# ROADS AND MARITIME SERVICES (RMS)

# QA SPECIFICATION R300

# ITS MAINTENANCE SERVICES – GENERAL REQUIREMENTS



## REVISION REGISTER

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**GUIDE NOTES**
(Not Part of Contract Document)

QA Specification R300

# ITS MAINTENANCE SERVICES – GENERAL REQUIREMENTS


IC-QA-R300

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DATE:

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# FOREWORD

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## REVISIONS TO PREVIOUS VERSION

This document is a new Edition

## PROJECT SPECIFIC CHANGES

Project specific changes are allowed in the Annexures of this document.

# RMS QA SPECIFICATION R300

# ITS MAINTENANCE SERVICES – GENERAL REQUIREMENTS

## 1. GENERAL

### 1.1 SCOPE

This document sets out the general requirements for the Maintenance of Intelligent Transport Systems (ITS). This document when read in conjunction with the respective ITS Type specific Maintenance Requirements listed in **Annexure A**, forms the Specification. This document must also be read in conjunction with the ITS Maintenance Contract, in particular; ITS Maintenance Contract, schedule 2, ITS Maintenance Service Requirements.

The intent of this specification is to provide a structured approach to all aspects of ITS maintenance services including asset management, fault management, maintenance planning, asset inspection, defect identification, planned maintenance, reactive maintenance, incident support and associated services.

Definition of terms and abbreviations are given as **Annexure B.**

### 1.2 ITS MAINTENANCE SERVICES

This specification applies to maintenance of RMS ITS assets and may include some elements of ITS Minor Improvement Works and/or Strategic Asset Renewal Works as Special Projects. Where the contract includes new installation activities, these will be required to be carried out in accordance with other relevant RMS specifications.

ITS Maintenance Contract, Exhibit 1, Asset Definition Specification, defines the Assets which are under the ITS Contractor's stewardship (Also referred in this document as **Annexure-C** – Asset Definition Specification)**.**

The ITS Maintenance Services Requirements lists the following Services categories:

- Program Management;
- Asset Management;
- Asset Inspection Works;
- Planned Maintenance Works (Routine/Preventative Maintenance);
- Reactive Maintenance Works (Fault Maintenance);
- Incident Support;
- Minor Improvement Works (Special Projects);

- Minor Improvement Works and Strategic ITS Asset Renewal and Replacement Works (Special Projects);
- Facilities (including depot, workshop, store) Support Services;
- Transition Services;
- Demobilisation and Handover Services.

Levels of Maintenance services are categorised as follows:

| Service Level | Typical Activities |
|---|---|
| Level 1 | Attend site for Planned Maintenance, response to Notification of Faults, Asset Inspections and Requests for Incident Support, Check for defects and/or damage, make safe, check for availability of power and communication systems and/or, reset/reboot if necessary. |
| Level 2 | Perform functional checks, fault diagnosis and resolution, remove and replace faulty parts/modules/assemblies, perform electrical, structural, minor mechanical and civil repairs. Also, includes managing rectification of power-supply and communication faults by third party service providers. |
| Level 3 | Perform component and system calibration & verification, advanced (system-level) fault diagnosis and resolution, install hardware and software upgrades and perform system integration. |
| Level 4 | Perform equipment repairs under warranty by the Original Equipment Manufacturer (OEM), perform component-level repairs; perform change in design of hardware and software for improving functionality and debugging. |

The ITS Contractor shall provide Level 1, Level 2 and Level 3 maintenance services for the ITS assets including those specified in the respective ITS Type specific Maintenance requirements. In situations where the ITS Contractor has been unable to resolve a defect or fault through Level 1, Level 2 or Level 3, they may request assistance from RMS.

In general, Level 4 maintenance services will be provided by third party service providers and OEMs on behalf of RMS or by RMS. The ITS Contractor shall be responsible for initiating, co-ordinating, expediting and closing out Level 4 maintenance service requests with the appropriate third party service providers or OEMs on behalf of RMS and/or RMS, and for reporting any delays outside its control to RMS.

## 1.3 MAINTENANCE PERFORMANCE OBJECTIVES

The ITS Contractor must carry out maintenance services in a way that supports the RMS network operational efficiency, including the below specific performance objectives.

RMS' objectives for the Road Maintenance Contestability Program are repeated here:

- Consider customer outcomes and stakeholders' needs in all decision making;
- Drive efficiency through competition, and business process and productivity improvements;
- Improve effectiveness of road maintenance through improved planning and asset management;
- Ensure RMS retains ITS Maintenance Engineering expertise, knowledge and capabilities to make intelligent decisions as an informed client;
- Improve Asset performance, safety and innovation through focused delivery of Services to achieve the desired outcomes;
- Develop and sustain competition in sub-contractor and supply markets;
- Create an environment that values and promotes teamwork and collaboration between the ITS Contractor and client;
- Provide flexibility to readily adapt to changing priorities and operating environments; and
- Promote stewardship, with a shared set of values, attitudes and behaviours to manage RMS' assets on its behalf.

Specific performance objectives for the ITS assets and the Services which support the above broader RMS objectives are:

- Support the safe and efficient operation of the road network for all road users.
- Support the enforceability of road traffic regulations, warn or alert road users of road conditions and hazards, and to provide clear information to road users in day, night and inclement weather conditions.
- Support the Traffic Management Centre (TMC) in the management of incidents (in relation to ITS assets).
- Ensure the correct operation and high availability of all ITS asset Types (the definition of Availability is provided in Appendix C of this document; and the performance targets are provided in the respective ITS Type Maintenance Specifications).
- Ensure that the Services provide Value for Money to RMS.
- Ensure that the whole-of-life performance of the ITS assets is optimised.
- Support RMS' strategic management of the ITS assets and informed decision making through appropriate asset management systems and processes and through timely and accurate reporting.

## 1.4 MAINTENANCE SERVICES PROCESS

The process for undertaking the Services is shown in Figure 1.

