\ Mail\ Revenue\ Value\ AVI\ (iToll) = \frac{(658\ x\ 10\%)\ x\ \$1.20}{1.5} = \$52.64 Pay\ by\ Mail\ Revenue\ Value$$

$$= \left((658\ x\ 90\%)\ x\ \$1.20\right) x\ 0.5 = \$355.32$$

$$\boldsymbol{Total\ Pay\ by\ Mail\ Revenue\ Value\ = \$52.64\ (AVI) + \$355.32\ (PBM) = \$407.96}$$

5 KPI #5 – IR

5.1 Description

For transactions rejected by the manual review process, less than 1.00% shall have incorrect code-off results.

5.2 KPI Goal

The KPI goal is <1.00%.

5.3 Maximum Liquidated Damages

Maximum liquidated damages are $200, per each 0.1% below threshold.

5.4 Testing Frequency

Audits by CTRMA, at their discretion, will be executed by CTRMA, with a minimum transaction count as determined by a statistically significant sample size, as shown in Table 6, to show KPI compliance.

Minimum Required Samples per Code Off Category
1,500

Table 6 KPI#5 Minimum Required Samples

5.5 Testing Process

The current testing process is a quarterly audit, where validation will be conducted on a randomized set of coded off transactions. This subset of transactions is manually reviewed by the Kapsch Transaction Validation Team to ensure coded off transactions are given the proper code off, and to identify any valid transactions that were erroneously coded off.

Quarterly Audit Schedule:

Quarter	Review Period	Audit Due Date
1	January 1st – March 31st	April MMR
2	April 1st – June 30th	July MMR
3	July 1st – September 30th	October MMR
4	October 1st – December 31st	January MMR

Table 7 KPI#5 Quarterly Audit Schedule

5.6 Measurement Method

$$Measured\ Accuracy = \left[1 - \left(\frac{Pursuable\ Code\ Offs + Incorrect\ Code\ Offs}{Total\ Manually\ Audited\ Coded\ Off\ Images}\right)\right] \times 100$$

1. Obtain a random sample set of manually reviewed coded off transactions.
2. Verify the image code off is not pursuable (license plate number or jurisdiction unclear)

5.7 Verify a valid code off reason was applied. Example KPI Calculation

In this example scenario, assume that during the audit period, there were 5,000 Manually Audited Coded Off Images. When reviewing the images, there were 25 code offs that were pursuable and 125 code offs that were categorized incorrectly.

- Total Number Manually Audited Coded Off Images = 5,000
- Total Number of Pursuable Coded Off Images = 25
- Total Number of Incorrectly Coded Off Images = 125

$$Measured\ Accuracy = \left[1 - \left(\frac{25 + 125}{5{,}000}\right)\right] \times 100 = 97.00\%$$

$$Liquidated\ Damages = \frac{(0.99 - 0.97)}{0.001} \times \$200 = \$4{,}000$$

6 KPI #6 – Trip

6.1 Description

99.50% of all transactions shall be correctly assembled into trips.

6.2 KPI Goal

The KPI goal is 99.50%.

6.3 Maximum Liquidated Damages

Maximum liquidated damages are $200 per roadway direction, per each 0.1% below threshold.

6.4 Testing Frequency

Testing will occur monthly.

6.5 Testing Process

Testing is performed through an Ad-Hoc Query.

The test will evaluate a “correctly assembled trip” using Trip Accuracy and Fare assignment. A vehicle’s identification will be evaluated by using both Tag, if present, and LPN information.

The inspection of a vehicle’s identification can identify two failure types: split trip and combined vehicle information. A split trip represents a vehicle reporting on two or more distinct trips, instead of being combined into a singular trip. A combined vehicle information failure represents two distinct vehicles included in a singular trip.

Trip building validation will be conducted by verifying that all transactions with a matching plate or tag value, between 21 minutes before trip start time, through 21 minutes after the trip end time, are all included within a singular trip. Once it is verified that the trip’s vehicle did not pass another toll point prior to or after the formed trip, the trip may be considered complete.

Fare assignment will be evaluated by comparing the Toll Rate Sign Posting Report to Entry Point Tolling location. The rate that was active on the sign will be compared to entry point and assigned fare to validate accuracy.

6.6 Measurement Method

$$Measured\ Accuracy\ per\ Roadway\ Direction = \left[1 - \left(\frac{Total\ Incorrectly\ Assembled\ Trips}{Total\ Audited\ Trips}\right)\right] \times 100$$

1. The number of incorrectly assembled trips will be identified by the sum of audited trips that failed to achieve both trip accuracy and correct fare assignment.
2. Total number of trips will be the count of trips evaluated.

6.7 Example KPI Calculation

In this example scenario, assume that during the audit period, and per audited roadway direction, there were 9,000 trips evaluated. Of those evaluated, 125 trips failed either trip accuracy or correct fare assignment.

- Total Number of Incorrectly Assembled Trips = 125
- Total Number of Trips = 9,000

$$Measured\ Accuracy = \left[1 - \left(\frac{125}{9{,}000}\right)\right] \times 100 = 98.61\%$$

$$Liquidated\ Damages = \frac{(0.995 - 0.986)}{0.001} \times \$200 = \$1{,}800$$

7 KPI #7 – Trip Processing

7.1 Description

100% of all trips shall be transmitted to the CTRMA Data Platform System (DPS) within six (6) calendar days of the exit transaction of the trip.

7.2 KPI Goal

The KPI goal is 100%.

7.3 Maximum Liquidated Damages (per calendar month)

Maximum liquidated damages for lost or uncollectable transactions:

1. Actual revenue above $5,000, AND
2. Any direct damages associated with the loss

Maximum liquidated damages for transactions transmitted > 6 days and <= 30 days, AND the result in revenue generation:

1. 10% of actual revenue, AND
2. Any direct damages associated with the delay

Maximum liquidated damages for transactions older than 30 calendar days:

3. Actual revenue above $5,000, AND
4. Any direct damages associated with the loss

Note: Actual revenue value should be calculated using 100% of AVI and i-Toll transactions, and Pay by Mail transactions at the liquidation rate (to be validated every new fiscal year).

7.4 Testing Frequency

Testing will occur monthly.

7.5 Testing Process

Testing is performed through an Ad-Hoc Query.

7.6 Measurement Method

$$Measured\ Accuracy\ =$$

$$\left\{1-\left[\frac{Count\ of\ Mopac\ DB\ Trips-(Count\ of\ CTRMA\ DB\ Trips\ -Count\ of\ CTRMA\ DB\ Trips\ >\ 6\ Days\ and\ \leq 30\ Days)}{Count\ of\ Mopac\ DB\ Trips}\right]\right\}\times 100$$

1. Count of Mopac DB Trips will be the total count of Mopac Trips in the Mopac DB.
2. Count of CTRMA DB Trips will be the total count of Mopac Trips that are found in the CTRMA DB.
3. The >6 Days will be determined by evaluating the Mopac Trip exit timestamp as the start time, and the RTRAN transmission timestamp, to the DPS, as the stop time.

