

# ROADS AND MARITIME SERVICES (RMS)

## QA SPECIFICATION R305

### MAINTENANCE OF TIDAL FLOW SYSTEMS

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#### REVISION REGISTER

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



# MAINTENANCE OF TIDAL FLOW SYSTEMS

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IC-QA-R305

VERSION FOR: DATE:
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## FOREWORD

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### REVISIONS TO PREVIOUS VERSION

This document has been released as RMS Specification R305 Edition 1 Revision 0.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

### PROJECT SPECIFIC CHANGES

Any project specific changes have been indicated in the following manner:

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. ***Additional Text***.
- (b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

**RMS QA SPECIFICATION R305****MAINTENANCE OF TIDAL FLOW SYSTEMS****1 GENERAL****1.1 SCOPE**

This document sets out the special requirements for the Maintenance of Tidal Flow Systems (TFS) (the “Services”). This document when read in combination with RMS QA R300 ITS Maintenance Services – General Requirements forms the Specification. The details herein include the Services relevant to TFS, so that they remain in good condition, operate as designed and meet the specified performance requirements. The TFS Equipment and/or their subsystems to be maintained under the Services may include site-specific combinations of, but not limited to,

- a) TFS Controller,
- b) TFS Controller cabinet (where used),
- c) Remote control box (where used; for remote-controlled display changeover),
- d) Remote control transmitter handheld and receiver units (where used),
- e) Proximity switches (located in the CMS control module),
- f) Inductive loops,
- g) Movable median (including motors, controllers, joint assemblies, hydraulic fluid pumps, pipe work, reservoirs, etc.),
- h) Barrier gates (horizontal),
- i) Barrier gates (vertical),
- j) Electromechanical message signs (CMS, SMS, etc.),
- k) VMS (where used),
- l) VLS (where used),
- m) LUS (where used),
- n) IPL (where used),
- o) Candy bars,
- p) Static signs,
- q) Delineation barriers,
- r) Sensor plates/tapes,
- s) Communication equipment, cables, pits and conduits,
- t) Power supply equipment (including cables, power regulators, surge protection, pits and conduits, etc.),
- u) Power backup equipment (including UPS, batteries and charging units, power regulators, photovoltaic cells where applicable, backup power generators, etc.),
- v) Support structures, and
- w) Access walkways.

Some examples of existing TFS locations include, but not limited to,

- a) Sydney Harbour Bridge (SHB) using LUS,
- b) Kyeemagh (General Holmes Drive and Airport Tunnel),
- c) Drummoyne North Inner West Busway (Victoria Rd) – TCS 4416,
- d) Drummoyne South Inner West Busway (Victoria Rd) – TCS 4415,
- e) Arncliffe (Forest Rd and Princes Hwy) – TCS 4473,
- f) Sydenham (Canal Rd and Princes Hwy) – TCS3008,
- g) Mosman (Spit Rd and Ourimbah Rd) – TCS 4388,
- h) Neutral Bay (Military Road and Wycombe Rd), and
- i) Northmead (Windsor Road and Churchill Drive).

## 1.2 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations, in combination with those listed in R300, are applicable to this Specification.

### 1.2.1 Definitions

Term	Description
Electromechanical message sign	Includes changeable message sign (CMS), shutter message sign (SMS), etc.
Enclosure	A housing providing an appropriate degree of environmental protection against contact with live parts (AS/NZS 60529).
Power backup equipment	Includes UPS, batteries and charging units, power regulators, photovoltaic cells where applicable, backup power generators, etc.
Protocol	RMS Communications Protocol For Roadside Devices (TSI-SP-003)
Supply Point (also known as Connection Point)	The junction of the electricity distributor's low voltage network conductors with the consumer's mains, i.e. the point at which the power supply is connected to the Utility network.
Supports	All structural components, brackets, clamps, straps and parts thereof, used to support the TFS Equipment.
Site/work site	Tidal Flow System site
TFS Controller	TCS Controller or PLC, whichever is applicable.

### 1.2.2 Abbreviations

Term	Description
AC	Alternating current
CMS	Changeable Message Sign
DC	Direct Current
EPV	Elevated platform vehicle (same as elevated work platform)
IPL	In-Pavement Light



LED	Light Emitting Diode
LUS	Lane Usage Sign (e.g. electronic lane control arrows/crosses on SHB)
MCR	Microprocessor-Controlled Regulator; a regulator that supplies constant current for LED applications. Same as Constant Current Regulator.
PLC	Programmable Logic Controller; a microcontroller with industrial interfaces for controlling and automating electromechanical systems.
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
O&M	Operations and Maintenance
RCD	Residual Current Device
SHB	Sydney Harbour Bridge
SMS	Shutter Message Sign
TCS	Traffic Control Signal
TFS	Tidal Flow System; a system capable of adjusting the number of general traffic lanes in one carriageway by reducing the same number of general traffic lanes from the opposite carriageway to compensate for changing traffic flow conditions during peak and off-peak times of a day.
UPS	Uninterruptible Power Supply

### **1.3 RELEVANT DOCUMENTS AND ORDER OF PRECEDENCE**

This document must be read together with RMS QA R300 – ITS Maintenance Services – General Requirements. Other relevant RMS Maintenance Specifications, RMS Equipment specifications, O&M manuals and Australian Standards are listed in **Annexure R305/A**.

In the event of any conflicting requirements between documents, the order of precedence must be:

1. Statutory and legislated requirements.
2. This Specification (QA Specification R305) read in conjunction with QA R300.
3. Other RMS ITS Maintenance specifications.
4. RMS ITS Equipment specifications;
5. O&M manuals; and then
6. Australian Standards.