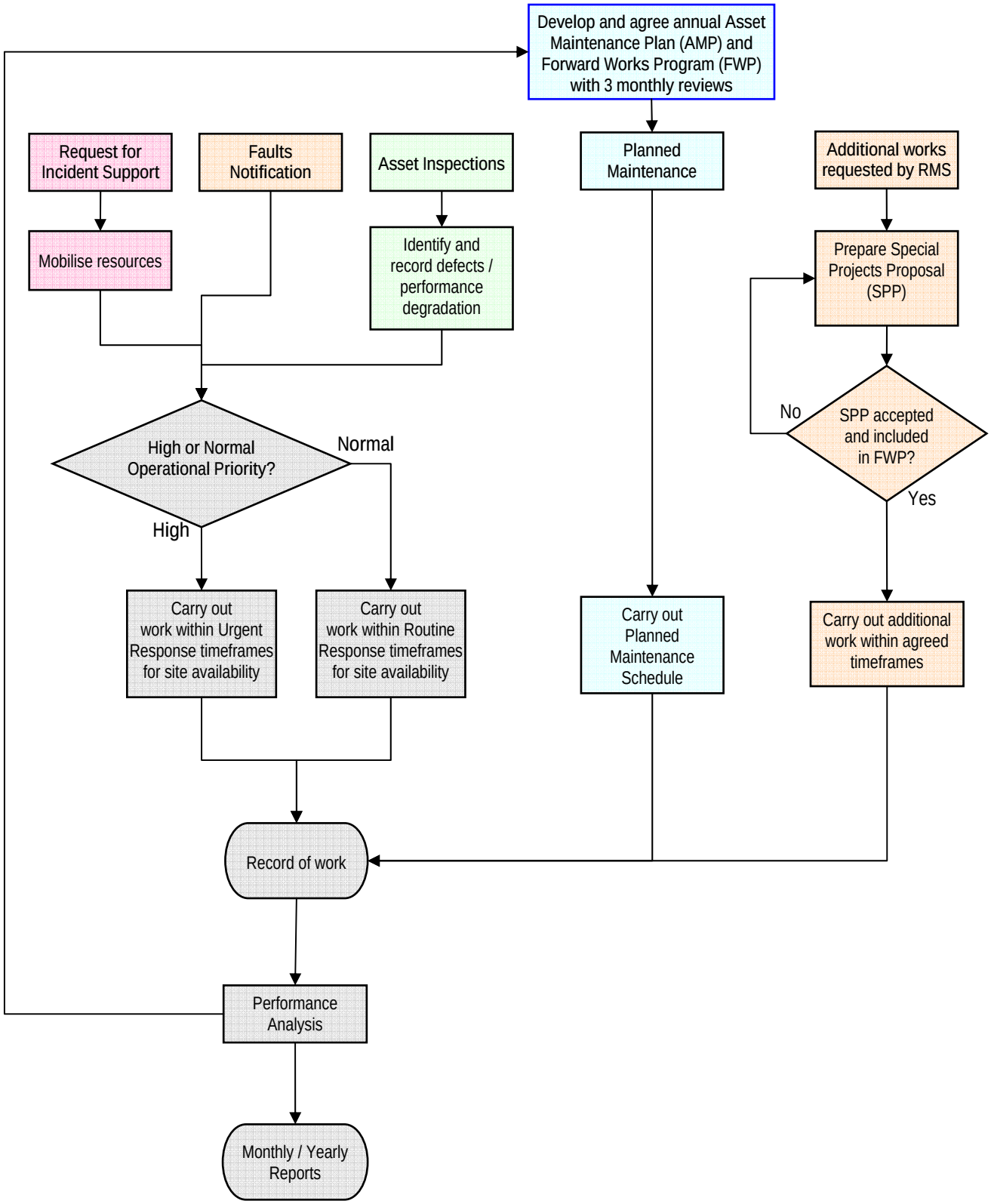


**FIGURE 1 - PROCESS FOR UNDERTAKING ITS MAINTENANCE SERVICES**

## 1.5 COMMON REQUIREMENTS

The ITS Contractor shall comply with RMS' and other stakeholders' technical, safety, environmental and statutory requirements as included within the Contract. Some of these are repeated below, which are common to all ITS assets.

### 1.5.1 Interfaces and Stakeholder Engagement

The management of stakeholder relationships and interfaces throughout the delivery of the Services is an integral component of the Services.

The ITS Contractor shall liaise with the Transport Management Centre (TMC), SMC Service Providers and other relevant stakeholders with regards to activities that impact on traffic operations.

The CMO will administer the contract in partnership with the ITS Contractors and the SMC Service Providers to ensure that efficiencies in maintenance programs are realised and emerging issues are identified and addressed.

The interface between the ITS Contractors and the SMC Service Providers will be via the RMS CMO from a contractual perspective with direct contact between the ITS Contractors and SMC Service Providers for day to day coordination matters at an operational level. The ITS Contractors will need to coordinate some works with the SMC Service Providers, relating to the following probable cases:

- Repair or replacement following an incident (Incident Support);
- New installation work; and
- Following major road maintenance (e.g. replacement of loops following resurfacing).

The ITS Contractor may also require interface protocols with local councils and other state or commonwealth authorities or private entities to facilitate the efficient delivery of the Services. RMS will provide access to existing protocols or agreements where appropriate to facilitate the interface. These entities may include, and are not limited to:

- Motorway owners and operators;
- Developers;
- Local councils;
- Sydney Water;
- Electricity distributors;
- Gas networks;
- Telecommunications service providers;
- Rail Corporation NSW (RailCorp);
- National Parks and Wildlife Services;

- Dial Before You Dig Services;
- Workcover;
- Other contractors;
- Other Government agencies and private entities.

In delivering the Services, the ITS Contractor will be required to engage with various stakeholders, including but not limited to;

- Users of the Road Network;
- Local communities and adjacent residents;
- RMS;
- OEMs; and
- Other entities listed above**.**

Activities required when engaging with stakeholders may include:

- Identification and protection of third party services that may be affected by maintenance activities;
- Identification of stakeholders, and development and implementation of management plans for those identified;
- Development and implementation of systems to receive, record, and resolve stakeholder complaints, claims, incident response queries, and requests for information; and
- Gain authorisation from, or provide notice to, stakeholders that may be affected by the ITS Contractors' activities.
- Power and communication supply charges are RMS responsibility. However, ITS Contractor is to liaise with electricity and telecommunication service providers for new connections or for issues with existing connections referred by RMS.

RMS has in place a number of Memoranda of Understanding (MOU) with some utility asset owners outlining intended principles for working collaboratively and coordinating works conducted in the road reserve. RMS intends that the ITS Contractor will be able to gain the benefit of these MOUs and that there is also further opportunity to improve interfaces with a number of entities, including development of formal interface agreements.

RMS is also a member of the Street Opening Conference Association and the ITS Contractor will be required to co-operate with RMS in relation to RMS' obligations brought about by that membership.

### 1.5.2 Emergencies and Incidents

The ITS Contractor is required to support traffic operations in managing emergencies and incidents, for example making damaged ITS assets safe following an incident.

In providing these Services, the ITS Contractor will be required to carry out the directions of the Traffic Commander and/or the relevant emergency service representatives in attendance.

The ITS Contractor will be responsible for rectification of Assets damaged by third parties with a suitable payment arrangement as agreed between RMS and the ITS Contractor.

The ITS Contractor will provide all necessary information to effectively manage and pursue any third party for damages and liaise with RMS insurers as part of the ITS Contractor's claims management responsibilities.

### 1.5.3 Safety

The ITS Contractor is required to comply with all Work Health and Safety (WHS) legislation.

The ITS Contractor will be the designated Principal Contractor under the New South Wales Government *Work Health and Safety Regulation 2011* for any construction work that forms part of the Services.

The ITS Contractor will be required to be accredited under the latest New South Wales Government *Work Health and Safety Management System & Auditing Guidelines*. Accreditation with the Federal Safety Commissioner is deemed to meet the Guidelines.

The ITS Contractor will be required to develop, implement and maintain a Program specific Work Health and Safety (WHS) Management System in accordance with the latest New South Wales Government *WHS Management System & Auditing Guidelines* . The program must also address inspections, verifications and authorizations on safety equipment used on ITS assets, from accredited sources.

### 1.5.4 Environment

The ITS Contractor will be required to comply with all environmental legislation.