7.7 Example KPI Calculation

In this example scenario, assume that during the audit period, there were 50,000 valid Mopac Trips found in the Mopac DB. Using the same sample set, there were a total of 50,000 Mopac Trips located in the CTRMA DB. Of those 50,000 Mopac Trips, 7,500 exceeded the 6 day RTRAN transmission time limit. Of the 7,500 trips that failed the KPI, 4,000 were AVI or iTolls, and 3,500 were Pay by Mail (PBM). The 4,000 AVI transactions totaled $8,400 while the 3,500 PBM transactions totaled $12,600.

- Total Count of Mopac Trips in Mopac DB = 50,000
- Total Count of Mopac Trips in CTRMA DB = 50,000
- Total Count of Mopac Trips in CTRMA DB > 6 Days and <= 30 Days = 7,500
- Total Count of Mopac Trips in CTRMA DB <= 6 Days = (50,000 – 7,500) = 42,500
- Total Count of Mopac Trips Delayed > 6 Days and <= 30 Days = 7,500

$$Measured\ Accuracy\ =\ \left\{1-\left[\frac{50{,}000-(50{,}000-7{,}500)}{50{,}000}\right]\right\}\times 100\ =\ 85.00\%$$

Actual Revenue Value = $8,400 + ($12,600 x 0.5) = $14,700

$$\boldsymbol{Liquidated\ Damages}\ =\ \$\mathbf{14{,}700}\ \boldsymbol{x}\ \mathbf{10}\%\ =\ \$\mathbf{1{,}470}$$

8 KPI #8 – Express Lane Microwave Vehicle Detection (MVD)

8.1 Description

The volume of MVD data provided by the Traffic Detection System will be 95.00% accurate.

8.2 KPI Goal

The KPI goal is 95.00%.

8.3 Maximum Liquidated Damages (per calendar month)

Maximum liquidated damages are $200 per MVD, per each 0.1% below threshold.

8.4 Testing Frequency

Kapsch will execute an annual performance audit.

8.5 Testing Process

The current testing process is a yearly audit of all MVDs, performed by Kapsch, that will verify MVDs through comparing volume provided by the physical device (observed via the HDSmart Utility), and the volume counted through DVAS footage or third-party video surveillance. Each MVD will be audited for a minimum of five minutes, with a minimum count of 30 vehicles. The results will be annotated on the MVD Calibration Verification Sheet (see Appendix A). Any devices that fail to meet KPIs will be re-audited the following month.

Yearly Audit Schedule:

Review Period	Audit Due Date
October 1st – October 31st	November MMR

Table 8 KPI#8 Yearly Audit Schedule

8.6 Measurement Method

$$Measured\ Accuracy\ per\ MVD = \left[1 - \left(\frac{Observed\ Traffic\ Volume - MVD\ Reported\ Traffic\ Volume}{Observed\ Traffic\ Volume}\right)\right] \times 100$$

1. Observed Traffic Volume is the total observed traffic volume passing the audited MVD.
2. MVD Reported Traffic Volume is the total traffic volume captured by the MVD, via the HDSmart Utility, at the audited MVD.
3. Exceptions:

    a) Any MVD disabled for predictive or preventative maintenance.

    b) Any MVDs in non-working conditions pending repair of a damaged component. Example KPI Calculation.

    c) Any MVD which is unavailable during the auditing period, will have an individual audit conducted within 30 days of becoming available.

In this example scenario, assume that during the audit period, and per the audited MVD, there were 5,000 vehicles observed through the recorded video feed for the audited MVD location. Using the same time period and location, there were a total of 4,500 vehicles captured by the MVD through the HDSmart Utility.

- Total Observed Traffic Volume at MVD Location = 5,000
- Total MVD Reported Traffic Volume at MVD Location = 4,500

$$Measured\ Accuracy = \left[1 - \left(\frac{5000 - 4500}{5000}\right)\right] \times 100 = 90.00\%$$

$$Liquidated\ Damages = \frac{(0.950 - 0.900)}{0.001} \times \$200 = \$10{,}000$$

9 KPI #9 – Non-EL Transaction Processing

9.1 Description

100% of all Non-EL transactions shall be transmitted to the CTRMA DPS within three (3) calendar days of the transaction date.

9.2 KPI Goal

The KPI goal is 100%.

9.3 Maximum Liquidated Damages (per calendar month)

Maximum liquidated damages for lost or uncollectable transactions:

1. Actual revenue above $5,000, AND
2. Any direct damages associated with the loss

Maximum liquidated damages for transactions transmitted > 3 days and <= 30 days, AND result in revenue generation:

1. 10% of actual revenue, AND
2. Any direct damages associated with the delay

Maximum liquidated damages for transactions older than 30 calendar days:

1. Actual revenue above $5,000, AND
2. Any direct damages associated with the loss

Note: Actual revenue value should be calculated using 100% of AVI and i-Toll transactions, and PBM transactions at the liquidation rate (to be validated every new fiscal year).

9.4 Testing Frequency

Testing will occur monthly.

9.5 Testing Process

Testing is performed through an Ad-Hoc Query

9.6 Measurement Method

$$Measured\ Accuracy = \left[1 - \left(\frac{Count\ of\ Transactions > 3\ Days\ and \leq 30\ Days}{Count\ of\ Total\ Transactions\ Created}\right)\right] \times 100$$

1. The count of transactions > 3 Days and <= 30 Days will be the number of transactions initially transmitted to the DPS, in the RTRAN file, within this timeframe.
2. To determine if the 3 day time limit was achieved, the transaction timestamp (lane date) will represent the start time, and the RTRAN file transmission timestamp will represent the end time.
3. The count of total transactions will be all created transactions within the annotated periods above.

9.7 Example KPI Calculation

In this example scenario, assume that during the audit period, there were 50,000 transactions created. Using the same sample set, it was found that 10,000 transactions were transmitted to the DPS, in the initial RTRAN file, outside the 3 day time limit. Of the 10,000 transactions, 6,000 were AVI or iToll, and 4,000 were PBM. The 6,000 AVI transactions totaled $4,800 while the 4,000 PBM transactions totaled $4,800.

- Total Count of Transactions = 50,000
- Total Count of Transactions Transmitted > 3 Days and <= 30 Days = 10,000

$$Measured\ Accuracy = \left[1 - \left(\frac{10{,}000}{50{,}000}\right)\right] \times 100 = 80.00\%$$

Actual Revenue Value = $4,800 + ($4,800 x 0.5) = $7,200

$$\boldsymbol{Liquidated\ Damages} = \$\mathbf{7{,}200}\ \boldsymbol{x}\ \mathbf{10}\% = \$\mathbf{720}$$

10 KPI #10 – IR

10.1 Description

For transactions requiring a manual review process, 99.50% shall be completed, AND returned, within 72 hours from the time the image review request was received.

10.2 KPI Goal

The KPI goal is 99.50%.

10.3 Maximum Liquidated Damages (per calendar month)

Maximum liquidated damages for Image Reviews completed > 72 hours and <= 10 days:

1. $200 per each 0.1% below threshold.

Maximum liquidated damages for Image Reviews completed > 10 days and <= 30 days, AND result in revenue generation:

1. 10% of actual revenue, AND
2. Any direct damages associated with the delay

Maximum liquidated damages for lost or uncollectable Image Review transactions:

1. Actual revenue above $5,000, AND
2. Any direct damages associated with the loss

Maximum liquidated damages for transactions older than 30 calendar days:

1. Actual revenue above $5,000, AND
2. Any direct damages associated with the loss

Note: Actual revenue value should be calculated using 100% of AVI and i-Toll transactions, and Pay by Mail transactions at the liquidation rate (to be validated every new fiscal year).