In the absence of specific requirements within this, other RMS Maintenance Specifications, RMS Equipment specifications or O&M manuals, Australian Standards must apply.

## **2 MAINTENANCE SERVICES**

You must undertake maintenance services of the TFS Equipment in your Zone in accordance with the approved Asset Maintenance Plan and Forward Works Program.

## **2.1 PLANNED MAINTENANCE**

Planned Maintenance Services must adhere to requirements given in QA Specification R300, ITS Maintenance Services – General Requirements. A combination of inspections/checks and preventative maintenance activities constitute planned maintenance to ensure continued serviceability and availability of a TFS asset.

Minimum scope of Planned maintenance on TFS consists of Routine maintenance and functional checks. **Annexure R305/B1 to B5** are sample Planned Maintenance Service checklists. Following QA specifications are applicable for additional devices in TFS.

- CMS or SMS, where used. See RMS QA Specifications R320.
- VMS, where used. See RMS QA specification R302.
- VSLs, where used. See RMS QA specification R303.
- All other associated TFS Equipment.

Frequency of Planned maintenance for TFS is six (6) months.

## **2.2 REACTIVE MAINTENANCE**

### **2.2.1 Fault Attendance Service**

You must provide a fault attendance service on a twenty-four (24) hours per day, seven (7) days per week basis for all TFS faults.

Typical causes of TFS faults include, but are not limited to,

- a) TFS Controller and associated equipment malfunctions,
- b) Communication equipment malfunctions,
- c) Power supply equipment failures,
- d) Power backup equipment failures,
- e) Inductive loop failures,
- f) Movable median electrical or mechanical failures,
- g) Barrier gate (horizontal) electrical or mechanical failures,
- h) Barrier gate (vertical) electrical or mechanical failures,
- i) CMS electrical or mechanical failures,
- j) SMS electrical or mechanical failures,
- k) VMS failures (where used),
- l) VSLs failures (where used),

- m) LUS failures (where used),
- n) IPL failures (where used),
- o) wiring faults,
- p) overheating,
- q) moisture or dust ingress,
- r) accident damage,
- s) storm damage, and
- t) Vandalism.

All repair works must be in accordance with RMS Specifications listed in Clause 1.3 or as amended.

### **2.2.2 Procedure**

You must make arrangements to continually monitor the Fault Management System(s) for TFS.

These systems are hosted by RMS and currently include:

- SCATS/FMan
- CMCS FMS web page for fault logs on the intranet; and
- PEGA Case Manager.

You will be provided with access (e.g. remote login via VPN) to these systems. Examples of site specific TFS faults and status codes are at **Annexure R305/C1 to C5**.

You may also develop your own software interface to read the CMCS “flat file” which is periodically updated with TFS fault status. In that case you will be provided with access to the CMCS “flat file” and a description of its structure.

Upon fault notification, you must review the nature and urgency of the problem and prioritise your response. You must dispatch appropriately skilled resource(s)/technician(s) to attend the site as soon as possible, but within the specified response time (see clause 2.3.3 for Response Time and Repair Time). Notification of the fault is either via phone callout or at the start of shift of your resource(s)/technician(s). It is expected that your skilled resource(s)/technician(s) review current faults at the start of their shift to determine their work priorities.

Upon arriving on site you must log the time of attendance in PEGA Case Manager together with your initial findings and any other relevant information (e.g. estimated time to repair). Alternatively, if PEGA Case Manager is unavailable, you may notify the TMC by phone.

You must assess whether the condition of the site poses any safety hazards to motorists or the public and make the site safe as a matter of priority.

In the event of a power failure, you must first contact the electricity distributor from off-site to ascertain that the cause of the outage is upstream of the TFS supply point. You must still ascertain from site that there are no other power equipment failures at the TFS site and then enter the appropriate fault response details in PEGA Case Manager.

In the event of a communications failure, you must first contact the service providers i.e. Telstra, Optus etc to ascertain that the failure is external to the TFS site. Once confirmed, you must log communications faults with the appropriate third party communications service provider and follow-up to expedite rectification of the fault. You must still ascertain from site that there are no other communication equipment failures at the TFS site and then enter the appropriate fault response details in PEGA Case Manager.

### **2.2.3 Response Times for Fault Attendance**

Response time starts from the initial fault occurrence time stamp in the appropriate electronic Fault Management System or from the time of the fault call (whichever is earlier) and is the sum of following;

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

Response times for initial site attendance upon notification of a TFS fault is guided by the criterion in **Annexure R305/D**.

Service provider to locate maintenance crews to facilitate their travel time to site.

### **2.2.4 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.

### **2.2.5 Repetitive Failures**

Where the same reported fault requires callouts on three (3) occasions within a fourteen (14) day period you must carry out root cause analysis, identify and implement appropriate actions to prevent recurrence.

Where these actions recommend replacement or major renewal of the TFS asset and these works have not been included in the current Forward Works Program (FWP) you must submit a Business Case to RMS for approval. The Business Case must be based on a life cycle cost comparison of the proposed action against a “business as usual” maintenance approach. If RMS agrees with your recommendations the renewal or replacement works will be included in the next FWP.

Till the recommended and approved replacement works in the FWP are completed, the availability target (%) will be reviewed and a lower KPI may be accepted or under unsustainable operating conditions, the asset excluded from the KPI assessment until replaced.

### **2.2.6 Requests for RMS Assistance**

Where a technical problem cannot be resolved by you, you may request assistance from RMS. When requesting assistance you must be able to demonstrate to RMS that the technical problem is complex and/or outside your scope of services, e.g. system integration issues with RMS or TMC systems.

