



Northern  
Territory  
Government

DEPARTMENT OF INFRASTRUCTURE

# 2015/2016

## standard specification for road maintenance

miscellaneous provisions ■ provision for traffic ■  
earthworks and drainage ■ conformance testing ■  
grading and gravel sheeting ■ stabilisation maintenance ■  
bituminous surface maintenance ■ spray sealing for maintenance ■  
concrete maintenance ■ drainage maintenance ■  
protection works maintenance ■ road furniture maintenance ■  
pavement marking ■ landscape maintenance ■  
slashing and weed control ■ traffic signal maintenance ■ street sweeping ■  
aerodrome maintenance ■ road and marine amenity maintenance ■  
protective coatings ■ measurement and payment ■ referenced documents ■

This document specifies the general standards of  
materials and workmanship required by the  
Department of Infrastructure  
for maintenance of the road network





# ABOUT THIS SPECIFICATION

This document was prepared by the Department of Infrastructure and specifies the general standards of materials and workmanship required by the Department for road maintenance works. It brings together standard terminology and methods for road maintenance work across all regions of the Northern Territory.

It is designed to be used as a reference document for road maintenance projects, using a schedule of rates form of payment. The Standards quoted are current as of July 2015.

The text has been edited to specify only the types of road maintenance work performed by the Department and is applicable to all regions of the Northern Territory. The text has been developed through consultation with Department of Infrastructure Officers with extensive experience in civil works in the Northern Territory.

This Standard Specification will remain unchanged until an updated version is published in July 2016.

This specification is also available electronically in PDF from the DOI Specification Services website:  
<http://www.nt.gov.au/infrastructure/techspecs/index.shtml>

A handwritten signature in black ink, appearing to read 'Bob Pemble'.

Bob Pemble  
Chief Engineer  
27 November 2015

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Thanks to Wicking for providing  
the caricatures which help  
enliven a rather mundane subject.





# STANDARD SPECIFICATION FOR ROAD MAINTENANCE 2015/2016

## REFERENCE TEXT

### REFERENCE

Read this Standard Specification in conjunction with the Request For Tender/Quotation, the Project Specific Requirements and with the Drawings, if any. Only those parts of the Standard Specification which refer to the works being carried out apply and those items are listed in the Schedule of Rates which is attached to the Response Schedules for the particular Contract. This document may be used as a blanket reference specification referring generally to the standards of materials and workmanship required by the Department for road maintenance works.

### PROJECT SPECIFIC REQUIREMENTS

The selection of specific items or materials for the works being carried out are those items listed in the Schedule of Rates in the Response Schedules for the particular Contract. Any additional work or any changes to the reference specification will be specified in the Request for Tender/Quotation document, usually in the Project Specific Requirements section.

### PRECEDENCE

Any provision in the project specification in the Request for Tender/Quotation document, including the Project Specific Requirements, or on the project drawings, shall override any conflicting provision in this Standard Specification.

### HOLD AND WITNESS POINTS

These apply whether Quality Assurance is included in this project or not. Refer to the definitions of Hold Points and Witness Points in the Miscellaneous Provisions section of this reference specification.

### SITE COPY

Retain a copy of this document on site for the duration of the works.

### COPYRIGHT

This reference specification is based on the Department of Infrastructure Roadworks Master Specification and modified to suit road maintenance works.

This document is copyright protected and the property of the Government of the Northern Territory and must not be retained, copied, or used without authority.

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# STANDARD SPECIFICATION FOR ROAD MAINTENANCE 2015/2016

## REFERENCE TEXT

### CONTENTS

1.	MISCELLANEOUS PROVISIONS .....	7
2.	PROVISION FOR TRAFFIC .....	17
3.	EARTHWORKS AND DRAINAGE .....	28
4.	CONFORMANCE TESTING .....	32
5.	GRADING AND GRAVEL SHEETING .....	44
6.	STABILISATION MAINTENANCE .....	52
7.	SPRAY SEALING MAINTENANCE .....	55
8.	BITUMINOUS SURFACE MAINTENANCE .....	68
9.	CONCRETE MAINTENANCE .....	80
10.	DRAINAGE MAINTENANCE .....	84
11.	PROTECTION WORKS MAINTENANCE .....	89
12.	ROAD FURNITURE MAINTENANCE .....	94
13.	PAVEMENT MARKING MAINTENANCE .....	105
14.	LANDSCAPE MAINTENANCE .....	110
15.	SLASHING AND WEED CONTROL .....	123
16.	TRAFFIC SIGNALS AND INTELLIGENT TRANSPORT SYSTEMS MAINTENANCE .....	131
17.	STREET SWEEPING .....	176
18.	AERODROME MAINTENANCE .....	179
19.	ROAD AND MARINE AMENITY MAINTENANCE .....	182
20.	PROTECTIVE COATINGS .....	193
21.	MEASUREMENT AND PAYMENT .....	209
22.	REFERENCED DOCUMENTS .....	232
23.	NORTHERN TERRITORY CLIMATE ZONE TABLE .....	250

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## 1. MISCELLANEOUS PROVISIONS

### 1.1 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

### 1.2 THE CONDITIONS OF TENDER AND CONDITIONS OF CONTRACT

The Conditions of Tender and the Conditions of Contract contain additional requirements which apply to works carried out under any contract awarded by NT Government, including any works carried out using this specification.

### 1.3 ENVIRONMENTAL MANAGEMENT

The Standard Specification for Environmental Management applies for all construction and demolition work for building and civil works carried out by or on behalf of the Northern Territory Government. (An electronic copy of this document is available at:

<http://www.nt.gov.au/infrastructure/techspecs/index.shtml>

The Standard Specification for Environmental Management takes precedence over this specification.

#### 1.3.1 Standards in Conflict

Where conflict arises between a referenced standard and particular clauses of this specification the specification prevails.

#### 1.3.2 Overseas Standards

Where no Australian Standard exists standards published by the British Standards Institute (BSI) or the American Society for Testing Materials are referenced.

### 1.4 PROJECT SPECIFIC REQUIREMENTS

Comply with all provisions in the PROJECT SPECIFIC REQUIREMENTS (PSRs) in the Request For Tender (RFT) or on the project drawings. Any conflicts must be advised in writing to the Superintendent for clarification.

### 1.5 AS CONSTRUCTED INFORMATION - WITNESS POINT

Document all changes and variations of the design as the work proceeds.