10.4 Testing Frequency

Testing will occur monthly.

10.5 Testing Process

Testing is performed through an Ad-Hoc Query.

10.6 Measurement Method

$$Measured\ Accuracy\ = \left[1 - \left(\frac{Total\ Manual\ Image\ Review\ Results\ Returned > 72\ Hours\ and \leq 10\ Days}{Total\ Manual\ Image\ Review\ Requests\ Received}\right)\right] \text{x } 100$$

1. Total manual Image Review requests received is the total amount of image review requests received from the DPS, in an IREQ file.
2. Total manual Image Review results returned > 72 hours and <= 10 days will be the number of image review results returned to the DPS, in an ITRAN, within this timeframe.
3. To determine if Image Review timeframes were achieved, the IREQ receipt timestamp will represent the start time, and the ITRAN file transmission timestamp will represent the end time.

10.7 Example KPI Calculation

In this example scenario, assume that during the audit period, there were 250,000 manual Image Review requests received in an IREQ file. Using the same sample set, there were a total of 246,000 manual Image Review results returned in an ITRAN file within the 72-hour time limit. Of the remaining 4,000 manual Image Review requests, 2,000 were completed and results returned > 72 hours and <= 10 days. The final 2,000 manual Image Review requests were completed and returned > 10 days and <= 30 days. Of the 2,000 transactions, 1,200 were AVI or iToll, and 800 were PBM. The 1,200 AVI transactions totaled $960 while the 800 PBM transactions totaled $1,450.

- Total Count of Manual Image Review Requests Received = 250,000
- Total Count of Manual Image Review Results Returned < 72 Hours = 246,000
- Total Count of Manual Image Review Results Returned > 72 Hours and <= 10 Days = 2,000
- Total Count of Manual Image Review Results Returned > 10 Days and <= 30 Days = 2,000

$$Measured\ Accuracy\ = \left[1 - \left(\frac{2{,}000}{250{,}000}\right)\right] \times 100\ =\ 99.20\%$$

$$Liquidated\ Damages\ for\ Image\ Review\ Results\ Returned > 72\ Hours\ and \leq 10\ Days\ = \frac{(0.995 - 0.992)}{0.001} \times \$200 = \$600$$

$$Actual\ Revenue\ Value\ for\ Image\ Review\ Results\ Returned > 10\ Days\ and \leq 30\ Days\ = \$960 + (\$1{,}450\ x\ 0.5) = \$1{,}685$$

$$Liquidated\ Damages\ for\ Image\ Review\ Results\ Returned > 10\ Days\ and \leq 30\ Days\ = \$1{,}685\ x\ 10\% = \$168.50$$

$$\boldsymbol{Total\ Liquidated\ Damages\ for\ Image\ Review\ Results\ Returned > 72\ Hours\ = \$600 + \$168.50 = \$768.50}$$

11 KPI #11 – Reports

11.1 Description

The Monthly Maintenance Report, accurately detailing system performance relative to all Project KPIs, shall be submitted to CTRMA each month. The Monthly Inventory Report, to be exported directly from the Remote Operations and Maintenance System (ROMS), accurately details the location, count, and serial numbers of all the CTRMA hardware, including retired hardware (if applicable), spares and Return Material Authorization (RMA) hardware for the previous calendar month. Kapsch is to provide complete reports, which include a cover page, table of contents, and summaries, in a format to be agreed upon by Kapsch and CTRMA.

11.2 KPI Goal

All elements described in Section 11.1 will be submitted to CTRMA by the 15th of the following month.

11.3 Maximum Liquidated Damages (per calendar month)

Kapsch cannot invoice for the monthly maintenance fee without submitting these reports.

11.4 Testing Frequency

Testing will occur monthly.

11.5 Testing Process

n/a

12 KPI #12 – ETC Availability

12.1 Description

Each ETC lane shall be available 99.50% of the time. An available lane is defined as a lane with the ability to collect revenue either through image capture or tag read and association.

12.2 KPI Goal

The KPI goal is 99.50%.

12.3 Maximum Liquidated Damages

Lost or delayed transactions as a result of ETC lane unavailability shall be included in, and calculated per, KPI #7 (Trip Processing) or KPI #9 (Non-EL Transaction Processing).

12.4 Testing Frequency

Testing will occur monthly.

12.5 Testing Process

The Toll Zone Equipment Availability KPI will be measured using the ROMS Downtime Analysis Report, as configured and agreed upon by Kapsch and CTRMA.

12.5.1 Applicability

The Toll Zone Equipment Availability KPI is applicable as follows:

MOPAC

1. Shoulder Lane Availability
    a. 1 of 2 Cameras are operational **AND**
    b. 1 of 2 SICKs are operational
2. Non-Shoulder Lane Availability
    a. 1 of 2 Cameras are operational **AND**
    b. 1 of 2 SICKs are operational **OR**
    c. Tag Reader is operational
3. All Lane Availability
    a. 1 of 2 ZC Applications are running and creating accurate vehicle transactions **AND**
    b. 1 of 2 ICS Servers is online and receiving images from cameras

All Other Roadways

1. Shoulder Lane Availability
    a. 1 of 2 Cameras are operational **AND**
    b. Idris is operational
2. Non-Shoulder Lane Availability
    a. 1 of 2 Cameras are operational **AND**
    b. Idris is operational **OR**
    c. Tag Reader is operational
3. All Lane Availability
    a. 1 of 2 ZC Applications are running and creating accurate vehicle transactions **AND**
    b. 1 of 2 ICS Servers is online and receiving images from cameras

12.6 Measurement Method

$$Measured\ Accuracy\ per\ ETC\ Lane = \left[1 - \left(\frac{Total\ Lane\ Unavailability\ Time\ Per\ Plaza}{Total\ Time\ in\ Audit\ Period}\right)\right] \times 100$$

1. Total lane unavailability time per plaza will be the cumulative downtime that meets the defined unavailability criteria listed in this KPI.
2. Total time in audit period is the total days, hours, and or minutes within the corresponding audit time frame.
3. The following excluded downtime examples will be captured within ROMS to adjust system availability calculations automatically:

    a) Inaccessibility due to hazardous conditions
    b) Downtime for scheduled maintenance
    c) External forces which cause equipment damage
    d) Inaccessibility due to CTRMA driven operational considerations, even though device has failed.

12.7 Example KPI Calculation

In this example scenario, assume that during the audit period, Lane X was unavailable, as defined in the availability criteria of this KPI, for a cumulative total of 6 hours and 35 minutes. The Total Time in Audit Period was 720 hours.

- Total Lane Unavailability = 6 hours, 35 minutes (395 min)
- Total Time in Audit Period = 720 hour (43,200 min)

$$Measured\ Accuracy\ =\ \left[1-\left(\frac{395}{43200}\right)\right]\times 100\ =\ 99.09\%$$

12.8 Estimated Revenue Loss Measurement Method

For the purpose of quantifying lost revenue, the calculated liquidation rate, as referenced in this document, will utilize the following parameters:

1. Identify the revenue loss timeframe
    a) Determine total allowable unavailable time for audit period
    b) Determine when total allowable unavailability time has been exhausted
    c) Determine adjusted start time and end time of lost revenue event that is subject to liquidated damages
2. Identify the historical transaction volume, rate, and type of the referenced plaza/lane for the liable timeframe for the lost revenue incident.
3. Historical transaction data will be for the identical day of the week and identical time of day for the prior three weeks.
4. Historical transaction data will be evaluated to determine percentage of tag based (TB) transactions vs PBM transactions.
5. Identify current Liquidation Rate (maintained by CTRMA).