If the technical problem cannot be resolved by RMS remotely, a site visit will be arranged by RMS at a mutually agreeable time. You must attend the site with relevant documents and information related to the technical problem.

## **2.4 INCIDENT SUPPORT**

An Incident Support report should be raised when;

- an incident is known to your team
- or when informed by the TMC
- or by the relevant SMC Service Provider.

In the event of an incident, response time and repair time for Reactive Maintenance applies.

On site attendance, you must assess whether the condition of the site poses any safety hazards to the public and make the site safe as a matter of priority.

You must also prioritise and rectify all other faults and defects as if for Reactive Maintenance.

You must record the Incident Support details in PEGA Case Manager. If PEGA Case Manager is unavailable or inaccessible, the report form in **Annexure R302/E** may be used on site. PEGA Case manager should be updated on first available opportunity.

You must assist RMS with all insurance claims and recovery actions arising from the incident.

Incident Support reports must be submitted as part of your monthly report to RMS.

## **3 PARTS AND EQUIPMENT**

### **3.1 SUPPLY**

You must arrange and manage supply of all parts, equipment, materials and technical services from OEM suppliers for the purpose of making available the TFS site. Quality of parts, equipment and technical services from OEMs is to be assured.

When supply disruptions occur due to unavailability or obsolescence of a part or equipment, a Replacement part or equipment is to be recommended to RMS as a business case. RMS may approve use of the Replacement part or equipment after necessary technical review and testing.

### **3.2 HOLDING STOCK**

At all times, you must hold in stock adequate minimum levels of parts and equipment to meet Planned and Reactive Maintenance needs.

Service provider is to determine minimum stock levels for parts, equipment and materials based on TFS maintenance scope.

An inventory of spares for parts, equipment, materials and technical services is to be maintained by the service provider. Inventory is to update minimum stock levels and holding stock periodically to match the TFS maintenance scope.

Inventory of spares is to be updated for Replacement parts and equipment, on approval by RMS.

### **3.3 DISPOSAL OF DAMAGED, DEFECTIVE, OBSOLETE OR REDUNDANT PARTS & EQUIPMENT**

Due to maintenance or incidents, parts and equipment which are damaged, defective, obsolete or redundant are required to be removed from the Work Site and disposed. Such removal and disposal is to be done after formal information and agreement with RMS.

Such parts and equipment are to be distinctly and permanently marked prior to disposal by indicating their condition.

Disposal of parts and equipment is to be done as follows;

- a) Repair or refurbish the parts or equipment and hold them as spares in store for future use. For purposes of quality assurance, repaired or refurbished parts are to be treated the same as Replacement parts & equipment (Clause 3.1). Their repair history is to be maintained and made available to RMS when requested.
- b) Carry out disposal of parts and equipment that are beyond-economical-repair (BER) by recycling. Items being disposed must be physically disfigured prior to recycling at a certified facility. Certificate of disposal must be provided.

## **4 PERFORMANCE REQUIREMENTS (ASSET SPECIFIC)**

You must meet the included Key Result Areas (KRAs) and Key Performance Indicators (KPIs) for performance of your Services.

Your asset Inspection and Planned Maintenance Services must support a design life for each TFS asset i.e. site availability should be sustained during design life for different components comprising TFS site. Design life of different components varies as follows;

- TFS electronics and electrical components- Fifteen (15) years.
- Steel fabricated Sign Support Structures, Brackets and Fixtures – Forty (50) years.
- Concrete & Masonry construction at Site - Thirty (30) years.
- Power back-up system / Batteries – Five (5) years.

Premature asset failures requiring major renewal or replacement of the asset (other than due to Incidents or Force Majeure events) may reduce your overall Stewardship Performance KPI score.

### **4.1 AVAILABILITY (OPERATIONAL)**

RMS QA R300 defines Availability for ITS assets. Performance calculation method is provided in the contract. The performance target for TFS availability is **98%**.

Availability as defined in R300 will be measured monthly by you across all TFS assets in your Zone.

Failure to meet the Availability performance targets will impact on your Asset Performance KPI score.

## **5 REPORTING AND RECORD KEEPING**

### **5.1 REPORTING**

You must provide a monthly performance report to RMS on work achievement against the FWP and asset performance statistics by the second week of the following month. The report must include the following items:

- (i) Availability
- (ii) Response Time
- (iii) Repair Effectiveness

See R300 for Availability, Response Time and Repair Effectiveness definitions.

You must report on the status of fault attendance and repairs through the appropriate Fault Management Systems in accordance with Clause 6.3 in R300.

These reports will be included in the KPI assessments by end of every month in accordance with the contract.

### **5.2 RECORD KEEPING**

You must keep and maintain accurate records of all repairs, calibrations, replacements and design alterations made to any TFS Equipment/site.

All Reactive and Planned Maintenance service attendances must be recorded in the electronic fault management system. Details of each attendance must also be manually recorded with you and should include the date and details of service carried out with the technician's name.

You must maintain all necessary records to support the monthly evaluation of actual performance against the specific performance targets.

You must retain records, including all details for accidents/damages/repairs for a period of at least five (5) years.

## **ANNEXURE R305/A – REFERENCE DOCUMENTS**

### **A1 RMS ITS MAINTENANCE SPECIFICATIONS**

- RMS QA R301 Maintenance of Traffic Control Signals
- RMS QA R302 Maintenance of Variable Message Signs
- RMS QA R303 Maintenance of Variable Speed Limit Signs
- RMS QA R320 Maintenance of Changeable Message Signs

### **A2 RMS ITS EQUIPMENT SPECIFICATIONS**

- TSC/4 Control Equipment for Road Traffic Signals
- TSI-SP-003 Communications Protocol For Roadside Devices
- TSI-SP-008 General Requirements For Variable Message Signs

### **A3 O&M MANUALS**

Refer to respective O&M Manuals based on make and model of Equipment of each TFS.