**Witness Point** - Provide amended versions of the information and drawings which reflect the as built conditions.

Provide hard copies of drawings, and CAD format in AutoCad (Dwg.) or Microstation or as requested by Superintendent.

Provide hard copies of the text information in A4 portrait format and in Microsoft Word document electronic format.

Provide the amended information and drawings to the superintendent progressively as the work proceed, with or before the claim for the variation which led to the need to amend the information and drawings to accurately reflect the as built conditions.

#### 1.5.1 Amended drawings – Hold Point

**Hold Point** - Before the work commences provide a proposed procedure for recording and submitting the amended drawings.

Use an independent surveyor who is eligible for membership of the Institution of Surveyors Australia or the Institution of Engineering and Mining Surveyors Australia to record the changes and variations.

### 1.6 DEFINITIONS

The terms used in this specification are in accordance with the definitions laid down in AS 1348 unless specified otherwise in the Definitions clauses.

#### AAPA

Aboriginal Areas Protection Authority.

#### APVMA

Australian Pesticides and Veterinary Medicines Authority.

#### ASTM

American Society for Testing and Materials.

#### Base

The layer of pavement immediately above the subgrade or sub-base and/or below the bituminous surfacing extending for the full width of the traffic lanes.

#### Carriageway

That portion of a road for the use of vehicles, that is between kerbs or barriers where these are provided, including shoulders and auxiliary lanes.

#### Catch Drain

A surface channel constructed along the high side of a road or embankment, outside the batter, to intercept the water.

#### CLC

Central Land Council.

#### CSR

Contractor Service Request.

#### DLPE

Department of Lands, Planning and the Environment

#### DLRM

Department of Land Resource Management

**Dry Density Ratio (DDR)**

The percentage ratio of the field dry density of a material to the modified maximum dry density of that material. This property is also termed Relative Compaction.

**EMP**

Environmental Management Plan.

**EPA**

Environmental Protection Authority.

**Excess Haulage**

Haulage for the distance in excess of 15 km one way.

**Formation Width**

The width of cut or fill, including table drains, out to the points of any batters.

**High Risk Construction Work**

Has the meaning given to it in the WHS Act.

**Hold Point**

Obtain the Superintendent's written approval for that particular part of the works.

**IRI**

International Roughness Index, stated as a numerical value.

**Material Extraction Areas**

(Formerly known as Borrow Pits)

An excavation outside the formation limits for obtaining fill, gravel, rock, rubble and other materials.

**max.**

Maximum.

**min.**

Minimum

**MMDD**

Maximum Modified Dry Density.

**NATA**

National Association of Testing Authorities.

**NLC**

Northern Land Council.

**NTCP/NTCOP**

NT Code of Practice – located in NTMTM.

**NTMTM**

Northern Territory Materials Testing Manual.

<http://www.nt.gov.au/infrastructure/publications/materialtesting/index.shtml>

**NTTM**

Northern Territory Test Methods – located in NTMTM.

**Pavement**

The portion of a road constructed for the structural support of, and to form the running surface, for traffic.

**PSRs**

Project Specific Requirements – appear in RFT - amendments to specified requirements published in Standard Specification reference texts.

**Recycled plastic**

Products from recycled and processed plastic wastes that have undergone processes in order to create new plastic products: proprietary products included.

**Remove**

Pick up and transport material to be removed to an approved disposal site. Use plant and equipment appropriate for the material to be removed and appropriate for the terrain.

**RFT, RFQ**

Request for Tender, Request For Quotation Provisions applicable to one are equally applicable to the other.

**Rock**

Hard naturally occurring elastic material which is not significantly affected by immersion in water and cannot be dug with construction equipment normally used for the particular operation.

**Roughness**

The roughness of the finished road surface in IRI as measured by a Roughness Meter approved by Superintendent.

**RTO**

Registered Training Organisation.

**RWA**

Restricted Work Area.

**SDS**

Safety Data Sheet formerly referred as Materials Safety Data Sheet (MSDS).

**Shall**

Is indicative of a mandatory requirement unless the context clearly indicates otherwise.

**Shoulder**

The layer of material immediately above the sub base or subgrade and adjacent of the pavement.

**Stop Berm**

An independent blockage of a table drain or a diversion of flow into a culvert.

**Sub-Base**

One or more layers of material placed over the subgrade and below the basecourse and shoulders.

**Subgrade**

Top 150 mm of material below subgrade surface.

**Subgrade Surface**

The prepared surface immediately beneath the pavement and shoulder layers.

## Surface Formation

The formation of a road from material generally cut from the table drains.

## Table Drain Block

A block constructed in a table drain to divert water into an offset drain.

## TCD

Traffic Control Diagram.

## TMP

Traffic Management Plan.

## URL

Uniform Resource Locator – an internet web address.

**Waste Disposal** (waste, rubbish, surplus items, surplus material).

Other material is to be removed and disposed of in compliance with the Waste Management and Pollution Control Act. These other materials are to be disposed of in approved waste disposal sites or facilities.

## Weeds

Weeds include both declared and non-declared species.

Declared weeds are plant species declared under the *Weeds Management Act*. Land managers have a legal obligation to manage these species.

Non-declared weeds are plant species which may represent a hazard to the public, impact road reserve assets or affect the aesthetics of a landscaped area. These plants can be exotic or native in origin. Non-declared weeds and their appropriate management methods will be identified by superintendent as part of the contract.

## WHS

Work Health and Safety. Also can be a reference to the NT Work Health and Safety (National Uniform Legislation) Act and its Regulations and their companion Codes of Practice (NT and Commonwealth).

## Witness Point

Give the Superintendent sufficient prior notice, in writing, of an action so that that part of the works may be inspected.

## WMB

Weeds Management Branch, a division of DLRM.

## You and Your

Indicative of the Contractor, any Sub-Contractor engaged to provide services under this contract, and any personnel engaged by either to provide services under this contract.

## 1.7 PROTECTION OF CULTURALLY AND HISTORICALLY SIGNIFICANT ITEMS

### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

Safeguard sacred Aboriginal relics and places, as defined by the Sacred Sites Act, within the road reserve. Where there is uncertainty as to the existence of sacred sites or relics, seek confirmation from the Aboriginal Areas Protection Authority (AAPA).

Safeguard any heritage assets including trees, as defined by the NT Heritage Conservation Act, which may be affected by the works.