The ITS Contractor will be required to comply with the New South Wales Government *Environmental Management Systems Guidelines*, and to apply best practice as per ISO 14001 *Environmental Management System - Requirements* to avoid or mitigate any detrimental effects on the environment in fulfilling obligations under the ITS MCs.

The ITS Contractor will be required to develop, implement and maintain an environmental management system that complies with the latest New South Wales Government *Environmental Management System Guidelines* and RMS standards and specifications.

### 1.5.5 Other Compliance Obligations

The ITS Contractor will be required to manage other compliance obligations relevant to the scope of Services, including but not limited to:

Accounting legislation and standards; and

Other NSW Government requirements including:

- NSW Treasury requirements;
- NSW Government's Commercial Policy Framework;

- NSW Government Sustainability Policy;
- NSW Government Goods and Services procurement policies including Code of Practice for Procurement - 18 January 2005;
- NSW Independent Commission Against Corruption (ICAC) Act 1988; and
- Statutory annual reporting requirements.

RMS places high priority on ethical behaviour in its own organisation and those of its suppliers and contractors and expects that the ITS Contractor will similarly place a high emphasis on ethical behaviour and supporting RMS' values.

### 1.5.6 Equipment and Material Supply

Equipment and materials supplied by the ITS Contractor must be new unless otherwise approved by RMS.

The ITS Contractor must maintain adequate stock of parts and equipment to support all maintenance activities.

The strategy for repair and reuse or disposal of damaged/defective equipment and minimum stock levels for spare parts shall be documented in the agreed Asset Maintenance Plans for each ITS Type (refer Clause 3.4).

RMS may elect to free issue some equipment and material to the ITS Contractor. The ITS Contractor is responsible for loading, unloading, transport and storage of free issued equipment and material. The ITS Contractor must insure such items against damage and/or loss while in transit or storage in the joint names of the ITS Contractor and RMS. The insured sum must be adequate to cover the replacement cost.

Equipment and material shall be stored in secure and enclosed storage facilities with adequate environmental protection, where specified.

All equipment and materials used must be listed in the "Register of Type-Approved, Accepted and Conditionally-Accepted ITS Equipment", and allowed to be used on RMS sites. If not listed, the Contractor shall apply for RMS concession.

# 2. PROGRAM MANAGEMENT

Program management includes all things necessary to support and manage the delivery of maintenance and improvement Services under the ITS maintenance contracts.

This may include, but is not limited to:

- Project management, supervision and administration;
- Stakeholder engagement and consultation;
- Review of Environmental Factors (REF) and heritage assessment for Minor Improvement Works;
- Obtaining planning approvals;
- Obtaining other necessary approvals before starting work;
- Customer liaison;
- Management of claims for damage to Assets or property by any party;
- Financial and commercial management including maintenance of auditable records;
- Procurement management;
- Reporting;
- Quality management and assurance; and
- Verification of third party works (including developer works).

# 3. ASSET MANAGEMENT

## 3.1 OVERVIEW

Asset Management is an important subset of Program Management which includes a broad range of Services which typically have a low cost but provide high value in managing the assets.

The ITS Contractor is responsible for the development and implementation, in consultation with RMS, of Asset Management strategies for the ITS assets which support the Maintenance Performance Objectives (refer to Clause 1.3).

The ITS Contractor's Asset Management responsibilities include:

- Development of systems and processes to support the Services;
- Planning of the Services (AMP's and FWP's);
- Initial verification and maintenance of asset data (including inventory, condition, performance, maintenance and fault history, etc);
- Development of interfaces with RMS Asset Management and Fault Management systems;
- Monthly accomplishment and performance reporting;
- Analysis and forecasting of asset performance and life cycle costs;
- Preparation of Business Cases and SPP's for Strategic Asset Renewal/Replacement Works and Minor Improvement Works for RMS consideration; and
- Continual improvement through innovation.

RMS will own the assets and will provide strategic asset management including:

- Forward Work Program Brief and overarching Asset Maintenance Plan;
- Approval of Asset Maintenance Plans prepared by the ITS Contractor;
- Approval of Forward Work Programs prepared by the ITS Contractor;
- Selection of return on investment (ROI) criteria for Business Cases;
- Allocation of funding to various programs and initiatives;
- Decisions regarding Strategic Asset Renewal/Replacement;

- Maintenance of an over-aching ITS Asset Management System;
- Request, Review and process SPP's prepared by the ITS Contractor;
- Ownership of the asset data;
- Sponsor and facilitate innovation;
- Maintain a "Register of Type-Approved, Accepted and Conditionally-Accepted ITS Equipment";
- Act as a Standards and Specification Authority for the ITS assets;
- Provide leadership and direction for overall Life Cycle Management of the ITS assets.

### 3.2 SETTING PRIORITIES

Prioritisation of maintenance activities is required for a number of reasons and needs to consider the asset life cycle. Firstly, maintenance activities are undertaken in the context of constrained budgets. Secondly, planning of maintenance activities must have regard to operational importance and priority, safety, response times, repair times, defect levels and emergency maintenance needs. Planning of maintenance activities will need to meet multiple objectives including operational priority, safety, cost-effectiveness and practicality. In addition to the general requirements provided in this document and relevant ITS Type Maintenance Specifications documents, the ITS Contractor should consider the following questions in planning and setting of priorities:

- Does the asset condition present a risk to human health or safety? This may trigger Reactive Maintenance activities even without Planned Maintenance intervention levels being reached.
- Is timely intervention required to ensure that an operational asset remains available for use and meets the specified performance requirements? The significance of the impact will vary according to the type of asset and its effect on traffic and with the strategic importance of the road to the community.
- Can the asset, due to physical deterioration (e.g. corrosion of structures), or physical damage (e.g. vandalism) continue to deliver the appropriate level of service?
- Is this activity required for preventative reasons? Will more timely intervention offset the physical deterioration of the asset and ensure optimal asset performance?
- What is the financial impact to RMS and the community? Has the technical, operational and/or economic life of the asset been exceeded? Is it economically efficient to continue to maintain or operate the asset?
- Is the cost of repairing or replacing an asset component relatively low in comparison to establishment and traffic management costs? If so, then a proactive program to replace such components which are approaching the end of their service life may be cost-effective.

- Has the asset become technically obsolete due to the introduction of new technology? Replacement of the asset by new or possibly improved technology may result in lower total costs than on-going maintenance of the existing asset.

### 3.3 MANAGEMENT ACTIONS

The ITS Contractor must examine asset condition with an intention to understand the cause of the fault or defect and to determine the most appropriate management action but must at all times comply with any intervention requirements documented in the agreed AMP's. In particular, recurring faults or defects may indicate an underlying problem that should be addressed.

When planning to undertake maintenance activities, the following issues must be addressed:

- What has caused the fault or defect?
- Is further investigation required?
- Will the proposed rectification action prevent re-occurrence?
- Is this a systemic failure that can be best addressed by carrying out hardware or software upgrades (considering that such upgrades may lower the maintenance costs of such assets)?
- Should additional maintenance activities be scheduled to address the root cause of the problem?