### **A4 AUSTRALIAN STANDARDS**

Not used.



# ANNEXURE R305/B – SAMPLE PLANNED MAINTENANCE SERVICE REPORT

TFS ID: ..... LOCATION: .....

SITE ATTENDANCE DATE: .....

## B1 COVER PAGE

1. Mark condition of each item with a ✓ in the “PASSED/FAILED/REPAIRED” columns.
2. If any item requires further attention, mark that item with a ✓ in the “for further action (FFA)” column.
3. Enter date in dd/mm/yy format and time in 24 hour format.

PLANNED MAINTENANCE SERVICE ITEMS	PASSED	FAILED	REPAIRED	COMMENTS	FFA
<b>Off-Site Preparation</b>					
Staff inducted, SWMS completed, attended tool box meeting onsite					
Obtain road occupancy licence (ROL) from TMC				ROL Number:	
<b>On-Site Checks</b>					
Contact TMC (Tango 5) for traffic control placement and clearance for maintenance.					
Once cleared, switch main control switch to “MANUAL” Notify TMC that the movable median is set to manual control.					
<b>TFS Controller</b>					
Checklist attached (Y/N)?					

<b>Movable Median</b>				
Checklist attached (Y/N)?				
<b>Changeable Message Sign (CMS)</b>				
In accordance with RMS QA R320. Checklist attached (Y/N)?				
<b>Shutter Message Sign (SMS)</b>				
In accordance with RMS QA R320. Checklist attached (Y/N)?				
<b>Variable Message Sign (VMS) (where used)</b>				
In accordance with RMS QA R302. Checklist attached (Y/N)?				
<b>Variable Speed Limit Sign (VSLs) (where used)</b>				
In accordance with RMS QA R303. Checklist attached (Y/N)?				
<b>Lane Usage Sign (LUS) (where used)</b>				
Refer relevant O&M manuals. Checklist attached (Y/N)?				
<b>Barrier Gate (Horizontal)</b>				
Refer relevant O&M manuals. Checklist attached (Y/N)?				
<b>Barrier Gate (Vertical)</b>				
Refer relevant O&M manuals. Checklist attached (Y/N)?				
<b>In-Pavement Lights (IPL)</b>				
Checklist attached (Y/N)?				

<b>Site Sign-Off</b>					
1. Check if site is safe					
2. Switch main control switch to "AUTO"					
3. Notify TMC that the movable median is set to automatic control.					

**TECHNICIAN:** ..... **COMPANY:** .....

**SIGNATURE:** ..... **DATE SIGNED:** .....

**DATE SENT TO RMS:** .....

**B2 TFS CONTROLLER & CABINET**

TFS CONTROLLER ID: ..... LOCATION: .....

SITE ATTENDANCE DATE: .....

1. Mark condition of each item with a ✓ in “PASSED/FAILED/REPAIRED” columns.
2. Mark condition CF or NCF in the FAILED column to categorize.
3. If any item requires further attention, write reasons in comments column and mark item with a ✓ in the “for further action (FFA)” column.
4. Enter date in dd/mm/yy format and time in 24 hour format.

PREVENTATIVE MAINTENANCE ITEMS	PASSED	FAILED	REPAIRED	COMMENTS	FFA
<b>TFS Controller &amp; Cabinet</b>					
Clean the cabinet, remove dust, vermin and other debris, tidy-up wiring					
Check housing identification labels and their condition, arrange for replacement if damaged or missing					
Check if Equipment identification label is worn, damaged or missing, and replace as per Annexure					
Check if Supply Point identification label is worn, damaged or missing, and replace as per Annexure					
Check Communication and Power pits for water and other damage, clean as necessary					
Check cabinet (inside and outside) is secured to prevent weather damage to electronics					
Check for graffiti on Control Cabinet. Remove, if graffiti found. Report date found to RMS.					
Check condition, replace and lubricate door locks, hinges & seals as required					

<p>Check that log sheet and WEA drawings are complete and intact.</p> <p>If WAE drawings missing, prepare at site and forward to RMS to reproduce</p>					
<p>Physically check switchboard and RCD items.</p> <p>Reset circuit breakers.</p> <p>Measure RCD tripping current (in mA)</p>				<p>RCD tripping current = _____</p> <p>RCD tester make and model = _____</p>	
<p>Locate MEN connection inside the cabinet</p>					
<p>Visually/physically check wiring/terminations/earthing items, tighten if required.</p> <p>Check and secure Earth connection.</p> <p>Measure Earth insulation reading using insulation tester</p>				<p>Reading between Earth stake &amp; Door = _____</p> <p>Reading between Earth stake &amp; Mains Earth = _____</p>	
<p>Check if surge protector is installed</p>				<p>Surge protector make and model = _____</p>	
<p>Install cable entry plate and seal around the cables</p>					
<b>TFS Controller and communication equipment</b>					
<p>Inspect electronics of TFS Controller and communication equipment for symptoms of electrical or thermal fatigue.</p> <p>Repair or replace as specified</p>					
<p>Remove mains power; verify uninterrupted controller operation. Check existing battery voltage and charger operation.</p> <p>If needed, replace and label battery as specified</p>				<p>Date on battery label or proof of purchase:</p> <p>Date of expiry of battery OEM's warranty:</p> <p>Date reached 400 recharge cycles to 80% depth of charge:</p>	

<b>Site - Sign-Off</b>				
Carry out sign-off procedure in Annexure R305/C1				

**TECHNICIAN:** .....**COMPANY:** .....

**SIGNATURE:** ..... **DATE SIGNED:** .....

**DATE SENT TO RMS:** .....

**B3 MOVABLE MEDIAN**

**MOVABLE MEDIAN ID:** ..... **LOCATION:** .....

**SITE ATTENDANCE DATE:** .....

1. Mark condition of each item with a ✓ in “PASSED/FAILED/REPAIRED” columns.
2. Mark condition CF or NCF in the FAILED column to categorize.
3. If any item requires further attention, write reasons in comments column and mark item with a ✓ in the “for further action (FFA)” column.
4. Enter date in dd/mm/yy format and time in 24 hour format.