Comply with conditions included in any Aboriginal Areas Protection Authority (AAPA) clearances or approvals applying to the site of the works. Observe the restrictions imposed by any Restricted Works Areas conditions applying to the site of the works.

Ensure all personnel working on site, including sub-contractors, are aware of any areas affected by these conditions.

Ensure all personnel working on site, including sub-contractors, comply with the requirements outlined in this clause.

Notify the Superintendent immediately if any items are found which are suspected of being items of significance in terms of this clause. Protect the items and the area surrounding where they were found. Do not carry out any works in the area surrounding where the items were found.

The Superintendent will advise the Contractor what actions are to be taken and when work may resume in the affected areas.

## 1.8 ESTABLISHMENT

### 1.8.1 General

Allow in the tender for establishment on site, including, but not necessarily limited to, the following:

#### Mobilisation

Transportation to and establishment on site, including all ongoing costs, of all the requirements to complete that stage of the work. Mobilisation will not be paid for work within 40 km of the regional post office. Refer to the Mobilisation diagram in MEASUREMENT AND PAYMENT or determined by regional requirements.

(If applicable) Refer to Project Specific Requirements section of Request for Tender.

#### Demobilisation

Removal and transportation from site of all temporary and construction facilities and equipment. Restoration of the site, on Practical Completion of the works, compatible with environs.

### 1.8.2 Camp Site/Compound/Workshop – Hold Point

**Hold Point** - Obtain written permission from the owner or lessee of the land. Provide a copy to the Superintendent.

Pay all costs associated with the use of the site(s).

Refer to the Department of Health-Environment Health Fact Sheet No.700 Requirements for Mining and Construction Projects for camp site requirements. It is available online at

[http://www.health.nt.gov.au/Environmental\\_Health/Health\\_Risk\\_Assessment/index.aspx](http://www.health.nt.gov.au/Environmental_Health/Health_Risk_Assessment/index.aspx)

Maintain all facilities in good condition.

Remove all facilities, unless otherwise agreed in writing with owner or lessee of land, and restore the site to a clean and tidy condition upon completion of the works.

Assume all responsibility for any current and consequential damage caused to the site as a result of occupation. Rehabilitate site similar to site conditions prior to disturbance.

Refer to Acts, Regulations And Codes Applicable To The Works And Authorities With Jurisdiction Over The Works table in the REFERENCED DOCUMENTS section.

### 1.9 TIME LIMIT FOR ATTENDANCE

Unless otherwise specified, the works must be attended within the following time limits:

- Generally the work must be attended within 3 working days of notification.
- For urgent call outs within and outside of normal working hours the Contractor must be mobilised within 2 hours of notification.
- For priority works, which involve health, safety and security, the Contractor must be mobilised within 6 working hours of notification.

### 1.10 EVIDENCE OF UNSCHEDULED WORKS

When requested by the Superintendent the Contractor will provide evidence for any unscheduled works.

The requirement for evidence shall include the provision of certified copies of the following:

- Material invoices
- Specialist sub-contractor invoices
- Time sheets, time records, vehicle log books and photos.

The provision of satisfactory evidence is a prerequisite to Payment for the work and percentage on-cost.

### 1.11 EXPLOSIVES - HOLD POINT

**Hold Point** - Provide evidence of the following requirements of NT Worksafe:

- License to carry and store explosives.

- Vehicle license to carry explosives.
- Shot Firer's certificate.

Inspect and record the condition of all structures and services subject to possible effect by use of explosives before and after blasting operations.

### 1.12 MATERIAL EXTRACTION AREAS AND WATER SOURCES – HOLD POINT

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

Material Extraction Areas adjacent to the works will be allowed provided that all the clearances and approvals listed in the Approvals For Material Extraction Areas clause in the Standard Specification for Environmental Management are obtained.

**Hold point** – Provide copies of clearances and approvals to the Superintendent before commencing works.

Material Extraction Areas will not be permitted within 125 m of the road centreline unless otherwise agreed upon by the Superintendent.

#### 1.12.1 Administration

Take responsibility for locating, selecting, operating and rehabilitating all Material Extraction Areas and water sources.

Determine any constraints on the use of potential Material Extraction Areas and water sources, including sites of significance, environmental and salinity etc.

#### 1.12.2 Crushing or Screening – Witness Point

The crushing or screening plant to be used on the project subject to this contract must be certified as fit for use by a competent person.

The certification of fitness for use must have been issued not more than one year prior to the date of the scheduled completion of the works plus one calendar month.

A competent person is defined in the NT Work Safe Bulletin 09.01.16 Competent Persons for Inspection and Maintenance of Plant.

**Witness Point** – Provide documentary evidence of the certification that the plant is fit for use issued by a competent person.

Provide documentary evidence of that person's skills and qualifications which indicate their competence as defined in the NT Work Safe Bulletin cited above.

This evidence is to be provided within 2 weeks of the award of the contract.

#### 1.12.3 Operation of Material Extraction Area ACCESS

Mark out with flags or other clear markings both proposed access route to Material Extraction Area

and boundaries of Material Extraction Areas or proposed Material Extraction Areas.

Obtain approval from Superintendent before commencing extraction or track construction works.

Construct only one access road to each pit.

Confine all transport operations to the access road.

Provide and maintain adequate road drainage.

Provide and maintain erosion and sedimentation controls to the access track and the Material Extraction Areas.

#### EXTRACTION

Strip 100 mm minimum depth top layer throughout the area of operation.

Stockpile stripped material clear of drainage to a maximum height of 1.5 m.

Side slopes of sand or gravel to be not steeper than one vertical to two horizontal at any time when the excavation is unattended.

By-products of the excavation operations to be removed or buried unless otherwise required.

Stabilise stockpiles to prevent erosion by using, for example, systems such as silt fences. For longer term stockpiles grassing and battering to 1:4 as well as silt fences are options.

#### LIMIT OF EXCAVATION

- Not within 6 m of any fence line or utility service.
- Not within sight of road traffic.
- Not within 125 m of any road or railway centre line.
- For waterways: Refer to the Department of Land Resource Management web page titled Land Clearing for the procedures and processes to be followed. The URL is: <http://www.lrm.nt.gov.au/land-clearing>.
- Maximum area: 1 ha. Align the long side with the contour.
- Maximum width: 50 m.
- Maximum depth: 2 m.
- Leave natural vegetation buffer strips 25 m width between pits.
- Do not dump or stockpile any material in these 25 m buffer strips,
- Stockpile cleared vegetation and subsequently spread over the surface of the extraction area.