The estimated revenue loss will use the following calculation methods:

$$Allowable\ Unavailable\ Time\ =\ Total\ Time\ in\ Audit\ Period-\left(0.995(Total\ Time\ in\ Audit\ Period)\right)$$
$$Adjusted\ Unavailable\ Time\ =\ Unavailable\ Time-Allowable\ Unavailable\ Time$$
$$Revenue\ Loss\ Start\ Time\ =\ Start\ Time\ of\ Unavailability+Allowable\ Unavailable\ Time$$
$$Revenue\ Loss\ End\ Time\ =\ Revenue\ Loss\ Start\ Time+Adjusted\ Unavailable\ Time$$
$$Estimated\ Revenue\ Loss\ =$$
$$\{Liquidation\ Rate\ (Avg\ PBM\ Transactions\ x\ Avg\ PBM\ Toll\ Rate)\}+(Avg\ TB\ Transactions\ x\ Avg\ TB\ Toll\ Rate)$$

12.9 Example Estimated Revenue Loss Calculation

In this example scenario, assume that during the audit period, Lane X was unavailable, as defined in the availability criteria of this KPI, for a cumulative total of 6 hours and 35 minutes (395 minutes). The Total Time in Audit Period was 720 hours (43,200 minutes).

$$Allowable\ Unavailable\ Time\ = 43{,}200\ minutes - \big(0.995(43{,}200)\big) = 216\ minutes$$

$$Adjusted\ Unavailable\ Time\ = 395\ minutes - 216\ minutes\ = 175\ minutes$$

$$Revenue\ Loss\ Start\ Time\ = 08{:}35AM + 216\ minutes\ = 12{:}11PM$$

$$Revenue\ Loss\ End\ Time\ = 12{:}11PM + 175\ minutes\ = 03{:}06PM$$

$$Estimated\ Revenue\ Loss\ = \{0.50\ (412\ x\ \$1.85)\} + (515\ x\ \$1.25) = \$1{,}024.85$$

Note: Reference KPI #7 (Trip Processing) and KPI #9 (Non-EL Transaction Processing) for the inclusion of any liquidated damages.

13 KPI #13 – ETC Host Availability

13.1 Description

The Host Level system shall be available 99.50% of the time. An available host is defined as a fully operating host such that reports, ROMS, and transaction processing are online (with the exception of approved downtime for maintenance purposes).

13.2 KPI Goal

The KPI goal is 99.50%.

13.3 Maximum Liquidated Damages

Maximum liquidated damages are $200 per each 0.1% below threshold.

13.4 Testing Frequency

Testing will occur monthly.

13.5 Testing Process

The ETC Host Availability KPI will be measured using the ROMS Downtime Analysis Report, as configured and agreed upon by Kapsch and CTRMA.

13.5.1 Applicability

The ETC Host Availability KPI is applicable as follows:

> For the purpose of this KPI, the ETC Host includes the systems, applications, and processes listed below:

- Database
- Toll Host (Reports)
- ROMS (Engine, DB, UI)
- Application Server
- VES Server
- Host Server
- Inserters (Host, ICS, ROMS)

> Calculated unavailability will only apply when both the primary ETC Host and secondary ETC Host have failed or are unavailable.

13.6 Measurement Method

$$Measured\ Accuracy = \left[1 - \left(\frac{Total\ ETC\ Host\ Unavailability\ Time}{Total\ Time\ in\ Audit\ Period}\right)\right] \times 100$$

1. Total ETC Host unavailability time will be the cumulative downtime that meets the defined unavailability criteria listed in this KPI.
2. Total Time in Audit Period is the total days, hours, and or minutes within the corresponding audit time frame.
3. The following excluded downtime examples will be captured within ROMS to adjust system availability calculations automatically:

    a) Inaccessibility due to hazardous conditions
    b) Downtime for scheduled maintenance
    c) External forces which cause equipment damage
    d) Inaccessibility due to CTRMA driven operational considerations, even though device has failed.

13.7 Example KPI Calculation

In this example scenario, assume that during the audit period, primary and secondary ETC Hosts were both unavailable, as defined in the availability criteria of this KPI, for a cumulative total of 6 hours and 35 minutes. Total Time in Audit Period was 720 hours.

- Total Host Unavailability = 6 hours, 35 minutes (395 min)
- Total Time in Audit Period = 720 hour (43,200 min)

$$Measured\ Accuracy\ = \left[1 - \left(\frac{395}{43200}\right)\right] \times 100\ =\ 99.09\%$$

$$Liquidated\ Damages\ = \frac{(0.995 - 0.990)}{0.001} \times \$200 = \$1{,}000$$

14 KPI #14 – Express Closed-Circuit Television (CCTV) Availability

14.1 Description

Express CCTV shall be available 99.50% of the time, excluding scheduled maintenance.

14.2 KPI Goal

The KPI goal is 99.50%.

14.3 Maximum Liquidated Damages.

Maximum liquidated damages are $200 per each 0.5% below threshold.

14.4 Testing Frequency

Testing will occur monthly.

14.5 Testing Process

The Express CCTV Availability KPI will be measured using the ROMS Downtime Analysis Report, as configured and agreed upon by Kapsch and CTRMA.

14.6 Measurement Method

$$Measured\ Accuracy = \left[1 - \left(\frac{Total\ Express\ CCTV\ Unavailability\ Time}{Total\ Time\ in\ Audit\ Period}\right)\right] \times 100$$

1. Total Express CCTV Unavailability Time will be the cumulative downtime of each Express CCTV during the audit period.
2. Total Time in Audit Period is the total days, hours, and/or minutes within the corresponding audit time frame.
3. The following excluded downtime examples will be captured within ROMS to adjust system availability calculations automatically:

    a) Inaccessibility due to hazardous conditions
    b) Downtime for scheduled maintenance
    c) External forces which cause equipment damage
    d) Inaccessibility due to CTRMA driven operational considerations, even though device has failed.

14.7 Example KPI Calculation

In this example scenario, assume that during the audit period, Express CCTV #1 & #2 were unavailable for a cumulative total of 6 hours and 35 minutes. The Total Time in Audit Period was 720 hours.

- Total Express CCTV Unavailability = 6 hours, 35 minutes (395 min)
- Total Time in Audit Period = 720 hour (43,200 min)

$$Measured\ Accuracy = \left[1 - \left(\frac{395}{43200}\right)\right] \times 100 = 99.09\%$$

$$Liquidated\ Damages = \frac{(0.995 - 0.990)}{0.005} \times \$200 = \$200$$

15 KPI #15 – Non-Express CCTV Availability

15.1 Descrip

Non-Express CCTV shall be a 95.00% of the time, excludi uled maintenance.

15.2 KPI Goal

The KPI goal is 95.00%.