PREVENTATIVE MAINTENANCE ITEMS	PASSED	FAILED	REPAIRED	COMMENTS	FFA
<b>Movable Median Equipment</b>					
Remove any accumulated debris in the working area of the median, particularly near the area of the location pads.					
Examine the roadway in the path of the drive track for signs of damage or wear.					
Ensure that the road clearance below the drive is approximately 35mm.  If the road clearance at any part of the travel is less than 20mm, carry out  six (6) monthly step 11, and  b) six (6) monthly step 12.					
Inspect the roadway for signs of oil spills/leaks, and if found, mop them up and carry out  six (6) monthly step 14,  six (6) monthly step 15,					

<p>six (6) monthly step 16, and d) six (6) monthly step 17.</p>					
<p>Move the medians in both directions to its extreme radius of travel, check that the flashing lights, if fitted, are operating, the medians have stopped correctly at each position and that the movement is smooth.</p>					
<p>Apply grease to the nipple on every joint assembly. Clean any excess grease from bearings to prevent spillage to roadway. Where a pivoting anchor is fitted, remove the access cover, and apply fresh grease to the pivot bearing and suspension guide bearing.</p>					
<p>Examine the cables where they are exposed at the median joints for cracks or damage. Where a pivoting anchor is fitted, remove the access cover from the pivoting end shell and examine the cable loop and support spring for chafing.</p>					
<p>Remove the central inspection cover in the drive module. Examine the table top chain for wear or damage, and if found, replace drive unit with spare unit and repair damage.</p>				Date: _____	
<p>Adjust the ground clearance to 35mm by turning the four adjustment screws on each side of drive equal amounts.</p>					
<p>Remove any debris which may have accumulated inside the shell and replace the inspection cover.</p>					
<p>Remove the small access cover on top of the drive module for access to the oil filler plug.</p>					
<p>Using a 24mm socket, remove the oil filler plug. The oil level should be between the two lines machined on the stem of the plug.</p>					



Inspect the oil for colour, clarity and smell. Any loss or changes in its characteristics are indications of problems in the hydraulic system.					
If the level, colour, clarity and smell of the oil is normal, replace the plug and the access plate.					
Inspect the median paintwork for damage or breakdown and retouch as necessary.					
Remove the central inspection cover in the drive module. Replace the track drive unit (This replacement must be carried out irrespective of the units operating conditions).					
Adjust the ground clearance to 35mm by turning the four adjustment screws on each side of drive equal amounts.					
Remove any debris which may have accumulated inside the shell and replace the inspection cover.					
Remove the hydraulic inspection covers from the drive module and examine all hydraulic pipe work and components for leaks. Repair or replace as required.				Date: _____	
Remove any accumulated dirt or debris from inside the module.					
Pump as much as possible from the reservoir into a suitable container. Maximum reservoir is 14 litres. Ensure that the pump used is clean to avoid contaminating the reservoir.					
Fit a replacement return line filter. Care must be taken when changing the filter to prevent oil from contaminating the road surface.					
Fill the reservoir to the upper mark on the fill plug stem with new oil.					

Mop up any oil which has spilled during any of the previous operations.					
Move the median to the extremes of travel in both directions several times and ensure that it operates satisfactorily.					
Replace the covers on the drive modules.					
Operate the median and ensure that the proximity switches stop the median as required.					
Adjust any adjustable stop joints or packing at the joints as required to ensure that the median shape complies to road design requirements. For adjustment of joints refer OEM's O&M manual.					
<b>Site - Sign-Off</b>					
Carry out sign-off procedure in Annexure R305/B1.					

**TECHNICIAN:** ..... **COMPANY:** .....

**SIGNATURE:** ..... **DATE SIGNED:** .....

**DATE SENT TO RMS:** .....

**B4 IN-PAVEMENT LIGHTS (IPL)**

IPL ID: ..... LOCATION: .....

SITE ATTENDANCE DATE: .....

1. Mark condition of each item with a ✓ in “PASSED/FAILED/REPAIRED” columns.
2. Mark condition CF or NCF in the FAILED column to categorize.
3. If any item requires further attention, write reasons in comments column and mark item with a ✓ in the “for further action (FFA)” column.
4. Enter date in dd/mm/yy format and time in 24 hour format.

PREVENTATIVE MAINTENANCE ITEMS	PASSED	FAILED	REPAIRED	COMMENTS	FFA
<b>IPL Equipment</b>					
Check MCR for symptoms of electrical fatigue. Repair or replace as necessary.				Symptoms found:	
Check isolation transformers for symptoms of electrical fatigue. Repair or replace as necessary.				Symptoms found	
Check for loose light fixtures and if loose tighten them up					
Inspect hold-down bolts for loose anti-rotational screws					
Check the light fixtures for corrossions					
Check the seals if the fixtures are fitted with waterproof seals between the fixture body and the lenses					
Check for any exposed conduit or wiring to IPLs					

Check for dirt, debris etc on light surfaces which will cause to reduce light intensity on each IPL					
Check the pavement around light bases for surface flatness and cracks					
Inspect IPL for symptoms of electrical, mechanical or thermal fatigue. Repair or replace as necessary.					
Test IPL for luminance depreciation level from initial value				Symptoms found:  Lumen depreciation: _____% from initial value  Lumen tester make and model:	
<b>Site (Sign-Off)</b>					
Carried out sign-off procedure in Annexure R305/B1?					