Existing pits within 125 m of a public road may be used provided:

- No significant revegetation exists,
- Extension proceeds away from the road,
- Site is rehabilitated after use.

#### 1.12.4 Rehabilitation of Material Extraction Areas

Rehabilitate existing pits, or progressively rehabilitate new pits:

- Backfill all test pits.
- Respread unused material and rip 0.5 m deep at 3 m spacing along the contours.
- Remove and dispose of all rubbish and debris in approved disposal sites.
- Replace stockpiled topsoil and cleared vegetation uniformly over the extraction area.
- Batter walls at three horizontal to one vertical where excavation is less than 1 m depth, and six horizontal to one vertical where depth exceeds 1 m.
- Rehabilitate the access road.
- Repair any erosion damage to the site. Rehabilitate the site to prevent future erosion and sedimentation issues.

Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

#### 1.12.5 Stream Sites

Contact the EPA or Environmental Services prior to conducting any work in a stream site.

#### EXCAVATION LIMITS

- Not within 200 m upstream or downstream of any road structure, pipeline or gauging station.
- Not in a manner liable to cause erosion or further disturbance to the watercourse.
- Not within 15 m of the trunk of a tree and not under the branches of any tree.

#### CONDITIONS

- Leave sizeable islands to ensure groupings of trees that will withstand stream bed erosion.
- Maximum batter slope: Two horizontal to one vertical.

#### 1.12.6 Inspection

Allow authorised personnel from the EPA to enter the site at any time.

#### 1.12.7 Records

Provide the following details on completion:

- List of areas used.
- Chainages of area along the public road.
- Direction and length of haul road.
- Approximate volume of material removed from each site.

Provide suitable forms for such records to the Superintendent.

#### 1.12.8 Water Extraction

Comply with DLRM requirements for water extraction as they relate to road construction and maintenance.



On completion of the works advise the Superintendent the total volume of water extracted.

Take measures to minimise erosion, sedimentation, site disturbance and damage caused by the extraction and transportation of the water. Install appropriate temporary control devices or systems.

Rehabilitate disturbed or damaged areas.

### 1.13 STOCKPILES

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

Stockpiles are to be located in previously cleared areas.

If no clear area is available within a reasonable distance from the work site obtain approval from the Superintendent prior to clearing a new area.

The stockpile is to be located within the boundaries of the site of the works.

Construct gravel foundation for stockpiles with 100 mm compacted thickness. Trim and compact to 95% relative compaction.

Do not create a stockpile within;

- An environmentally sensitive area.
- A vegetated area without prior approval for clearing as stated above.
- On a flood plain.
- For waterways: Refer to the Department of Land Resource Management web page titled Land Clearing for the procedures and processes to be followed. The URL is: <http://www.lrm.nt.gov.au/land-clearing>.
- Where it will affect a site with cultural or heritage significance.
- Within 5m of the boundary of the cleared area.

Cover stockpiles with plastic sheet or other appropriate materials to prevent pre-coat, fines and dust from being released in to the environment during rain or wind events.

Stockpiles in urban areas are not permitted.

Provide a separate site for each aggregate size. Allow 15 m between adjacent sites.

Ensure sites are well drained and on hard ground. Avoid contamination by dust.

Maintain access roads and stockpile sites.

Avoid sites under trees, telephone lines, overhead transmission lines or where overhead clearance is less than 6 m.

Remove from site any non-conforming aggregate.

For work in or close to regional centres, towns and urban areas, remove all unused aggregate

from stockpile sites at conclusion of work. For rural work, prepare unused aggregate into one neat and tidy stockpile, per aggregate size.

Construct stockpiles at least 1 m high and batter sides 1V: 1.5H.

Trim neatly to facilitate measurement.

Neatly stockpile all waste materials from the screening process.

### 1.14 PLANT AND EQUIPMENT

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

#### 1.14.1 General

Do not clean spray bars or other contaminated equipment on the work site.

Clean plant and equipment in a location and in a manner which prevents pollution of the surrounding environment.

Clean plant and equipment before it is brought on to the site and immediately before it leaves the site to make it pest and weed free.

Plant and equipment is to be inspected and maintained as necessary during the course of the works. Emissions and fluid leaks are to be minimized by ensuring plant and equipment are well maintained, in good repair and in good working order.

#### 1.14.2 Mobile Plant Machinery - Broadband Alarm

##### Standards

AS 4742: Machine-mounted forward and reverse audible warning alarm (withdrawn)

ISO 9533: Earth-moving machinery - Machine-mounted audible travel alarms and forward horns - Test methods and performance criteria

##### Definitions

**Broadband alarm:** Pulsed acoustic signal that comprises a range of frequencies and sometimes referred to as quacker, woosher, non-tonal reversing beepers or white sound.

##### Broadband/White-Sound Alarm Requirement:

Broadband Alarms (White Sound) must be fitted to all construction vehicles and mobile plant before commencement of works.

Ensure that installation and operations of the alarm/warning systems are sufficient before commencement of works, including, but not limited to:

- All alarms clearly audible above the noise level of the machinery or vehicles.
- Alarms are automatically activated when reverse gear is selected in the vehicle to which it is fitted, or when the machine to

which the alarm is fitted is switched on and is in use.

- Directional nature of the broadband alarm is appropriate for works.

### 1.15 WORK HEALTH AND SAFETY

Comply with Work Health and Safety (NUL) Act and Regulations and applicable Codes of Practice.

#### 1.15.1 Safety Officer – Witness Point

**Witness point** - Appoint a Safety Officer and notify the Superintendent of the officer's name.

Ensure the Safety Officer is capable and available at all times as required by the Standards.

The Superintendent retains the right to revoke the appointment of the Safety Officer at any time, and direct that another person be appointed.

#### 1.15.2 Work Health and Safety Management Plan - Hold point

**Hold point** - If the Act requires it, provide a copy of the site specific Work Health and Safety Management Plan before commencing work.

Comply with the Work Health and Safety (National Uniform Legislation) Act and Regulations and any applicable Codes of Practice.

A person with control of a construction project, irrespective of monetary value of the contract, where five or more persons are working, or are likely to be working simultaneously on a construction site must ensure that:

- a site-specific Work Health and Safety Management Plan is prepared before the work commences; and
- The plan is monitored, maintained and kept up to date during the course of the work.