### 3.4 ASSET MAINTENANCE PLANS

Based on the performance requirements in this document and the ITS Type Maintenance Specifications, overarching Asset Maintenance Plan provided by RMS, assessment of asset condition, historical performance and life cycle cost considerations, the ITS Contractor must develop an Asset Maintenance Plan (AMP) for each ITS Type and submit it for approval to RMS. The AMP's must address key maintenance aspects including but not limited to:

- Asset Inspection needs and frequency;
- Planned Maintenance needs and frequency;
- Strategic Asset Renewal/Replacement needs;
- RMS priorities and available budget;
- Required skills, resources and training needs;
- Resourcing to meet the Reactive Maintenance response times;
- Facilities Support Services requirements;
- Supply chain availability, including timely support from OEM's;

- Availability of spares and stock holding levels of parts and equipment for lifecycle of an asset; and

- Strategy for damaged, defective, obsolete or redundant parts and equipment (i.e. repair or disposal).

During the transition period, the Overarching Asset Maintenance Plan will be issued to the Contractor by RMS. The Contractor shall adopt any Asset Inspection and Planned Maintenance intervention requirements specified in the relevant ITS Type Maintenance Specifications.

The AMP's will be reviewed quarterly by the Contractor, updated and submitted for RMS approval annually in conjunction with the annual FWP review cycle.

In addition, the ITS Contractor shall arrange engineering and technical liaison meetings with RMS, scheduled monthly during the transition period, and quarterly thereafter.

## 3.5 FORWARD WORKS PROGRAM

The Forward Works Program (FWP) is an essential planning tool which is developed by the ITS Contractor in consultation with RMS. The FWP is an annual program of works which is based on the agreed Asset Maintenance Plans for the various ITS assets and any other planned works. The FWP should also include a three year planning horizon to provide visibility for longer term budgeting decisions.

At the start of the annual FWP cycle RMS will issue a FWP Brief, identifying any known works, priorities, budget constraints, and other issues for consideration in the preparation of the FWP.

The FWP is intended to reflect the anticipated (and achievable) work program. The intent of the FWP process is to plan yearly maintenance and other known works with as much precision as possible.

The FWP must take into account:

- The ITS Contractor's assessment of asset condition, based on its own inspections, condition assessment, the specified performance for each ITS Type and the maintenance performance objectives;
- Cost impacts of specified frequencies for Asset Inspections and Planned Maintenance activities;
- Anticipated Reactive Maintenance resources based on historical asset performance and specified performance requirements;
- Any known and agreed Minor Improvement Works (MIW);
- Any planning discussions with RMS regarding maintenance and MIW priorities;
- Any known and agreed Special Projects Proposals (SPP);
- RMS' advice as to any budgetary constraints;

The FWP must be agreed with RMS and be ready for implementation at the commencement of each one-year maintenance period. During this year, RMS may recommend ways in which the FWP may be improved by reprogramming, increasing or decreasing certain works.

The agreed FWP will be used to monitor the performance of the Services by comparing the actual accomplishments with the forecasts, on a monthly basis. The FWP must be reviewed and updated every quarter to reflect changing priorities and the accomplishment achieved in the previous quarter.

During the year RMS may request priced proposals for additional Minor Improvement Works. When the proposals are accepted by RMS these works will be added to the FWP.

The ITS Contractor shall target opportunities where the delivery of works may be improved or better co-ordinated in order to deliver value for money, through actively involving itself in the planning process. The improvements and changes thus made shall be submitted to RMS for approval.

Each update of the FWP must have a different version number and must be retained.

### 3.6 RECORD KEEPING

The ITS Contractor will ensure that all maintenance activities and events are recorded and historical data maintained with them for ready reference by RMS. The ITS Contractor must maintain records to support:

- Work accomplishment, recorded data and reports;
- Track compliance with the specified performance requirements and KPI performance;
- Analysis of the effectiveness of maintenance strategies and asset life cycle costs;
- Tracking of maintenance history of each asset, including location of asset, replacement of parts with quantities, types, models, part numbers, serial numbers, firmware and/or software version numbers where applicable, inspection and maintenance activities and test results;
- Robust evidence for use in court (incidents and claims management);
- Track and reconcile spare parts inventory;
- Satisfactory safety and environmental reporting requirements;
- Satisfactory financial and all other reporting requirements.

### 3.7 DRAWINGS

Existing equipment drawings will be provided by RMS. Where available, drawings will be issued in electronic PDF format, otherwise RMS will issue two (2) prints of each drawing.

One set of drawings for each ITS asset site shall be stored on site in the controller cabinet and one set kept at the ITS Contractor’s office.

The ITS Contractor shall be responsible for ensuring that any changes resulting from the delivery of the Services and any discrepancies observed between the site installation and the latest drawings are captured in Work as Executed (WAE) drawings. WAE changes shall be hand marked (red lined) on a clean set of prints and provided at site within seven (7) days of work completion, and a copy supplied to RMS. A final CAD drafted WAE drawing is to be replaced on site within 4 weeks of work completion, and three copies supplied to RMS.

Design drawings prepared by the ITS Contractor (e.g. in relation to MIW and SPP) must comply with the relevant RMS drawing standards. WAE drawings must be supplied in native CAD and PDF format.

Each set of design drawings must include:

a) the design layout,

b) the cable installation plan,

c) the cable connection chart, and

d) drawings of any special or non-standard construction, fabrication or installation.

# 4. ASSET INSPECTIONS

## 4.1 OVERVIEW

Asset Inspections during preventative maintenance provide the opportunity to periodically assess the condition of ITS assets and to identify defects not apparent through electronic fault monitoring systems and which, if not attended to, can impact adversely on asset performance. Asset Inspections are combined with Planned Maintenance activities in order to increase availability of certain assets. Asset Inspections may also be carried out on an ad-hoc basis, e.g. as part of Incident Support services.

The ITS Contractor has some degree of discretion in assessing the need for or timing of ad-hoc Asset Inspections in order to best meet the Maintenance Performance Objectives (refer to Clause 1.3). More detailed requirements for Asset Inspections specific to each ITS Type are provided in the ITS Type Maintenance Specifications. Where the ITS Type Maintenance Specifications stipulate an intervention frequency for certain Asset Inspections, the ITS Contractor must not depart from the specified frequency without prior RMS approval of the departure through an approved Asset Maintenance Plan.

Asset Inspections generally consist of a visual assessment of asset condition but may also include appropriate test procedures (e.g. Non Destructive Testing of structures, electrical earthing measurements, signal strength measurements etc) where required.

Asset Inspections must be carried out by trained and competent personnel.

All forms, checklists and records relating to Asset Inspections, defect identification and the subsequent scheduling of rectification work must be provided to RMS upon request.

## 4.2 DEFECTS

Defects identified through Asset Inspections shall be recorded and actioned. Defects identified in any assets belonging to High Priority ITS Assets or Normal Priority ITS Assets in **Annexure C**, as a potential CF will require an urgent response which shall be entered into the appropriate Fault Management System and actioned in accordance with the specified fault response criteria. Similarly, a potential or existing NCF nature of defect identified in either High or Normal priority asset when requiring a Routine response may be programmed for rectification within the specified fault response criteria or at an upcoming Planned Maintenance opportunity. When doing so, the ITS contractor must inform and consult RMS.