**TECHNICIAN:** ..... **COMPANY:** .....

**SIGNATURE:** ..... **DATE SIGNED:** .....

**DATE SENT TO RMS** .....

**B5 TFS ENCLOSURES & STRUCTURES**

**TFS ENCLOSURE ID:** ..... **LOCATION:** .....

**REPORT DATE:** .....

1. Mark condition of each item with a ✓ in “PASSED/FAILED/REPAIRED” columns.
2. Mark condition CF or NCF in the FAILED column to categorize.
3. If any item requires further attention, write reasons in comments column and mark item with a ✓ in the “for further action (FFA)” column.
4. Enter date in dd/mm/yy format and time in 24 hour format.

PREVENTATIVE MAINTENANCE ITEMS	PASSED	FAILED	REPAIRED	COMMENTS	FFA
<b>TFS Enclosures and Structures</b>					
Inspect TFS enclosures and structures for symptoms of mechanical fatigue or damage.  Repair or replace as necessary.					
Inspect for any sign of vermin activity in the enclosure or structures.  Clean as necessary.					
Check if vegetation encroaching.  Trim all vegetation that interferes with TFS parts, lane usage or lane control.					
Check for graffiti. Remove, if graffiti found. Report date found to RMS.					
Clear access area around the Controller cabinet					
Check all support structures, fixtures and brackets for structural integrity.					
<b>Site - Sign-Off</b>					

1. Carry out sign-off procedure in Annexure R305/C1					
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**TECHNICIAN:** ..... **COMPANY:** .....

**SIGNATURE:** ..... **DATE SIGNED:** .....

**DATE SENT TO RMS:** .....

## ANNEXURE R305/C EXAMPLES OF SITE-SPECIFIC TFS FAULTS AND STATUS CODES

### C1 TCS 4416 – Drummoyne North Inner West Bus way (Victoria Rd)

REPORTED FAULT	FAULT CODE	MAXIMUM RESPONSE TIME (HOURS) <sup>1</sup>		CMCS/TMC DESCRIPTION <sup>2</sup>	PROTOCOL ERROR CODE <sup>2</sup>	COMMENTS
		CF	NCF			
<b>TFS FAULT</b>						
STARTUP ERROR	MSS1			NA	NA	TFS alarm to SCATS/TMC
CMS 01 IS NOT POSITIONED CORRECTLY	MSS2			NA	NA	TFS alarm to SCATS/TMC
CMS 02 IS NOT POSITIONED CORRECTLY	MSS3			NA	NA	TFS alarm to SCATS/TMC
IN PAVEMENT LIGHTS (IPL) ARE NOT POSITIONED CORRECTLY	MSS4			NA	NA	TFS alarm to SCATS/TMC
IPL STRING ERROR	MSS5			NA	NA	TFS alarm to SCATS/TMC
IPL VOLTAGE NOT OK	MSS6			NA	NA	TFS alarm to SCATS/TMC
IPL CURRENT NOT OK	MSS7			NA	NA	TFS alarm to SCATS/TMC
MOVABLE MEDIAN (MM) IS NOT POSITIONED CORRECTLY	MSS8			NA	NA	TFS alarm to SCATS/TMC
MM MAINS FAILURE	MSS9			NA	NA	TFS alarm to SCATS/TMC
MM OIL PRESSURE NOT OK	MSS10			NA	NA	TFS alarm to SCATS/TMC
UPS MAINS FAILURE	MSS11			NA	NA	TFS alarm to SCATS/TMC
UPS FAULT	MSS12			NA	NA	TFS alarm to SCATS/TMC
UPS ALARM	MSS13					
UPS BATTERY LOW	MSS14			NA	NA	TFS alarm to SCATS/TMC
<b>TFS OPERATION</b>						
NO FAULT – OPERATION MODE - TIDAL FLOW IS IN AM PEAK MODE	MSS15			NA	NA	0: Not used 1: AM Peak Mode
NO FAULT – OPERATION MODE - TIDAL FLOW IS IN OTHER TIMES MODE	MSS16			NA	NA	0: Not used 1: Other Times mode

### C2 TCS 4415 – Drummoyne South Inner West Bus way (Victoria Rd)

REPORTED FAULT	FAULT CODE	MAXIMUM RESPONSE TIME (HOURS) <sup>1</sup>		CMCS/TMC DESCRIPTION <sup>2</sup>	PROTOCOL ERROR CODE <sup>2</sup>	COMMENTS
		CF	NCF			
<b>TFS FAULT</b>						
STARTUP ERROR	MSS1			NA	NA	TFS alarm to SCATS/TMC
CMS 01 IS NOT POSITIONED CORRECTLY	MSS2			NA	NA	TFS alarm to SCATS/TMC