The person with control of the construction project must ensure that the Work Health and Safety Management Plan includes but not limited to:

- a statement of responsibilities, listing the names, positions and responsibilities of all persons who will have specific responsibilities on the site for Work Health and Safety;
- the detail of arrangements for ensuring compliance with the Work Health and Safety induction training requirements of this national standard;
- the detail of arrangements for the co-ordination of health and safety issues of persons engaged to undertake construction work;
- the detail of arrangements for managing Work Health and Safety incidents when they occur, including the identities of and contact details of all persons who will be available to prevent, prepare for, respond to and manage recovery from such incidents;

- any site safety rules, with the detail of arrangements for ensuring that all persons at the site, whether employees, contractors, suppliers or visitors, are informed of the rules;
- the hazard identification, risk assessment and risk control information for all work activities assessed as having safety risks; and
- The safe work method statements for all high-risk construction work.

#### 1.15.3 Work Involving Chemicals

Comply with Work Health and Safety (NUL) Act and Regulations.

SDS documentation for chemicals used during the works must be held on site at all times during the works.

Spill clean-up equipment and materials, appropriate for the type and quantities of chemicals used on site, must be kept on site at all times during the works. They must be kept in a readily accessible location. The equipment and materials must be maintained and replenished as needed.

Staff trained in the use of the spill clean-up equipment and materials must be on site at all times during the works.

Report all chemical spills to the Superintendent.

Where appropriate, also report spills to the NT Pollution Hotline, phone 1800 064 567.

Chemicals include, but are not limited to, paints, fuels, oils, herbicides, pesticides, tars, lubricants, cleaning products (domestic and industrial types), inks, dyes, toners, fertilizers etc.

### 1.16 FENCING AND SHORING OF OPEN EXCAVATIONS

Comply with Work Health and Safety (NUL) Act and Regulations.

Design, construct and maintain the excavation and shoring in a safe and satisfactory condition.

Support trenches in saturated or unstable ground with close timbered shoring or similar.

Ensure fencing and access / egress requirements are identified and implemented to comply with Workplace Health & Safety (NUL) Act and Regulations.

### 1.17 WORK ON RAILWAY SITES – HOLD POINT

Comply with Work Health and Safety (NUL) Act and Regulations.

Carry out work within railway sites to the approval of the owner and operator of the railway.

The Contractor must comply with all requirements, conditions and directions of the owners and operators of the Railway pursuant to the Northern Territory Rail Safety Act when carrying out work

under the Contract within 100 metres of the Railway.

Obtain any approvals or licences required for such work.

Comply with the terms of any current existing interface agreement for work within the railway sites.

Procure railway track possession, railway track isolation and access to railway land necessary for the construction of the works.

Provide documentation detailing all interfaces between the works under the Contract and the Railway or Railway land. The Contractor must fully comply with the terms of the plan.

The contractor indemnifies in the Principal in respect of any claim made by or liability to any person arising out of:

- The performance of work on, over or near the Railway, and
- The procurement or utilisation of a Railway track possession or track isolation (including any postponement, improper use or delay in relinquishing them).

Give 14 days written notice to the owner and operator of intent to commence work and provide a work plan showing safe working conditions for the site.

**Hold Point** - Do not commence work until the work plan has been approved by the owner and operator of the rail system. Provide copies of the work plan and of the approval to carry out the works to the Superintendent.

If work is required to be carried out within 3 m of the actual rail line, this work must be co-ordinated through the Superintendent.

#### **1.18 WORK IN THE VICINITY OF TRAFFIC COUNTING STATIONS – HOLD POINT**

**Hold Point** - Prior to commencing any excavation, boring of holes, blasting, rock breaking, soil compaction or similar activity in the vicinity of traffic counter station detector loops, obtain the location of the cables.

This information is available from Department of Transport, Transport Infrastructure Planning Division, contact 8924 7531.

Follow all directions and instructions issued by the Transport Infrastructure Planning Division in relation to work in the vicinity of such cables.

#### **1.19 DISTANCE MEASURING EQUIPMENT**

Install distance measuring equipment with a digital display capable of measuring to one metre, in all relevant work and supervisory vehicles within 4 weeks of the Contract being awarded.

Ensure that the measurement of kilometres is consistent with the Permanent Reference Points (PRPs) taken from the Department of

Infrastructure (DoI) Road Information Management System (RIMS) data sheets.

Verify the accurate locations of all work performed under the Contract to enable the Government Asset Management Database to be updated.

#### **1.19.1 Road Asset Information**

The Superintendent will provide a current Road Information Management System (RIMS) data sheet listing when the Contract is awarded and provide regular updates, as required, throughout the Contract.

The data sheet listing will include the following;

- Each road under the Contract,
- The respective identification number,
- The respective Permanent Reference Points (PRPs) and chainages.

Work will be located by reference to the information contained on the data sheet listings.

#### **1.20 CONSTRUCTION INDUSTRY WHITE CARD**

All workers on site are to have completed "General Safety Induction Training for the Construction Industry" (CPCCOHS1001A) and hold a valid current NT White Card issued in their name by NT WorkSafe.

Site specific and Task specific induction training is still required for all work sites and is to be provided by the employer.

#### **1.21 AREAS FOR VEHICLE AND PLANT MOVEMENT AND PARKING**

Restrict vehicle and plant movement, turning and parking to the area of the works or to previously sealed, cleared or disturbed areas not within the area of the works.

If no suitable previously sealed, cleared or disturbed area is available obtain Superintendent's approval prior to clearing or disturbing any area for these purposes.

Rehabilitate any area newly cleared or disturbed for these purposes at the completion of the works.

Protect the areas cleared or disturbed and adjacent areas against erosion and sedimentation.

#### **1.22 PROJECT NOTICE BOARDS-SUPPLY, ERECT AND MAINTAIN PROJECT NOTICE BOARDS**

Confirm if project notice board is required. If required allow to supply and install a notice board/project sign in accordance with the NTG standard drawings, wording and image to be supplied.



**1.23 ASBESTOS**

Comply with the requirements of NT WorkSafe and the Work Health and Safety (N.U.L) Act and Regulations. Refer to the Code of Practice – How to Safely Remove Asbestos and the Code of Practice - How to Manage and Control Asbestos in the Work Place.

**1.24 CONTRACTOR'S RESPONSIBILITY AND SUBMISSIONS****1.24.1 Warranties – Witness Point**

**Witness Point** - Provide the standard manufacturer's warranty. Name the Principal as the warrantee.

Contractors to submit details of warranties outlining the responsibilities of the manufacturers and contractors for the period of warranty.