# 5. PLANNED MAINTENANCE

The ITS Contractor has some degree of discretion in assessing the need for or timing of Planned Maintenance in order to best meet the maintenance performance objectives (refer to Clause 1.2). More detailed requirements for Planned Maintenance specific to each ITS Type are provided in the ITS Type Maintenance Specifications. Where the ITS Type Maintenance Specifications stipulate an intervention frequency for certain Planned Maintenance services, the ITS Contractor must not depart from the specified frequency without prior RMS approval of the departure through an approved Asset Maintenance Plan.

Planned Maintenance may include routine, preventative, proactive and predictive maintenance strategies.

Planned Maintenance activities include elements of both mandatory intervention frequencies and discretionary elements that require adoption of an asset management and risk management approach to prioritising repairs within available funding.

# 6. REACTIVE MAINTENANCE

## 6.1 OVERVIEW

Reactive Maintenance includes site attendance and rectification of ITS asset faults notified to the ITS Contractor through the relevant Fault Management processes and defects identified through Asset Inspections or Planned Maintenance.

ITS system faults are categorised as;

**Critical Fault (CF)** is a component failure or physical defect that has occurred in the ITS device/system. When a CF occurs the device/system cannot perform its intended functions.

**Non-Critical Fault (NCF)** is a component failure or physical defect that has occurred in the ITS device/system. When NCF occurs the device/system can still perform its intended functions

Response time starts from the initial fault occurrence time stamp in the appropriate electronic Fault Management System or from the time when the fault is communicated to the contractor through SMS, telephone, radio or similar, or by manual entry in FMS (whichever is earlier) and is the sum of following;

- Remote investigation time to ascertain nature of defect(s)
- Equipment/parts/materials preparation time, and
- Travelling time to site.

Fault response times for reactive maintenance are different for ITS assets falling under different operational priority categories, which are defined as follows;

- **High Priority ITS assets** are those which have operational priority over Normal Priority ITS assets and have high availability requirements. The response time for High Priority ITS assets are specified in **Annexure-D**. High Priority ITS assets comprise designated locations of different ITS Types.

- **Normal Priority ITS assets** are those which have lower availability requirements than High Priority ITS assets. The response times for Normal Priority ITS assets are specified in ITS Type Specific Maintenance Document (Annexure-B). Normal Priority ITS assets comprise designated locations of different ITS Types.

High Priority ITS assets encountering a CF will invoke an Urgent response unless otherwise specified. High Priority and Normal Priority ITS assets encountering a NCF will

invoke a Routine response unless otherwise specified. ITS Contractor will locate and position maintenance crews to facilitate efficient travel times to sites.

RMS may from time to time add ITS assets to High Priority or Normal Priority ITS assets, or change from one category to the other. ITS Contractor is required to reflect changes in AMP accordingly.

Reactive Maintenance takes precedence over Planned Maintenance. The ITS Contractor is required to provide a Reactive Maintenance service on a 24/7 basis (including public holidays). Sufficient allocation of shift resources and appropriate location of maintenance crews shall be ensured to comply with the specified Reactive Maintenance performance criteria.

In performing Reactive Maintenance, the ITS Contractor shall prioritise the return of the ITS assets to service in the shortest possible time. This may involve carrying out temporary repairs without compromising device safety and WHS requirements where practicable to quickly put assets into service, and then planning a permanent repair later.

## 6.2 REACTIVE MAINTENANCE SERVICE LEVELS

The ITS Contractor shall perform reactive maintenance services in accordance with Service Levels 1, 2, 3 and 4 as defined in Clause 1.2.

### 6.2.1 Response Time

The Response times for ITS assets are detailed in **Annexure D.**

Response times may change subject to RMS and TMC operational requirements. The ITS Contractor will be informed of any change to response times or for immediate attendance to faults as and when operational priorities demand.

### 6.2.2 Repair Time

Repair time at site is the time taken to trouble-shoot the fault, completely repair the asset and make it available for service. Asset downtime directly effects operational availability. Swift, efficient and well coordinated repairs will bring the asset back into operation quickly and positively affect performance targets.

You must inform RMS as soon as possible of any abnormal delays, reasons for delayed repairs and estimate of the time required to complete the repairs.

## 6.3 FAULT MANAGEMENT SYSTEMS

The ITS Contractor shall initially adopt relevant electronic RMS Fault Management Systems and processes.

All services for each ITS Type shall be entered and maintained in an appropriate RMS fault management system database. RMS currently has several electronic systems for management of ITS equipment faults:

- FMAN – a traffic signal fault management system (SCATS connected assets);
- Detfaults – for loop detector fault tracking and database;
- PEGA/FMS – for VMS, VSLS, TMU and RWIS fault management system (CMCS connected assets);
- TDAS – for traffic counters asset inventory and fault management; and
- CMC(SZAS) – for School Zone Alert Sign asset inventory and fault management.
- CES – Camera Enforcement System.

However, the ITS Contractor will also ensure that all maintenance activities are recorded and data/documents maintained with them for ready reference by RMS.

The ITS Contractor and RMS shall collaborate in the ongoing development and improvement of fault management systems and its procedural and quality processes to improve and enhance service delivery.

# 7. INCIDENT SUPPORT

Incident Support includes responding to vandalism, traffic incidents and accidents or declared natural disasters which result in ITS assets getting damaged/defective or faulty. Incident Support may initially involve Asset Inspection and those Level 1 Reactive Maintenance activities necessary to make the site safe. Permanent rectification works stemming from an incident or declared natural disaster may require additional Reactive Maintenance and /or Planned Maintenance and/or Capital Renewal Works.

Incident Support may also include providing interim arrangements to make the site safe and operational, for example provision of temporary portable power generators and/or communication links to ITS assets. The the required response will be managed between the ITS Contractor in collaboration with RMS, TMC and SMC Service Providers depending on the specifics of each situation.

Responding to incidents will also mean interfacing appropriately with other stakeholders including road users and local residents.

Requests to the ITS Contractor for Incident Support are generally made by the TMC through the Fault Management process but may also originate from the SMC Service Providers who have primary responsibility for Incident Response.

# 8. MINOR IMPROVEMENT WORKS AND STRATEGIC ASSET RENEWAL/REPLACEMENT WORKS

RMS may from time to time request priced proposals from the ITS Contractor for Special Projects (SPP's) such as ITS asset related Minor Improvement Works and Strategic Asset Renewal/Replacement Works. When such proposals are accepted by RMS the Works will be added to the FWP scope.

Where the ITS Contractor considers, based on life cycle cost analysis, that strategic renewal or replacement of specific ITS assets will result in better outcomes and benefits (e.g. lower ongoing maintenance costs or reduction in operational risks) , the ITS Contractor can submit a Business Case for Strategic Renewal/Replacement Works to RMS. Subject to funding availability, RMS may request a SPP for the Works from the ITS Contractor.

Examples of Minor Improvement Works include:

- Traffic signals site reconstruction;
- Construction of new traffic signals site;
- Replacement of ITS assets (VMS, VSLS, TMU, etc.).

Examples of Strategic Asset Renewal/Replacement Works include:

- End-of-life asset replacement;
- Technology change/upgrade;
- Other asset renewal/replacement programs driven by energy efficiency, safety, etc.

# 9. FACILITIES SUPPORT SERVICES

## 9.1 OVERVIEW

The ITS Contractor shall establish appropriate Facilities to support the delivery of the Services, including:

- Depot(s);
- Workshop(s); and
- Store(s).