REPORTED FAULT	FAULT CODE	MAXIMUM RESPONSE TIME (HOURS) <sup>1</sup>		CMCS/TMC DESCRIPTION <sup>2</sup>	PROTOCOL ERROR CODE <sup>2</sup>	COMMENTS
		CF	NCF			
CMS 02 IS NOT POSITIONED CORRECTLY	MSS3			NA	NA	TFS alarm to SCATS/TMC
CMS 03 IS NOT POSITIONED CORRECTLY	MSS4			NA	NA	TFS alarm to SCATS/TMC
IPL IS NOT POSITIONED CORRECTLY	MSS5			NA	NA	TFS alarm to SCATS/TMC
IPL STRING ERROR	MSS6			NA	NA	TFS alarm to SCATS/TMC
IPL CURRENT / VOLTAGE NOT OK	MSS7			NA	NA	TFS alarm to SCATS/TMC
MOVABLE MEDIAN (MM) IS NOT POSITIONED CORRECTLY	MSS8			NA	NA	TFS alarm to SCATS/TMC
MM OIL PRESSURE NOT OK	MSS9			NA	NA	TFS alarm to SCATS/TMC
MM MAINS FAILURE	MSS10			NA	NA	TFS alarm to SCATS/TMC
UPS MAINS FAILURE	MSS11			NA	NA	TFS alarm to SCATS/TMC
UPS BATTERY LOW	MSS12			NA	NA	TFS alarm to SCATS/TMC
UPS ALARM	MSS13			NA	NA	TFS alarm to SCATS/TMC
UPS FAULT	MSS14			NA	NA	TFS alarm to SCATS/TMC
<b>TFS OPERATION</b>						
NO FAULT – OPERATION MODE - TIDAL FLOW IS IN AM PEAK MODE	MSS15			NA	NA	0: Not used 1: AM Peak Mode
NO FAULT – OPERATION MODE - TIDAL FLOW IS IN OTHER TIMES MODE	MSS16	2		NA	NA	0: Not used 1: Other Times mode

### C3 TCS 4473 – Arncliffe (Forest Rd and Princes Hwy)

REPORTED FAULT	FAULT CODE	MAXIMUM RESPONSE TIME (HOURS) <sup>1</sup>		CMCS/TMC DESCRIPTION <sup>2</sup>	PROTOCOL ERROR CODE <sup>2</sup>	COMMENTS
		CF	NCF			
<b>TFS OPERATION</b>						
NO FAULT – OPERATION MODE - TFS IS IN OTHER TIMES MODE	MSS1			NA	NA	0: Not used 1: Other Times mode
NO FAULT – OPERATION MODE - TFS IS IN AM PEAK MODE	MSS2			NA	NA	0: Not used 1: AM Peak mode
NO FAULT – OPERATION MODE - TFS IS IN PM PEAK MODE	MSS3			NA	NA	0: Not used 1: PM Peak mode
<b>TFS FAULT</b>						
TFS MANUAL OVERRIDE	MSS4			NA	NA	TFS alarm to SCATS/TMC
CMS01 IS IN AM PEAK MODE	MSS5			NA	NA	TFS alarm to SCATS/TMC
CMS01 IS IN INCORRECT STATE (STUCK)	MSS6			NA	NA	TFS alarm to SCATS/TMC
CMS02 IS IN PM PEAK MODE	MSS7			NA	NA	TFS alarm to SCATS/TMC



**Maintenance of Tidal Flow Systems****R305**

REPORTED FAULT	FAULT CODE	MAXIMUM RESPONSE TIME (HOURS) <sup>1</sup>		CMCS/TMC DESCRIPTION <sup>2</sup>	PROTOCOL ERROR CODE <sup>2</sup>	COMMENTS
		CF	NCF			
CMS02 IS IN INCORRECT STATE (STUCK)	MSS8			NA	NA	TFS alarm to SCATS/TMC
NOT USED	MSS9			NA	NA	TFS alarm to SCATS/TMC
NOT USED	MSS10			NA	NA	TFS alarm to SCATS/TMC
UPS MAINS FAILURE	MSS11			NA	NA	TFS alarm to SCATS/TMC
UPS FAULT	MSS12			NA	NA	TFS alarm to SCATS/TMC
UPS ALARM	MSS13			NA	NA	TFS alarm to SCATS/TMC
UPS BATTERY LOW	MSS14			NA	NA	TFS alarm to SCATS/TMC
UPS TAMPER ALARM	MSS15			NA	NA	TFS alarm to SCATS/TMC
SYSTEM ERROR, DUE TO I) EITHER OF CMS01 OR CMS02 HAS PS & SS ARE OFF DURING STARTUP OR OR II) CMS01 OR CMS02 NOT DISPLAYING CORRECT FACE DURING STARTUP OR OR III) CMS01 OR CMS02 PS & SS IN OFF STATE FOR MORE THAN 15 MIN.	MSS16			NA	NA	TFS alarm to SCATS/TMC

**C4 TCS 3008 – Sydenham (Canal Rd and Princes Hwy)**

REPORTED FAULT	FAULT CODE	MAXIMUM RESPONSE TIME (HOURS) <sup>1</sup>		CMCS/TMC DESCRIPTION <sup>2</sup>	PROTOCOL ERROR CODE <sup>2</sup>	COMMENTS
		CF	NCF			
<b>TFS OPERATION</b>						
NO FAULT – OPERATION MODE	MSS1 & MSS2			NA	NA	MSS2/MSS1 0/0 = Fall back 0/1 = Other 1/0 = AM 1/1 = Off
<b>TFS FAULT</b>						
MANUAL MODE - SWITCH IS NOT IN THE AUTO POSITION	MSS3			NA	NA	TFS alarm to SCATS/TMC
UPS ALARM	MSS4			NA	NA	TFS alarm to SCATS/TMC
MAINS POWER FAILURE USING BATTERY BACKUP	MSS5			NA	NA	TFS alarm to SCATS/TMC
DISPLAY FAULT: SIGN A	MSS6			NA	NA	TFS alarm to SCATS/TMC
DISPLAY FAULT: SIGN C	MSS7			NA	NA	TFS alarm to SCATS/TMC
DISPLAY FAULT: SIGN G	MSS8			NA	NA	TFS alarm to SCATS/TMC
BARRIER #0 FAULT	MSS9			NA	NA	TFS alarm to SCATS/TMC
BARRIER #1 FAULT	MSS10			NA	NA	TFS alarm to SCATS/TMC
BARRIER #2 FAULT	MSS11			NA	NA	TFS alarm to