15.3 Maximum Liquidated Damage

Maximum liquidated damages are $200 0.5% reshold.

15.4 Testing Frequency

Testing will occur monthly.

15.5 Testing P

The Non-Express CCTV Availability KPI will be measured using the ROMS Downtime Analysis Report, configured and agreed upon by Kapsch and CTRMA.

15.6 Measurement Method

$$Measured\ Accuracy = \left[1 - \left(\frac{Total\ Non\ Express\ CCTV\ Unavailability\ Time}{Total\ Time\ in\ Audit\ Period}\right)\right] \times 100$$

1. Total Non-Ex…ss CCTV Unavailability Time will be the cumulative …ntime of each Non-Express CCTV during audi…
2. Total Time in A…iod is the total days, hours, and or min…in the corresponding audit time frame.
3. The following exci…ntime examples will be captu… ROMS to adjust system availability calculations automat…

   a) Inaccessibility due to …s conditions…
   b) Downtime for scheduled …ce…
   c) External forces which cause e… …age
   d) Inaccessibility due to CTRMA d… …tional considerations, even though device has failed.

15.7 Example KPI Calculation

In this example scenario, assume t… …g the audit period, …ress CCTV #1 & #2 were unavailable for a cumulative total of 6 hours and …es. The Total Time in Au… …was 720 hours.

- Total Non-Express C… …vailability = 6 hours, 35 minutes (39…
- Total Time in Au… …d = 720 hour (43,200 min)

$$Measured\ Accuracy = \left[1 - \left(\frac{395}{43200}\right)\right] \times 100 = 99.09\%$$

$$Liquidated\ Damages = \frac{(0.950 - 0.990)}{0.005} \times \$200 = \$0$$

16 KPI #16 – Dynamic Message Sign (DMS) Availability

16.1 Description

DMS shall be available 95.00% o excluding scheduled mainte

16.2 KPI Goal

The KPI goal is 95.00%.

16.3 Maximum Liquidated Damages.

Maximum liquidated damages are $200 per ea be hold.

16.4 Testing Frequency

Testing will occur monthly.

16.5 Testing Proce

The DMS Availability KPI w be measured using the ROMS Downtime Analysis Report, configured and agreed upon by Kapsch and CTRMA.

16.6 Measurement Method

$$Measured\ Accuracy = \left[1 - \left(\frac{Total\ DMS\ Unavailability\ Time}{Total\ Time\ in\ Audit\ Period}\right)\right] \times 100$$

1. Total DMS Un[illegible]ability Time will be the cumulative downtime of ea[illegible]MS during audit period.
2. Total Time in [illegible]iod is the total days, hours, and or minutes [illegible]e corresponding audit time frame.
3. The following exc[illegible]wntime examples will be captured w[illegible]MS to adjust system availability calculations automat[illegible]

   a) Inaccessibility due to [illegible]s conditions
   b) Downtime for scheduled [illegible]nce
   c) External forces which cause [illegible]
   d) Inaccessibility due to CTRMA dr[illegible]onal considerations, even though device has failed.

16.7 Example KPI Calculation

In this example scenario, assume that [illegible]e audit period, [illegible] & #2 were unavailable for a cumulative total of 6 hours and 35 minutes. The Total Ti[illegible]it Period was 720 h[illegible]

- Total DMS Unavailabilit[illegible]s, 35 minutes (395 min)
- Total Time in Audit P[illegible]20 hour (43,200 min)

$$Measured\ Accuracy = \left[1 - \left(\frac{395}{43200}\right)\right] \times 100 = 99.09\%$$

$$Liquidated\ Damages = \frac{(0.950 - 0.990)}{0.005} \times \$200 = \$0$$

17 KPI #17 – Express MVD Availability

17.1 Description

Express MVDs shall be available 99.50% of the time per segment, excluding scheduled maintenance.

17.2 KPI Goal

The KPI goal is 99.50%.

17.3 Maximum Liquidated Damages

Maximum liquidated damages are: $100 per each 0.5% below threshold, per segment.

17.4 Testing Frequency

Testing will occur monthly.

17.5 Testing Process

The Express MVD's Availability KPI will be measured using the ROMS Downtime Analysis Report, as configured and agreed upon by Kapsch and CTRMA.

17.6 Measurement Method

$$Measured\ Accuracy\ per\ Segment = \left[1 - \left(\frac{Total\ Express\ MVD\ Unavailability\ Time}{Total\ Time\ in\ Audit\ Period}\right)\right] \times 100$$

1. Total Express MVD Unavailability Time will be the cumulative downtime of each Express MVD, per segment, during audit period.
2. Total time in audit period is the total days, hours, and or minutes within the corresponding audit time frame.
3. The following excluded downtime examples will be captured within ROMS to adjust system availability calculations automatically:

    a) Inaccessibility due to hazardous conditions
    b) Downtime for scheduled maintenance
    c) External forces which cause equipment damage
    d) Inaccessibility due to CTRMA driven operational considerations, even though device has failed.

17.7 Example KPI Calculation

In this example scenario, assume that during the audit period, Express MVD #1 and #2, of segment #4, was unavailable for a cumulative total of 6 hours and 35 minutes. Total Time in Audit Period was 720 hours.

- Total Express MVD Unavailability = 6 hours, 35 minutes (395 min)
- Total Time in Audit Period = 720 hour (43,200 min)

$$Measured\ Accuracy = \left[1 - \left(\frac{395}{43200}\right)\right] \times 100 = 99.09\%$$

$$Liquidated\ Damages = \frac{(0.995 - 0.990)}{0.005} \times \$100 = \$100$$

18 KPI #18 – Non-Express MVD Availability

18.1 Description

Non-Express MVDs shall be [illegible] 95.00% of the time per device [illegible] scheduled maintenance.

18.2 KPI Goal

The KPI goal is 95.00%.

18.3 Maximum Liquidated Damages

Maximum liquidated damages are: $100 pe[illegible] threshold per device.

18.4 Testing Frequency

Testing will occur monthly.

18.5 Testing Pr[illegible]

The Non-Express MVD [illegible]vailability KPI will be measured using the ROMS D[illegible]me Analysis Report, configured and agreed upon by Kapsch and CTRMA.

18.6 Measurement Method

$$Measured\ Accuracy\ per\ Device = \left[1 - \left(\frac{Total\ Non\ Expess\ MVD\ Unavailability\ Time}{Total\ Time\ in\ Audit\ Period}\right)\right] \times 100$$

1. Total Non-Expres… …navailability Time will be the cumulative … of each Non-Express MVD during audit period.
2. Total Time in Audit Per… …total days, hours, and or mi… …in the corresponding audit time frame.
3. The following excluded dow… …amples will be captu… …ROMS to adjust system availability calculations automatically:

   a) Inaccessibility due to hazardous…
   b) Downtime for scheduled maintenan…
   c) External forces which cause equip…
   d) Inaccessibility due to CTRMA … …siderations, even though device has failed.

18.7 Example KPI Calculatio…

In this example scenario, assume… …g the audit period, Non-Exp… …D #1 was unavailable for a cumulative total of 6 hours and 35 minutes… …me in Audit Period was 720 hours.