**1.24.2 Contractor's Environmental Management Plan (CEMP) – Witness Point**

**Witness Point** - Submit details of procedures to protect the environment. Refer to the Standard Specification for Environmental Management. Submission of a Contractor's Environmental Management Plan (CEMP) may be required.

**1.24.3 Inspection Test Plans (ITPs) – Witness Point**

**Witness Point** - Submit ITPs detailing all procedures and test plans to be undertaken.

**1.24.4 Project Control Plan (PCP) – Witness Point**

**Witness Point** - Submit a project control plan for the project which sets out in detail all control procedures for the project. A framework Project Control Plan document is available at DOI Specification Services webpage: <http://www.nt.gov.au/infrastructure/techspecs/index.shtml>.

This document is to be prepared by the Contractor and not a third party.

**1.25 URGENT WORKS ATTENDANCE**

The contractor may be required to respond to urgent works that are outside the standard maintenance service level.

**1.26 OFFICER AND VEHICLE**

The contractor may be required to supply a suitably qualified and competent person acceptable to the Superintendent to perform other works associated with the contract, including road inspections, responses to reports and emergency requests.

The Contractor shall equip that person with a suitable vehicle, mobile communication, and all necessary equipment to attend the request.

**Negotiated Rate**

Where a type of works is described but does not appear in the Schedule of Rates or is not defined in the Specification and not included in the Schedule Of Rates items, a rate shall be negotiated to cover the works required.

The item of works may then be included in the Schedule Of Rates at the Superintendent's discretion.

**1.27 DIVING WORK****1.27.1 General**

Comply with the Work Health and Safety (NUL) Act and Regulations.

Comply with ADAS Operation Manual or DRDC (formerly DCIEM) Diving Manual or NOAA Diving Manual.

**1.27.2 Standards**

AS/NZS 2299 Occupational diving operations

AS/NZS 2299.1 Standard operational practice

AS/NZS 2299.2 Scientific diving

AS 2815 Training and certification of occupational divers

AS 2815.1 Occupational SCUBA diver – Standard

AS/NZS 2815.2 Surface supplied diving to 30 m

AS 2815.3 Air diving to 50 m

AS 2815.4 Bell diving

AS 2815.5 Dive supervisor

**1.27.3 Definitions**

ADAS Australian Diver Accreditation Scheme

DRDC Defense Research and Development Canada

NOAA National Oceanic and Atmospheric Administration (USA)

WHS(NUL) Work Health and Safety (National Uniform Legislation)

**1.27.4 Diver Qualifications**

Provide evidence of competency for all personnel undertaking diving work (general occupational diving or high risk diving as applicable). Minimum competencies required are the competencies required by ADAS deemed by ADAS to be appropriate for the works to be undertaken. Refer to AS 2815 (set).

### 1.27.5 Dive Safety Log

Maintain and provide Dive Safety Log (in accordance with Regulation 180, of the WHS(NUL) Regulations). To be provided for review on request and at completion of works. Refer to AS/NZS 2299 (set).

### 1.27.6 Dive Plan

Submit a Dive Plan (in accordance with Regulation 178, of the WHS(NUL) Regulations). To be submitted after contract award and at least 14 days prior to commencement of diving works. Refer to AS/NZS 2299 (set).

The Dive Plan is to include:

- the method of carrying out the diving work to which it relates;
- the tasks and duties of each person involved in the dive;
- the diving equipment, breathing gases and procedures to be used in the dive;
- as applicable, dive times, bottom times and decompression profiles;
- hazards relating to the dive and measures to be implemented in the control of risks associated with those hazards;
- emergency procedures.

### 1.27.7 Crocodile Hazard Management

Provide a Crocodile Hazard Management Plan where diving work is to occur in waters known to have, or suspected of having, crocodiles. The plan can include, but not be limited to;

- Having spotters at water level and on a bridge
- Minimizing movement of vessels once diving work commences to reduce risk of attracting crocodiles
- Establishing a communication plan and having a communications system or methodology in place so that all parties conducting the activity can communicate with each other

### 1.27.8 Dive Cage

Diving work in waters known to have, or suspected of having, crocodiles is to be carried out by divers who are protected by a dive cage. This dive cage should be engineered for the task and can be mounted to either a service barge or other watercraft or lowered from a bridge, depending on the task environment.

### 1.27.9 Crocodile Net

If a crocodile net is the only viable option provide details of the construction of the net and its support systems and provide details of the risk management plan which will be in place during use of the net.

### 1.27.10 Response if a crocodile is spotted

Ensure or personnel move to a safe place.

Contact the Crocodile Management Unit of the Parks and Wildlife Service

- Darwin All hours 0419 822 859 or 0401 118 776 or Office hours 8999 4691
- Katherine All hours 0407 958 405 or Office hours 8973 8849

If safe and practical to do so, monitor the movement of the crocodile(s) so that the personnel from the Crocodile Management Unit can be told of the crocodiles last known location.

### 1.28 OTHER REQUIREMENTS

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 2. PROVISION FOR TRAFFIC



### 2.1 GENERAL

Minimise obstruction and inconvenience to the public.

Ensure public safety is accommodated at all work sites.

A traffic escort vehicle is required for all resealing works.

Assume responsibility for the safe conduct of traffic through, past or around the works, 24 hours a day, from possession of the site to completion of all works, defects liability period (if any) and handover.

Comply with the Acts, Regulations, Codes and Guidelines applicable to the works. Comply with the requirements of Authorities which have jurisdiction over the works or the sites of the works.

Comply with the Work Health and Safety (NUL) Act and Regulations.

### 2.2 STANDARDS

Conform to the current editions of the following Standards and Publications unless specified otherwise: AS 1742.3 Manual of uniform traffic control devices - Traffic control devices for works on roads.

AS 1742.9 Manual of uniform traffic control devices – Bicycle facilities

AS 1742.10 Manual of uniform traffic control devices – Pedestrian control and protection

AS/NZS 1906.1 Retroreflective materials

AS/NZS 3845.1 Road safety barrier systems

AS 4191 Portable traffic signals

AS/NZS ISO 3100 Risk management

NTTM NT Test Methods.

NTMTM NT Materials Testing Manual.