**R305****Maintenance of Tidal Flow Systems**

REPORTED FAULT	FAULT CODE	MAXIMUM RESPONSE TIME (HOURS) <sup>1</sup>		CMCS/TMC DESCRIPTION <sup>2</sup>	PROTOCOL ERROR CODE <sup>2</sup>	COMMENTS
		CF	NCF			
						SCATS/TMC
MCR #1 LAMP FAULT	MSS12			NA	NA	TFS alarm to SCATS/TMC
MCR #1 FAILURE	MSS13			NA	NA	TFS alarm to SCATS/TMC
MCR #2 LAMP FAULT	MSS14			NA	NA	TFS alarm to SCATS/TMC
MCR #2 FAILURE	MSS15			NA	NA	TFS alarm to SCATS/TMC
SYSTEM FAULT - TIDAL FLOW SYSTEM HOLDING CURRENT MODE	MSS16			NA	NA	TFS alarm to SCATS/TMC

**C5 TCS 4388 – Mosman (Spit Rd and Ourimbah Rd)**

REPORTED FAULT	FAULT CODE	MAXIMUM RESPONSE TIME (HOURS) <sup>1</sup>		CMCS/TMC DESCRIPTION <sup>2</sup>	PROTOCOL ERROR CODE <sup>2</sup>	COMMENTS
		CF	NCF			
<b>TFS FAULT</b>						
STARTUP ERROR	MSS1			NA	NA	MSS2/MSS1 0/0 = Fall back 0/1 = Other 1/0 = AM 1/1 = Off
SHUTTER MESSAGE SIGN (SMS) 01 IS NOT POSITIONED CORRECTLY	MSS2			NA	NA	TFS alarm to SCATS/TMC
CHANGEABLE MESSAGE SIGN (CMS) IS NOT POSITIONED CORRECTLY	MSS3			NA	NA	TFS alarm to SCATS/TMC
SMS 02 IS NOT POSITIONED CORRECTLY	MSS4			NA	NA	TFS alarm to SCATS/TMC
IN PAVEMENT LIGHTS (IPL) ARE NOT POSITIONED CORRECTLY	MSS5			NA	NA	TFS alarm to SCATS/TMC
IPL STRING ERROR	MSS6			NA	NA	TFS alarm to SCATS/TMC
MOVABLE MEDIAN (MM) IS NOT POSITIONED CORRECTLY	MSS7			NA	NA	TFS alarm to SCATS/TMC
MM OIL PRESSURE NOT OK	MSS8			NA	NA	TFS alarm to SCATS/TMC
MM MAINS FAILURE	MSS9			NA	NA	TFS alarm to SCATS/TMC
UPS MAINS FAILURE	MSS10			NA	NA	TFS alarm to SCATS/TMC
UPS FAULT	MSS11			NA	NA	TFS alarm to SCATS/TMC
UPS ALARM	MSS12			NA	NA	TFS alarm to SCATS/TMC
UPS BATTERY LOW	MSS13			NA	NA	TFS alarm to SCATS/TMC
LANE 5 CLOSED DUE TO START-UP OR TRANSITION PROBLEM	MSS16			NA	NA	TFS alarm to SCATS/TMC

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REPORTED FAULT	FAULT CODE	MAXIMUM RESPONSE TIME (HOURS) <sup>1</sup>		CMCS/TMC DESCRIPTION <sup>2</sup>	PROTOCOL ERROR CODE <sup>2</sup>	COMMENTS
		CF	NCF			
<b>TFS OPERATION</b>						
NO FAULT – OPERATION MODE - TIDAL FLOW IS IN AM PEAK MODE	MSS14			NA	NA	0: Not used 1: AM Peak mode
NO FAULT – – OPERATION MODE - TIDAL FLOW IS IN OTHER TIMES MODE	MSS15			NA	NA	0: Not used 1: Other Times mode

## **ANNEXURE R305/D – FAULTS TYPES AND RESPONSE TIMES**

Response times for initial site attendance upon notification of TFS faults are detailed in R300 (Clause 6.2.1 Response Times and **Annexure D**). R300 categorizes ITS assets as either High Priority or Normal Priority and assigns suitable response times.

**ANNEXURE R305/E – SAMPLE INCIDENT SUPPORT REPORT**

**TFS ID:** ..... **LOCATION:** .....

**INCIDENT DATE:** ..... **REPORT DATE:** .....

Incident Details	
When reported	
Who reported	
Was Incident or fault a dangerous situation? (Y/N)	
Police attendance? (Yes/No) Police Report #:	
Details of any vehicles involved	
Attending supervisor and team at site. Date and time.	
Immediate Safety measures taken. Date & time.	
Power Supply Point / post identification number	

Initial Repair undertaken. Date & time	
Details of long term repair. To whom forwarded to for action.	
Description of replaced equipment and cost of equipment plus materials	
Number of hours claimed for complete repair	
Notes & Comments	

**TECHNICIAN:** .....**COMPANY:** .....

**SIGNATURE:** ..... **DATE SIGNED:** .....