RMS may, at its discretion, make available (through lease arrangements) some of its existing facilities to the ITS Contractor.

## 9.2 WORKSHOP CAPABILITIES

Workshop facilities shall include but not be limited to the following capabilities:

- Testing and repair of traffic signals equipment;
- Testing and repair of other ITS equipment;
- Assembly and testing of controller cabinets and electronics.

Facilities for testing and repair of electronic modules, printed circuit boards, etc. (Level 4 services), where requested or agreed by RMS, may be provided through partnerships with OEM's or specialist subcontractors.

## 9.3 STORES

Secure and where specified, environmentally sheltered storage facilities shall be provided for:

- Equipment and materials to support the Services;
- Free issued equipment and materials.

# 10. TRANSITION SERVICES

Transition Services are those activities required in the mobilisation and start-up of the ITS Contractor, including employment and management of the transition of RMS staff, potential transition of plant and equipment, and transition of certain depots. The Draft Transition Requirements in the contract provides further information.

The ITS Contractor is responsible for the provision of Transition Services in coordination with RMS and TfNSW, including but not limited to:

- Establishment of a mobilisation team;
- Recruitment of personnel;
- Management of industrial relations for the ITS Contractor;
- Establishment of facilities;
- Establishment of plant and equipment;
- Establishment of arrangements with subcontractor and OEMs;
- Development of interface protocols;
- Development of systems, processes and training;
- Development and agreement of the Overarching Asset Maintenance Plans;
- Confirmation of the Initial Forward Works Program;
- Management of the start-up;
- Consolidation of the asset inventory;
- Any other contract requirements needed for the performance of the Services;
- Collaboration as required with RMS;
- Start performing services.

# 11. DEMOBILISATION AND HANDOVER SERVICES

A range of Demobilisation and Handover Services will be required prior to completion of the contract. Activities required will include:

- Completion of the delivery of Services under any FWP and SPP;
- Induction and training of all personnel nominated by RMS;
- Provision of access to all records relating to the management and maintenance of the ITS assets to RMS and its nominees;
- Transfer of all warranties and guarantees to RMS or its nominees;
- Transfer of all IP regarding any new hardware or software supplied;
- Provision of up to date WAE drawings pertaining to the asset, clearly documenting any changes made during the term of the contract;
- Collation and handover of all maintenance data recorded for the ITS assets;
- Provision of access to all supply and subcontract arrangements (including utilities) to RMS and its nominees, and provision of assistance to RMS and its nominees in negotiating transfer of arrangements as requested by RMS;
- Provision of access to interface arrangements for RMS;
- Detailed assessment of the existing condition of the ITS assets, including a detailed reconciliation against the agreed performance in the respective AMP, FWP and any SPPs;
- Removal from site and making good any materials, plant or temporary facilities used in the performance of the Services, including any RMS site which has been made available to the ITS Contractor e.g. depots; and

Provision of suitable, experienced, and dedicated person(s) to act as the primary interface between the ITS Contractor and RMS nominees throughout the handover period.

# ANNEXURE A – ITS TYPE MAINTENANCE SPECIFICATIONS

| ITS Type specific Requirements Number | ITS Type specific Requirements Descriptor |
|---|---|
| R301 | Maintenance of Traffic Control Signals |
| R302 | Maintenance of Variable Message Signs |
| R303 | Maintenance of Variable Speed Limit Signs |
| R304 | Maintenance of Traffic Monitoring Units |
| R305 | Maintenance of Tidal Flow Systems |
| R306 | Maintenance of Travel-Time Information Systems |
| R308 | Maintenance of Road Weather Information Systems |
| R311 | Maintenance of Over-Speed Detection Systems |
| R312 | Maintenance of Over-Height Detection Systems |
| R313 | Maintenance of Vehicle Detection and Classification Systems |
| R314 | Maintenance of Sydney CBD Emergency Warning Systems |
| R315 | Maintenance of Advanced Warning Systems |
| R316 | Maintenance of Lane Use Management Systems |
| R317 | Maintenance of Communication Systems |
| R319 | Maintenance of Enforcement Systems |
| R320 | Maintenance of Changeable Message Signs |
| R321 | Maintenance of Weigh-In-Motion Systems |
| R322 | Maintenance of CCTV Cameras |

# ANNEXURE B – DEFINITIONS AND ABBREVIATIONS

| | |
|---|---|
| **Asset Maintenance Plan** | Defines and agrees the intended longer term strategy for management of each ITS Type and key issues and constraints |
| **Availability** | Availability is defined as the measured uptime divided by the sum of measured uptime and downtime. Downtime is discounted for power and communication faults from service point which renders the ITS equipment unavailable for operations.<br><br>Availability: = [1 – (Total down time' {TDT} / ('Number of XXX assets in your Zone' {N} x 'Number of days in the month' {D} x 24 ) ] x 100%.<br>Availability: = $\left[1 - \left(\frac{\text{Total down time' \{TDT\}}}{\text{'Number of XXX assets in your Zone' \{N\} x 'Number of days in the month' \{D\} x 24}}\right)\right]$ x 100% |
| **Compliance** | The state of being in accordance with established guidelines, specifications, legislation, regulations, standards, contracts or internal policies and procedures, or the process of becoming so. |
| **Controller** | A complete electronic assembly for local control of ITS equipment. |
| **Controller Cabinet** | An approved outdoor housing for a controller, control relays, auxiliary equipment, communications equipment, terminal blocks, wiring, communications devices, etcand other supportive equipment. |
| **Critical Fault** | Critical Fault is a component failure or physical defect that has occurred in the ITS device/system. When a CF occurs the device/system cannot perform its intended functions. |
| **Defect** | The visible or measurable evidence of failure or other undesirable condition that requires intervention or that is likely to become a Hazard (as reasonably determined by you) before the next scheduled Asset Inspection or Planned Maintenance. The defect may affect the safety, serviceability, structural capacity or appearance of the asset. |
| **Detfaults** | Database for tracking of loop detector faults. |
| **Fault** | Any malfunction or undesirable condition of ITS equipment which requires Reactive Maintenance. Similar to the "defect" definition, a fault is categorized as "Critical" or "Non-Critical". |
| **FMAN** | FMS software for SCATS connected ITS assets |
| **Forward Works Program** | Program which defines and agrees a broad range of Services to be performed by the ITS Contractor, the timeframe they are to be completed in and the intended outcomes. |