- Total Non-Express M… …vailability = 6 hours, 35 minutes (395 min)
- Total Time in Audit Period = 720 hour (43,200 min)

$$Measured\ Accuracy\ = \left[1 - \left(\frac{395}{43200}\right)\right] \times 100\ =\ 99.09\%$$

$$Liquidated\ Damages\ = \frac{(0.950 - 0.990)}{0.005} \times \$100\ =\ \$0$$

19 KPI #19 – Variable Toll Message Sign (VTMS) Availability

19.1 Description

The Variable Toll Message Sign (VTMS) System will be available as outlined below, excluding scheduled maintenance. It will have an availability of 99.95%, with a 15-minute grace period for emergency maintenance.

19.2 KPI Goal

The KPI goal is 99.95%, with the exclusion of a 15-minute grace period.

19.3 Maximum Liquidated Damages

Maximum liquidated damages are actual revenue above $5,000 (calculated using liquidation rate).

19.3.1 Liquidated Damages Calculation Method

For the purpose of calculating liquidated damages of actual revenue, said revenue shall be otherwise deemed uncollectable by CTRMA. Uncollectable revenue will utilize the following calculation example:

$$Liquidated\ Damages = Liquidation\ Rate\ (PBM\ Expected\ Revenue) + (TB\ Expected\ Revenue)$$

****Current Liquidation Rate maintained by CTRMA****

19.4 Testing Frequency

Testing will occur monthly.

19.5 Testing Process

The VTMS's Availability KPI will be measured using the ROMS Downtime Analysis Report, configured and agreed upon by Kapsch and CTRMA.

19.6 Measurement Method

$$Measured\ Accuracy = \left[1 - \left(\frac{Total\ VTMS\ Unavailability\ Time - 15\ Minute\ Grace\ Period\ per\ Occurrence}{Total\ Time\ in\ Audit\ Period}\right)\right] \times 100$$

1. Total VTMS Unavailability Time will be the cumulative downtime of each VTMS during audit period.
2. Total Time in Audit Period is the total days, hours, and or minutes within the corresponding audit time frame.
3. A 15-minute grace period, per occurrence, will be deducted from the total unavailable time.
4. The following excluded downtime examples will be captured within ROMS to adjust system availability calculations automatically:

    a) Inaccessibility due to hazardous conditions
    b) Downtime for scheduled maintenance
    c) External forces which cause equipment damage
    d) Inaccessibility due to operational considerations, even though device has failed.

19.7 Example KPI Calculation

In this example scenario, assume that during the audit period, VTMS #1 was unavailable for a cumulative total of 6 hours and 35 minutes. Of the cumulative unavailable time, two hours was excluded downtime due to the sum of eight separate, 15-minute grace periods. Total time in audit period was 720 hours.

- Total VTMS Unavailability = 6 hours, 35 minutes (395 min)
- Total Grace Period Time = 2 hours (120 min)
- Adjusted Unavailability = 4 hours, 35 minutes (275 min)
- Total Time in Audit Period = 720 hour (43,200 min)

$$Measured\ Accuracy\ = \left[1 - \left(\frac{395 - 120}{43200}\right)\right] \times 100\ =\ 99.36\%$$

19.8 Estimated Revenue Loss Measurement Method

For the purpose of quantifying lost revenue, the calculated liquidation rate as referenced in this document, will utilize the following parameters:

1. Identify the revenue loss timeframe
    a) Determine total allowable unavailable time for audit period
    b) Determine when total allowable unavailability time has been exhausted
    c) Determine adjusted start time and end time of lost revenue event that is subject to liquidated damages
2. Identify the historical transaction volume, rate, and type of the referenced plaza/lane for the liable timeframe for the lost revenue incident.
3. Historical transaction data will be for the identical day of the week and identical time of day, for the prior three weeks.
4. Historical transaction data will be evaluated to determine percentage of TB transactions vs PBM transactions.
5. Identify current Liquidation Rate (maintained by CTRMA).

The estimated revenue loss will use the following calculation methods:

$$Allowable\ Unavailable\ Time\ =\ Total\ Time\ in\ Audit\ Period - \left(0.9995(Total\ Time\ in\ Audit\ Period)\right)$$
$$Adjusted\ Unavailable\ Time\ =\ Unavailable\ Time - Allowable\ Unavailable\ Time$$
$$Revenue\ Loss\ Start\ Time\ =\ Start\ Time\ of\ Unavailability + Allowable\ Unavailable\ Time$$
$$Revenue\ Loss\ End\ Time\ =\ Revenue\ Loss\ Start\ Time + Adjusted\ Unavailable\ Time$$
$$Estimated\ Revenue\ Loss\ =$$
$$\{Liquidation\ Rate\ (Avg\ PBM\ Transactions\ x\ Avg\ PBM\ Toll\ Rate)\} + (Avg\ TB\ Transactions\ x\ Avg\ TB\ Toll\ Rate)$$

19.9 Example Estimated Revenue Loss Calculation

In this example scenario, assume that during the audit period, Lane X was unavailable, as defined in the availability criteria of this KPI, for a cumulative total of 6 hours and 35 minutes (395 minutes). The Total Time in Audit Period was 720 hours (43,200 minutes).

$$Allowable\ Unavailable\ Time\ =\ 43{,}200\ minutes - \left(0.9995(43{,}200)\right)\ =\ 21\ minutes$$
$$Adjusted\ Unavailable\ Time\ =\ 395\ minutes - 21\ minutes\ =\ 374\ minutes$$
$$Revenue\ Loss\ Start\ Time\ =\ 08{:}35AM\ +\ 21\ minutes\ =\ 08{:}56\ AM$$
$$Revenue\ Loss\ End\ Time\ =\ 08{:}56\ AM\ +\ 374\ minutes\ =\ 03{:}10PM$$
$$Estimated\ Revenue\ Loss\ =\ \{0.50\ (412\ x\ \$1.85)\}\ +\ (515\ x\ \$1.25)\ =\ \$1{,}024.85$$

20 KPI #20 – VTMS Accuracy

20.1 Description

The system will post and maintain the correct toll rate to the VTMS 99.90% of the time, per VTMS, under all conditions within the design specification described in the requirements.

20.2 KPI Goal

The KPI goal is 99.90%.

20.3 Maximum Liquidated Damages

Maximum liquidated damages are $200 per each 0.5% below threshold.

20.4 Testing Frequency

Testing will occur monthly.

20.5 Testing Process

Testing is performed through an Ad-Hoc Query, in addition to the ROMS Downtime Analysis Report, as configured and agreed upon by Kapsch and CTRMA.

Accuracy of the VTMS will be evaluated for the following criteria:

- Rate sent from the trip engine matches the rate displayed on VTMS
- Default rates shown on VTMS

20.6 Measurement Method

$$Measured\ Accuracy\ per\ VTMS = \left[1 - \left(\frac{Total\ Time\ of\ Incorrectly\ Displayed\ Toll\ Rate\ per\ VTMS}{Total\ Time\ in\ Audit\ Period}\right)\right] \times 100$$

1. Total Time of Incorrectly Displayed Toll Rate per VTMS will be the cumulative time that each VTMS presented an incorrect toll rate during the audit period.
2. Total Time in Audit Period is the total days, hours, and or minutes within the corresponding audit time frame.
3. The following excluded downtime examples will be captured within ROMS to adjust system availability calculations automatically:

    a) Inaccessibility due to hazardous conditions
    b) Downtime for scheduled maintenance
    c) External forces which cause equipment damage
    d) Inaccessibility due to operational considerations, even though device has failed.