AUSTROADS Guide to Road Design

AUSTROADS Guide to Bridge Technology

NT WorkSafe All Relevant Bulletins

## 2.3 DEFINITIONS

### Long term

Applies when traffic guidance is required to operate for more than one shift, irrespective of whether it is day or night.

### Short term

Applies when work is started and completed in one shift and the road is returned to normal conditions by the end of that shift.

### Traffic Controller

The person responsible for the control of traffic on public roads utilising a stop-slow bat.

## 2.4 WORKZONE TRAFFIC MANAGEMENT

### 2.4.1 Traffic Management Personnel

All personnel engaged in the works must have a current valid NT Construction Induction White Card, or equivalent qualification recognised by WorkSafe NT. Evidence must be available on site in the form of a card.

Only persons qualified in nationally accredited units of competency in WorkZone Traffic Management can be utilised for traffic management at worksites. The four levels of accreditation are:

- Workzone Traffic Supervisor (WZ3)
- Workzone Traffic Controller (WZ2)
- Workzone Traffic Management Plan Designer (WZ1)
- Escort mobile road marking operations (WZ 4)

The Superintendent may grant approval for the use of a "Trainee Traffic Controller" within the work site. Such approval will only be considered after submission of a written request. A Trainee Traffic Controller cannot commence work until such approval has been granted and received in writing.

### 2.4.2 Trainee Traffic Controller

A Trainee Traffic Controller must meet all of the following criteria:

- be an employee of the Traffic Control Provider,
- hold a valid current Australian motor vehicle driver's licence,
- be registered with a Northern Territory Registered Training Organisation (NT RTO) to undertake the RII09 Resources and Infrastructure Industry Training Package unit of competency "RIIWH205D Control Traffic with a STOP/SLOW Bat" (or the replacement unit of competency if and when applicable),
- only work under the direct supervision of a Controller (WZ2),
- have commenced training to become a qualified Controller (WZ2) and complete all

assessments of competency within 8 weeks of registration.

The direct supervision of a Trainee Traffic Controller is defined as the constant personal oversight of the work by a Workzone Traffic Controller (WZ2).

#### **2.4.3 WorkZone Traffic Controller (WZ2)**

The following prerequisites must be met to enable NT accreditation as a Traffic Controller (WZ2):

- hold a valid current Australian motor vehicle driver's licence, and either
- successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency "RIIWHS205D Control Traffic with a STOP/SLOW Bat" (or the replacement unit of competency if and when applicable) training course through an Northern Territory Registered Training Organisation, or
- successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency "RIIWHS205D Control Traffic with a STOP/SLOW Bat" (or the replacement unit of competency if and when applicable) training course through a Registered Training Organisation from another State or Territory AND successfully completed a bridging course through a Northern Territory Registered Training Organisation in the above unit of competency.

#### **2.4.4 WorkZone Traffic Supervisor (WZ3)**

The following prerequisites must be met to enable NT accreditation as a Traffic Supervisor (WZ3):

- hold a valid current Australian motor vehicle driver's licence, and either
- successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency "RIIWHS302D Implement Traffic Management Plan" (or the replacement unit of competency if and when applicable) training course through an Northern Territory Registered Training Organisation, or
- successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency "RIIWHS302D Implement Traffic Management Plan" (or the replacement unit of competency if and when applicable) training course through a Registered Training Organisation from another State or Territory AND successfully completed a bridging course through a Northern Territory Registered Training Organisation in the above unit of competency.

#### **2.4.5 WorkZone Traffic Management Plan Designer (WZ1)**

The following prerequisites must be met to enable NT accreditation as a Traffic Management Plan Designer (WZ1):

- hold a valid current Australian motor vehicle driver's licence, and either
- successful completion of RII09 Resources and Infrastructure Industry Training Package unit of competency "RIICWD503D Prepare Workzone Traffic Management Plans" (or the replacement unit of competency if and when applicable) training course through an Northern Territory Registered Training Organisation, or
- successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency "RIICWD503D Prepare Workzone Traffic Management Plans" (or the replacement unit of competency if and when applicable) training course through a Registered Training Organisation from another State or Territory AND successfully completed a bridging course through a Northern Territory Registered Training Organisation in the above unit of competency.

#### **2.4.6 Escort Mobile Road Marking Operations (WZ 4)**

The following pre requisites must be met to enable Northern Territory accreditation as an Escort mobile road marking operations (WZ 4):

- hold a valid current Australian motor vehicle driver's licence, and either
- successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency "RIICRM201D Escort mobile road marking operations" (or the replacement unit of competency if and when applicable) training course through a Northern Territory Registered Training Organisation, or
- successful completion of the RII09 Resources and Infrastructure Industry Training Package unit of competency "RIICRM201D Escort mobile road marking operations" (or the replacement unit of competency if and when applicable) training course through a Registered Training Organisation from another State or Territory AND successfully completed a bridging course through a Northern Territory Registered Training Organisation in the above unit of competency.

#### **2.4.7 Traffic Escort Vehicle – Resealing Works**

Provide a traffic escort vehicle for all work sites where resealing works are undertaken under the contract. The vehicle must have, as a minimum, one rotating beacon light. The escort vehicle is to be the lead vehicle for traffic permitted to pass through the work site at the direction of the traffic control personnel. The escort vehicle is to control the speed of the traffic to ensure safety of road works personnel. The driver of the escort vehicle is to have adequate skills and knowledge to be able to maintain safety of the public and of the roadworks personnel.

#### 2.4.8 NT Accreditation in WorkZone Traffic Management

NT accreditation is provided by the following process:

- Completion of training course (or courses) as outlined above,
- Obtain WorkZone Traffic Management ID Card from NT Motor Vehicle Registry.

#### 2.5 TRAFFIC MANAGEMENT PLAN (TMP)

Standard: To AS 1742.3 Traffic control for works on roads.

Provide a Traffic Management Plan and Generic Traffic Control Diagrams of a complex and noncomplex nature per activity as required for the scheduled works.

##### 2.5.1 Traffic Management Plan – Hold Point

**Hold Point** – Submit the Traffic Management Plan, with the Traffic Control Diagrams prior to commencing the works.

Provide specific or generic Traffic Control Diagrams (TCD) per activity as required and/or as specified.

The Traffic Management Plan (TMP) is required to be designed by a Northern Territory accredited Traffic Management Plan Designer. Include the details of the TMP Designer's name, accreditation number and date of expiry of accreditation on the TMP.