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| **Initial Forward Works Program** | The Forward Works Program for an initial period at start of the Maintenance Contract. |
| **Interface** | The interaction or point of connection (i.e. physical location, or a situation) between the parties that act together or affect each other in relation to a project, activity or physical asset. |
| **Interface Agreement** | An agreement between two or more parties in relation to the management of an Interface which sets out the responsibilities of each party. |
| **ITS Assets** | The assets for which the ITS Contractor is responsible for maintaining under the ITS Maintenance Contract. |
| **ITS Contractor** | Organisation engaged by RMS under the ITS Maintenance Contract for provision of the Services. |
| **Non Critical Fault** | Non-Critical Fault is a component failure or physical defect that has occurred in the ITS device/system. When NCF occurs the device/system can still perform its intended functions |
| **Non-Safety Critical Related ITS** | Refer to any Intelligent Transport System system that is not Safety-CriticalRelated |
| **Planned Maintenance** | Maintenance activities which have a known intervention frequency or which can be foreseen and scheduled based on known asset condition. |
| **Reactive Maintenance** | Maintenance activities which unplanned, cannot be easily foreseen or scheduled – generally involving response to and repair of notified equipment faults within agreed time frames. |
| **Response Time** | The time elapsed from the initial receipt of a fault attendance call to the initial arrival at the site, by the ITS Contractor. |
| **Routine Response** | Time to attend to a non-critical nature of fault/defect on an operationally Normal Priority ITS Asset, invoking a ≤ 24 hrs (24/NWD) response. |
| **Safety-Critical Related ITS** | Refers to any Intelligent Transport systemSystem, or part thereof, whose failure or malfunction immediately increases the risk of damage to health personal injury and/or property damage to of the RMS road usercustomer. |
| **Services** | The broad scope of services for the ITS Maintenance Contract developed and agreed by RMS and the ITS Contractor. |
| **Special Project Proposal** | Proposals provided by the ITS Contractor in response to an RMS request for Services not otherwise included within an agreed Forward Works Program. |
| **Specification** | Formed only when the General Maintenance Requirements in this document are read in conjunction with the respective ITS Type Maintenance Specification. |

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| **Steward** | In the context of the ITS Maintenance Contract, the ITS Contractor appointed to manage RMS' ITS assets on its behalf, in accordance with the Stewardship Principles. |
| **Stewardship Maintenance Contract** | The Contracts currently being contested and applicable to road maintenance in Sydney. |
| **Stewardship Principles** | In the context of the ITS Maintenance Contract, a broad set of values, attitudes and behaviours, required of an ITS Contractor to effectively manage RMS' ITS assets on its behalf. The key Stewardship Principles applying include:<br>• Putting RMS' customer first and being responsive to them;<br>• Performing the Services in the best interests of RMS as the owner, as well as the users of the ITS assets;<br>• Being responsible and accountable for the outcomes resulting from the management of the ITS assets;<br>• Managing the ITS assets diligently, efficiently and effectively with limited direction from RMS;<br>• Working collaboratively with RMS to deliver Services that are tailored to best meet RMS' evolving needs; and<br>• Acting with integrity and transparency in the performance of the Services. |
| **Urgent Response** | Time to attend to a Critical (CF) nature of fault/defect on an operationally High Priority ITS asset, invoking a ≤ 2 to ≤ 4 hours response. |
| **Zone** | The geographical area encompassing different types of ITS assets included in an ITS Maintenance Contract. |

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| **AMP** | Asset Maintenance Plan |
| **ANTTS** | Automatic Network Travel Time System |
| **CF** | Critical Fault |
| **CCTV** | Closed Circuit Television |
| **CMC** | Central Monitoring Computer |
| **CMCS** | Central Monitoring Computer System |
| **CMO** | Contract Management Office |
| **EWS** | Emergency Warning System |

| | |
|---|---|
| **FMS** | Fault Management System |
| **FWP** | Forward Works Program |
| **HVCS** | Heavy Vehicle Checking Stations |
| **ITS** | Intelligent Transport System |
| **KPI** | Key Performance Indicator |
| **LUS** | Lane Use Sign |
| **MIW** | Minor Improvement Works |
| **MOU** | Memorandum of Understanding |
| **MRG** | Management Review Group |
| **NCF** | Non-Critical Fault |
| **NDT** | Non Destructive Testing |
| **NWD** | Next Working Day |
| **OEM** | Original Equipment Manufacturer |
| **RMS** | Roads and Maritime Services |
| **ROI** | Return On Investment |
| **SCATS** | Sydney Coordinated Adaptive Traffic System |
| **SMC** | Stewardship Maintenance Contract |
| **SPP** | Special Projects Proposal |
| **SZAS** | School Zone Alert Sign |
| **TCS** | Traffic Control Signals |
| **TFS** | Tidal Flow System |

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|---|---|
| **TfNSW** | Transport for New South Wales |
| **TMC** | New South Wales Transport Management Centre |
| **TMU** | Traffic Monitoring Unit |
| **UPS** | Uninterruptable Power Supply |
| **VMS** | Variable Message Sign |
| **VSLS** | Variable Speed Limit Sign |
| **WAE** | Work as Executed (drawings) |
| **WHS** | Work Health and Safety |
| **WIM** | Weigh-In-Motion |

# ANNEXURE C – ASSET DEFINITION SPECIFICATION

Refer to the ITS Maintenance Contract, Exhibit 1, Asset Definition Specification, which defines Assets under the ITS Contractor's Stewardship.

# ANNEXURE D – ITS RESPONSE TIMES

NWD = Next Working Day

| Code | Description | High Priority Assets | Normal Priority Assets |
|---|---|---|---|
| AC | Twisted Lantern (Conflicting) | 2 Hrs | 2 Hrs |
| AF | Damaged Post - (Not Dangerous) | 1 Week | 1 Week |
| AL | Visors Or Louvres (Damaged) | 24 Hrs | 24 Hrs |
| AN | Twisted Lantern (No Conflict) | 24 Hrs | 24 Hrs |
| AP | Damaged Post - (Dangerous) | 2 Hrs | 2 Hrs |
| AT | Pushbutton - Audio Tactile Fault | 4 Hrs | 4 Hrs |
| AV | Visors or Louvres (Missing) | 24 Hrs | 24 Hrs |
| BB | Barrier Board Failure | 2 Hrs | 2 Hrs |
| BC | Battery Charger Fault | 1 Week | 1 Week |
| BL | Battery Low | 2 Wk | 2 Wk |
| BO | Blacked Out | 2 Hrs | 24 Hrs/NWD |
| BS | Sign on TCS Post-Twistd/Missing etc | 1 Month | 1 Month |
| BU | Battery Failed or UPS Fault | 1 Week | 1 Week |
| CA | Knocked Down | 2 Hrs | 2 Hrs |
| CC | Cut Sensor Cable | 2 Hrs | 24 Hrs/NWD |
| CD | Conflicting Displays | 2 Hrs | 2 Hrs |
| CF | Controller Faults | 2 Hrs | 2 Hrs |
| CI | Internal Communications Failure | 2 Hrs | 24 Hrs/NWD |
| CK | Computer - Checksum | 2 Hrs | 2 Hrs |
| CM | Message Failed | 72 Hrs | 72 Hrs |
| CN | Setting Discrepancy | 2 Hrs | 24 Hrs/NWD |
| CO | Door Open | 2 Hrs | 2 Hrs |
| CP | Computer Fault or Memory Error | 2 Hrs | 24 Hrs/NWD |
| CR | Corrupted Display | 2 Hrs | 2 Hrs (VSLS) 24 Hrs/NWD (VMS) |
| CT | Communications Timeout | 1 Week | 1 Week |
| DA | Computer - Detector Fault / Detector Loop Fault | 24 Hrs/NWD | 1 Week |
| DC | Deficiencies in Conditions | 2 Months | 2 Months |
| DD | Dimming Discrepancy | 72 Hrs | 72 Hrs |
| DE | Build up of Debris | 2 Hrs | 72 Hrs |
| DF | DIDO Fault (Not Communicating) | 24 Hrs | 24 Hrs |
| DI | Display Timeout | 1 Week | 1 Week |
| DL | Sensor Dirty Lens | 1 Week | 1 Week |
| DM | Display Matrix Failed | 2 Hrs | 24 Hrs/NWD |
| DN | Detector - Not Operating Correctly | 24 Hrs | 1 Week |
| DO | Detector - No Call (O/C) | 24 Hrs | 24 Hrs |
| DP | Detector - Permanent Call (S/C) | 24 Hrs | 24 Hrs |
| DS | Display Driver Fault | 2 Hrs | 24 Hrs/NWD |
| DT | LRV Detector (Light Rail Vehicle) | 4 Hrs | 4 Hrs |
| EM | Equipment Damaged (Major Failure) | 2 Hrs | 24 Hrs/NWD |
| EN | Equipment Damaged (Minor Failure) | 24 Hrs/NWD | 72 Hrs |
| ES | Electrical Sensors Problems | 2 Hrs | 24 Hrs/NWD |