20.7 Example KPI Calculation

In this example scenario, assume that during the audit period, VTMS #1 posted an inaccurate toll rate for a cumulative total of 6 hours and 35 minutes. The Total Time in Audit Period was 720 hours.

- Total Time of Incorrectly Displayed Toll Rates per VTMS = 6 hours, 35 minutes (395 min)
- Total Time in Audit Period = 720 hour (43,200 min)

$$Measured\ Accuracy\ = \left[1 - \left(\frac{395}{43200}\right)\right] \times 100\ =\ 99.08\%$$

$$Liquidated\ Damages\ = \frac{(0.999 - 0.990)}{0.005} \times \$200 = \$400$$

21 KPI #21 – Time to Respond – Priority 1

21.1 Description

All Priority 1 tickets must be acknowledged within one (1) hour of ticket creation. A Priority 1 Maintenance Event is defined as any malfunction or fault that will result in the immediate loss of revenue and/or hazard to personnel.

21.2 KPI Goal

N/A

21.3 Maximum Liquidated Damages

Maximum liquidated damages are $100 per each event > 1 hour.

21.4 Testing Frequency

Testing will occur monthly.

21.5 Applicability

Time to Respond – Priority 1 KPI is applicable as follows:

- Emergency events that are directly impacting safety, or issues in which revenue and/or data loss has occurred, is imminent, or is reasonably expected to occur if repair, restoration, or remediation is not completed.

21.6 Testing Process

Measured per event, based on the ROMS Service Level Agreement (SLA) Detail Report

21.6.1 Exclusion for safety

If there are reasonable instances in which a technician cannot respond—if that response would put themselves, the travelling public, or any other being in harm or impending danger—the technician will be expected to wait until they can safely assess, access, and respond to the incident. This will be recorded in the daily log, and this time will be excluded from the calculation of this KPI.

21.7 Measurement Method

$$P1\ Response\ Time\ =\ (Time_{Acknowledged}) - (Time_{Created})$$

21.8 Example KPI Calculation

In this example scenario, assume that during the audit period, there were 10 P1 tickets that had a response time > 1 hour.

$$Total\ Sum\ of\ P1\ Tickets\ with\ Response\ Time\ >\ 1\ hour\ =\ 10$$

$$Liquidated\ Damages\ =\ 10\ x\ \$100\ =\ \$1{,}000$$

22 KPI #22 – Time to Repair – Priority 1

22.1 Description

All Priority 1 tickets must be repaired within four (4) hours of ticket acknowledgement.

22.2 KPI Goal

N/A

22.3 Maximum Liquidated Damages

Maximum liquidated damages are $200 per each event > 4 hours.

22.4 Testing Frequency

Testing will occur monthly.

22.5 Applicability

Time to Repair – Priority 1 KPI is applicable as follows:

- Emergency events that are directly impacting safety, or issues in which revenue and/or data loss has occurred, is imminent, or is reasonably expected to occur if repair, restoration, or remediation is not completed.

22.6 Testing Process

This KPI is measured per event, based on the ROMS Service Level Agreement (SLA) Detail Report.

22.6.1 Exclusion for safety

If there are reasonable instances in which a technician cannot respond—if that response would put themselves, the travelling public, or any other being in harm or impending danger—the technician will be expected to wait until they can safely assess, access, and respond to the incident. This will be recorded in the daily log, and this time will be excluded from the calculation of this KPI.

22.7 Measurement Method

$$P1\ Repair\ Time\ =\ \left(Time_{Repaired}\right) -\ \left(Time_{Acknowledged}\right)$$

22.8 Example KPI Calculation

In this example scenario, assume that during the audit period, there were 10 P1 tickets that had a repair time > 4 hours.

$$Total\ Sum\ of\ P1\ Tickets\ with\ Repair\ Time\ >\ 4\ hours\ =\ 10$$

$$Liquidated\ Damages\ =\ 10\ x\ \$200\ =\ \$2{,}000$$

23 KPI #23 – Time to Respond – Priority 2

23.1 Description

All Priority 2 tickets must be acknowledged within one (1) hour of ticket creation. A Priority 2 Maintenance Event is defined as any malfunction or fault that will not result in immediate loss of revenue but will/may impact operational performance.

23.2 KPI Goal

N/A

23.3 Maximum Liquidated Damages

Maximum liquidated damages are $75 per each event > 1 hour.

23.4 Testing Frequency

Testing will occur monthly.

23.5 Applicability

Time to Respond – Priority 2 KPI is applicable as follows:

- Non-critical issues in which revenue and/or data loss is not reasonably expected to occur if repair, restoration, or remediation is not completed.

23.6 Testing Process

This KPI is measured per each event, based on the ROMS SLA Detail Report.

23.6.1 Exclusion for safety

If there are reasonable instances in which a technician cannot respond—if that response would put themselves, the travelling public, or any other being in harm or impending danger—the technician will be expected to wait until they can safely assess, access, and respond to the incident. This will be recorded in the daily log, and this time will be excluded from the calculation of this KPI.

23.7 Measurement Method

$$P2\ Response\ Time\ =\ (Time_{Acknowledged}) - (Time_{Created})$$

23.8 Example KPI Calculation

In this example scenario, assume that during the audit period, there were 10 P2 tickets that had a response time > 1 hour.

$$Total\ Sum\ of\ P2\ Tickets\ with\ Response\ Time\ >\ 1\ hour\ =\ 10$$

$$Liquidated\ Damages\ =\ 10\ x\ \$75\ =\ \$750$$

24 KPI #24 – Time to Repair – Priority 2

24.1 Description

All Priority 2 tickets must be repaired within 12 hours of ticket acknowledgement.

24.2 KPI Goal

N/A

24.3 Maximum Liquidated Damages

Maximum liquidated damages are $150 per each event > 12 hours.

24.4 Testing Frequency

Testing will occur monthly.

24.5 Applicability

Time to Repair – Priority 2 KPI is applicable as follows;

- Non-critical issues in which revenue and/or data loss is not reasonably expected to occur if repair, restoration, or remediation is not completed.

24.6 Testing Process

This KPI is measured per each event, based on the ROMS SLA Detail Report.

24.6.1 Exclusion for safety

If there are reasonable instances in which a technician cannot respond--if that response would put themselves, the travelling public, or any other being in harm or impending danger--the technician will be expected to wait until they can safely assess, access, and respond to the incident. This will be recorded in the daily log, and this time will be excluded from the calculation of this KPI.

24.7 Measurement Method

$$P2\ Repair\ Time\ =\ \left(Time_{Repaired}\right) - \left(Time_{Acknowledged}\right)$$

24.8 Example KPI Calculation

In this example scenario, assume that during the audit period, there were 10 P2 tickets that had a repair time > 12 hours.

$$Total\ Sum\ of\ P2\ Tickets\ with\ Repair\ Time\ >\ 12\ hours\ =\ 10$$

$$Liquidated\ Damages\ =\ 10\ x\ \$150\ =\ \$1{,}500$$

25 KPI #25 – Time to Respond – Priority 3

25.1 Description

All Priority 3 tickets must be acknowledged within one (1) hour of ticket creation. A Priority 3 Maintenance Event is defined as any action or event reported that will/may impact operational performance, has the potential to degrade the system performance, and has no impact to revenue collection.