| | | | |
|---|---|---|---|
| EU | Equipment Damaged (Unsafe) | 2 Hrs | 2 Hrs |
| FC | Functional Check | Direct | Direct |
| FM | Sign Firmware Mismatch | 2 Hrs | 24 Hrs/NWD |
| FO | Facility Switch Override | 2 Hrs | 2 Hrs |
| FS | No Flasher Synchronisation | 1 Week | 1 Week |
| FY | Flashing Yellow On | 2 Hrs | 2 Hrs |
| GD | Graffiti on Display | 24 Hrs/NWD | 72 Hrs |
| GG | Graffiti on Enclosure | 1 Week | 1 Week |
| GM | General Maintenance | Direct | Direct |
| HD | Housing or Cabin Damaged | 2 Hrs | 2 Hrs |
| HE | HAR Hardware Error | 2 Hrs | 24 Hrs/NWD |
| HF | Heater Failure | 72 Hrs | 72 Hrs |
| HI | Hydraulic Issues | 4 Hrs | 24 Hrs/NWD |
| HT | Undertemperature Alarm or Cabinet Undertemperature | 72 Hrs | 72 Hrs |
| IE | Invalid Entry | Direct | Direct |
| IR | Computer - Invalid RAM | 24 Hrs | 24 Hrs |
| IS | In Service | Direct | Direct |
| LA | Lamp Failure | 72 Hrs | 72 Hrs |
| LC | Luminance Controller Failure | 1 Week | 1 Week |
| LF | Computer - Lamp Fault | 1 Week | 1 Week |
| LL | O/H Lane Controller Lamp Out | 48 Hrs | 48 Hrs |
| LO | Flasher Lamps Out or Flasher Failed or Cconspicuity Device Failure or Amber Flasher Fault - Bottom Left, Bottom Right, Top Left, Top Right | 1 Week | 1 Week |
| LP | Pedestrian "Don'T Walk" Lamp Out | 24 Hrs | 24 Hrs |
| LU | Critical Lamp Failure / Lamp Pair Failure | 2 Hrs | 24 Hrs/NWD |
| MA | Maintenance Mode Fault | 1 Week | 1 Week |
| MB | Moveable Median Failure | 2 Hrs | 24 Hrs/NWD |
| MC | Memory CRC Fault | 2 Hrs | 2 Hrs |
| MD | Drive Speed Adjustment (Twin Drive) | 4 Hrs | 24 Hrs/NWD |
| MF | Master Faults | Direct | Direct |
| ML | Multi-LED Failure, Multi Pixel Failure (Driver Chip/Board Failure) | 2 Hrs | 24 Hrs/NWD |
| MM | Mastarm Preventative Maintenance | Direct | Direct |
| MO | Mast Arm Lamp Out | 1 Week | 1 Week |
| MS | Drive Speed Adjustment (Single Drive) | 2 Hrs | 24 Hrs/NWD |
| MT | Post Top (Damaged or Missing) | 4 Hrs | 4 Hrs |
| NA | Non Attendance Required | Direct | Direct |
| NC | Computer - No Carrier | 2 Hrs | 2 Hrs |
| NF | No Fault Found | Direct | Direct |
| NO | Not Operating Correctly | 2 Hrs | 2 Hrs |
| NR | No Response From Sensor | 2 Hrs | 24 Hrs/NWD |
| NS | New Site Construction | Direct | Direct |
| OA | Over Temperature Alarm | 2 Hrs | 72 Hrs |
| OD | Lenses Damaged or Reflector Broken | 48 Hrs | 48 Hrs |
| OT | Other | 1 Week | 2 Wk |

| | | | |
|---|---|---|---|
| PA | Pushbutton - Damaged | 4 Hrs | 4 Hrs |
| PC | Powered Off By Command | 1 Week | 1 Week |
| PF | Mains Power Failure, Mains Fail, Power Failure | 2 Hrs | 24 Hrs/NWD |
| PM | Preventative Maintenance | Direct | Direct |
| PO | Pushbutton - No Call (O/C) | 4 Hrs | 4 Hrs |
| PR | Permanent | Direct | Direct |
| PS | Pushbutton - Permanent Call (S/C) | 24 Hrs | 24 Hrs |
| PT | Passing Through | Direct | Direct |
| RC | Reconstruction By Contractor | Direct | Direct |
| RF | HAR Radio Fault | 2 Hrs | 24 Hrs/NWD |
| RS | Road Surface | 4 Hrs | 24 Hrs/NWD |
| RT | Passed To RTA | Direct | Direct |
| SB | Backup Controller Unavailable | 2 Hrs | 24 Hrs/NWD |
| SI | Systems Inspection | Direct | Direct |
| SL | Single LED Failure, Single Pixel Failure | 1 Week | 1 Week |
| SP | Stuck In Phase or Phase Not Introducing | 2 Hrs | 2 Hrs |
| SS | Sensor Short Circuit | 2 Hrs | 24 Hrs/NWD |
| ST | Computer - Stop Communicating /Unobtainable Device | 2 Hrs | 24 Hrs/NWD |
| TA | Fan Failed | 2 Hrs | 24 Hrs/NWD |
| TB | Target Boards (Missing or Damaged) | 1 Week | 1 Week |
| TD | Track Drive Problems | 4 Hrs | 24 Hrs/NWD |
| TE | Telecom Faults | Direct | Direct |
| TF | Timing Fault | 24 Hrs | 24 Hrs |
| TL | LRV Detector Loop (Light Rail Vehicle) | 4 days | 4 days |
| TN | Audio Tactile Noise Level | 24 Hrs | 24 Hrs |
| TR | Temporary | Direct | Direct |
| TT | ANTTS Failure | 1 Week | 1 Week |
| VD | Vehicle Damage | 4 Hrs | 72 Hrs |
| VE | HAR Voice Data Error | 2 Hrs | 24 Hrs/NWD |
| WD | Computer - Watchdog / Watchdog Failed or Controller Reset | 2 Hrs | 24 Hrs/NWD |
| WE | Exposed/Hanging Cables/Conduits | 2 Hrs | 2 Hrs |
| WF | Damaged Cables/Conduits | 2 Hrs | 2 Hrs |