25.2 KPI Goal

N/A

25.3 Maximum Liquidated Damages

Maximum liquidated damages are $25 per each event > 1 hour.

25.4 Testing Frequency

Testing will occur monthly.

25.5 Applicability

Time to Respond – Priority 3 KPI is applicable as follows;

Any action or event reported that will/may impact operational performance, has potential of degrading the System performance, and has no impact to revenue collection.

25.6 Testing Process

This KPI is measured per each event, based on the ROMS SLA Detail Report.

25.6.1 Exclusion for safety

If there are reasonable instances in which a technician cannot respond—if that response would put themselves, the travelling public, or any other being in harm or impending danger—the technician will be expected to wait until they can safely assess, access, and respond to the incident. This will be recorded in the daily log, and this time will be excluded from the calculation of this KPI.

25.7 Measurement Method

$$P3\ Response\ Time\ =\ (Time_{Acknowledged}) - (Time_{Created})$$

25.8 Example KPI Calculation

In this example scenario, assume that during the audit period, there were 10 P3 tickets that had a response time > 1 hour.

$$Total\ Sum\ of\ P3\ Tickets\ with\ Response\ Time\ >\ 1\ hour\ =\ 10$$

$$Liquidated\ Damages\ =\ 10\ x\ \$25\ =\ \$250$$

26 KPI #26 – Time to Repair – Priority 3

26.1 Description

All Priority 3 tickets must be repaired within 36 hours of ticket acknowledgement.

26.2 KPI Goal

N/A

26.3 Maximum Liquidated Damages

Maximum liquidated damages are $50 per each event > 36 hours.

26.4 Testing Frequency

Testing will occur monthly.

26.5 Applicability

Time to Repair – Priority 3 KPI is applicable as follows;

- Any action or event reported that will/may impact operational performance, has potential of degrading the System performance, and has no impact to revenue collection.

26.6 Testing Process

This KPI is measured per each event, based on the ROMS SLA Detail Report.

26.6.1 Exclusion for safety

If there are reasonable instances in which a technician cannot respond—if that response would put themselves, the travelling public, or any other being in harm or impending danger—the technician will be expected to wait until they can safely assess, access, and respond to the incident. This will be recorded in the daily log and this time will be excluded from the calculation of this KPI.

26.7 Measurement Method

$$P3\ Repair\ Time\ =\ \left(Time_{Repaired}\right) -\ \left(Time_{Acknowledged}\right)$$

26.8 Example KPI Calculation

In this example scenario, assume that during the audit period, there were 10 P3 tickets that had a repair time > 36 hours.

$$Total\ Sum\ of\ P3\ Tickets\ with\ Repair\ Time\ >\ 36\ hours\ =\ 10$$

$$Liquidated\ Damages\ =\ 10\ x\ \$50\ =\ \$500$$

27 KPI #27 – Inventory

27.1 Description

All CTRMA hardware, including that which is currently installed, maintained as spares, and RMA (if applicable), shall be included in an Annual Physical Inventory Audit Program, as agreed upon by Kapsch and CTRMA.

27.2 KPI Goal

All elements described in Section 27.1 shall be inventoried annually and submitted with the yearly February Monthly Maintenance Report (MMR).

27.3 Maximum Liquidated Damages (per calendar month)

Kapsch cannot invoice for the monthly maintenance fee without submitting this audit.

27.4 Testing Frequency

Testing will occur annually.

27.5 Testing Process

n/a

-END OF DOCUMENT-

Appendix A Appendix A MVD Calibration Verification Sheet

The MVD Calibration Verification Sheet is displayed on the following pages.

MVD Calibration Verification Sheet

Detector ID	05100 - NB	**Associated Cabinet**	DP1
Mounting Height		**Setback**	

TEST SETUP

References	*1. Wavetronix MVD Calibration Guide*
Requirements	**(modified) - ITS-327 (4.18.8.1**) Total traffic and per lane volume must be within 10% of visually confirmed counts. *Note: 5% stated erroneously in spec. HDSmart datasheet states 90% accuracy (10% of visually confirmed counts), not 95%.* **ITS-329 (4.18.8.3)** Occupancy must be within 10% of field verified calculations. **ITS-331 (4.18.8.4)** These requirements apply to all MVD locations. Testing must require the use of live traffic. **ITS-332 (4.18.8.5)** The MVD shall provide full coverage of the managed lanes, general purpose lanes, frontage roads, and all ramps.
Pre-Requisites	*1. Initial MVD alignment procedure completed (per wavetronix mvd calibration guide).* *2. MVD configured for coverage of all required lanes and bin classes (per mvd configuration datasheet).* *3. Live traffic on the roadway.*
Test Setup Instructions	*1. One or more persons as needed to cover all lanes during volume and bin testing.* *2. One person with accurate watch synchronized (+/- 1 sec) to MVD time.* *3. Laptop connected to MVD via HDSmart configuration utility to review MVD data log. Also must be in close proximity to other test personnel during the test.*

MVD Calibration Verification Sheet

MVD Configuration

With laptop logged in to MVD via HDSmart utility, check all configuration settings are correct, per the mvd configuration sheet and mvd lane configuration list.	*Configuration Verified* ☐

VEHICLE COUNT VERIFICATION

1. Using the thumb clicker, count cars in assigned lane for a minimum 5 minute period (note: 5 cars minimum must be counted). Record total counts to the right.

Note: Two people will be simultaneously counting up to 2 lanes each.

Note: In addition to counting for a mimimum of 5 minutes, a minimum of 5 vehicles must be counted for each lane to get an acceptable sample size.

2. Record values reported by the MVD the right.

3. Calculate and record Difference and %Accuracy values.

LANE 1 (closest lane) COUNTS

Start Time	*Clicker*	*MVD*	*End Time*	*Difference*	*% Accuracy*
2:04pm	30	29	2:08pm	1	96.7%

LANE 2 COUNTS

Start Time	*Clicker*	*MVD*	*End Time*	*Difference*	*% Accuracy*
2:08pm	30	26	2:12pm	4	86.7%

LANE 3 COUNTS

Start Time	*Clicker*	*MVD*	*End Time*	*Difference*	*% Accuracy*
2:12pm	30	26	2:16pm	4	86.7%

LANE 4 COUNTS

Start Time	*Clicker*	*MVD*	*End Time*	*Difference*	*% Accuracy*
				0	#DIV/0!

LANE 5 (furthest lane) COUNTS

Start Time	*Clicker*	*MVD*	*End Time*	*Difference*	*% Accuracy*
				0	#DIV/0!

Total Volume Counts
1. Add up and record clicker values from lane#s 1-4 above.
2. Record values reported by the MVD to the right.
3. Calculate and record Difference and %Accuracy values.

Total Counts (add clicker counts above, compare with total volume logged by MVD)

Start Time	*Clicker*	*MVD*	*End Time*	*Difference*	*% Accuracy*
2:04pm	90	81	2:16pm	9	90.0%

MVD Calibration Verification Sheet

Test Lead Signature	Kevin Pruitt	**Date Completed**	22-Nov-21

END OF DATA SHEET