Design the TMP in conformance with the requirements of AS 1742 – 'Manual of uniform traffic control devices Part 3: Traffic control for works on roads'. Produce the plan by electronic means and submit electronically to the Superintendent.

Include sufficient details on the TMP to explain the potential hazards, the assessed risks and the proposed treatments for the proposed work activities and work site which may include some or all of the following:

##### 2.5.2 Project Information

- Purpose and Scope
- Project Location
- Site Constraints/Impacts
- Traffic Management Objectives and Strategies
- Principal for the Works; Principal Contractor/Design Consultant including contact details
- Responsibilities including role responsibility and authority of key personnel, management hierarchy including site representatives and contact details of the responsible personnel
- Prior approvals (if any) granted by the Road Authority with relevant reference number.

#### 2.5.3 Works on Roads

- Project scope inclusive of works to be undertaken, staging of works, duration of works (work hours)
- Existing Traffic and Speed environment
- Roles and Responsibilities
- Traffic Management Responsibility Hierarchy
- Project Representatives
- Traffic Management Administration

##### 2.5.4 Statutory Requirements

- Work Health and Safety (NUL) Act and Regulations
- Provide details on the TMP of responsibilities and authorities of all key personnel on the project including project manager, line managers (site engineers, supervisors etc.), contractors and workers, safety personnel and traffic management personnel
- Requirements of personal protective equipment, plant and equipment
- Procedures for incidents or accidents

##### 2.5.5 Monitoring and Measurement

- Site Inspections and Record Keeping
- TMP Auditing
- Public Feedback
- References

##### 2.5.6 Management Review

- TMP Review and Improvement
- Variations to Standards and Plans
- Attention to hazards for non-motorised road users

##### 2.5.7 Planning

- Risk Identification and Assessment – Critical element to identify and assess foreseeable potential hazards associated with the work activities and work site
- Legal and Other Requirements – Confirmation of use of up-to-date information and legislation

- Traffic Assessment (Vehicular Traffic)
- Volume and Composition
- Existing and Proposed Speed Zones
- Intersection Capacity
- Existing Parking Facilities
- High Wide Loads
- Public Transport

Special Events and Other Works

Non-motorised Road Users

- Cyclists and Pedestrians
- People with Disabilities
- School Crossings

Site Assessment

- Access to Adjoining Properties
- Environmental Conditions

- Impact on Adjoining Road Network
- Works Programming
- Work Sequence
- Night Works
- Emergency Planning
- Consultation and Communication

#### Approvals

- Road, Utility and Service Authorities
- Public Notification
- Notification to Other Agencies

#### 2.5.8 Implementation

- Hazard Identification, Risk Assessment and Control
- Traffic Control Diagrams
- Traffic Control Devices
- Signs
- Pavement Markings
- Variable Message Signs
- Delineation
- Temporary Speed Zones
- Emergency Arrangements
- Site Access
- Communicating TMP Requirements

#### 2.5.9 Submission Of Traffic Control Diagrams

Provide specific or generic Traffic Control Diagrams (TCD) per activity as required and/or as specified.

Where a traffic management situation is not covered by a generic TCD, submit the specific TCD to the Superintendent 5 working days prior to undertaking the required works. Submitted TCDs shall, in turn, then become generic.

For Urgent Works, advise of the generic TCD or submit the specific TCD within 2 working days.

Provide amended TCDs which incorporate changes which have been approved by the Superintendent on site within two working days of the authorisation of the change

### 2.6 AUDITS OF WORK SITE TRAFFIC MANAGEMENT

Appropriately qualified and experienced Auditing Officers from DoI Road Projects may perform random audits of traffic management at work sites as part of their daily routine duties. The Auditing Officer will hold current NT accreditation as a Traffic Management Plan Designer. Project Officers may collect information on behalf of, and for forwarding to, the Auditor.

Audits undertaken will include verification of:

- The Traffic Management Plan held on site
- The Traffic Control Diagram(s) held on site
- Traffic control devices established in accordance with the Traffic Control Diagram

- The correctness and currency of accreditation of all personnel associated with traffic management at the work site.

Where the Auditing Officer deems modifications to Traffic Management are required for reasons of public safety or safety on the work site, an Instruction to Contractor (ITC) will be issued requesting immediate correction. If modifications are deemed necessary but not urgent, corrections are to be made at the earliest practicable opportunity.

#### 2.6.1 Non Compliance

Where personnel associated with traffic management at work sites are found not to have current accreditation to an appropriate level in WorkZone Traffic Management, the Superintendent may direct the Contractor to cease work, make the site safe, and withdraw plant, equipment and personnel from the road reserve.

### 2.7 WORK IN RURAL AREAS – HOLD POINT

**Hold Point** - Undertake work during daylight hours only unless approval is given by the Superintendent for special circumstances.

### 2.8 WORK IN BUILT UP AREAS

#### 2.8.1 Working Times – Hold Point

Program work, provide and install traffic management devices/controllers, equipment, materials etc., accordingly so that traffic flows are not impeded during the following hours, from Monday to Friday, excluding Public Holidays:

**Table 2.1 – Restricted Work Hours In Build Up Areas**

0700 hours to 0900 hours.
1530 hours to 1730 hours.

This table is only an example of peak traffic periods in urban areas.

**Hold Point** - Obtain Superintendent's approval if proposing to work inside these hours.

Remove or cover signs or devices as appropriate to stop confusion during these hours. Further restrictions may apply should the DoI deem it appropriate to do so. Concessions to work within these hours may be approved by the Superintendent, should the need arise and the officer deems it necessary.

Do not operate construction vehicles used in conjunction with the proposed works, either SV plated or vehicles in excess of 19 m on public roads during peak traffic times (see above, working times) or in any way impede peak traffic flow during these times. Vehicles in excess of 19 m in length are only permitted to travel on roads designated for road trains unless an appropriate permit from the Motor Vehicle Registry has been obtained in advance of using such routes.

## 2.8.2 Traffic Lanes

Maintain at least 2 lanes (one in each direction) open to traffic at all times unless permitted otherwise on duplicated roads and maintain at least one lane open on two lane roads with appropriate traffic control in place accordingly. Obtain the written permission of the Superintendent if it is necessary to fully close a road.

Program works so that the closure of turning lanes is minimised.

Obtain prior written approval from the relevant Local Government or Council if traffic is to be detoured onto their road network or the proposed works affects their network/assets accordingly.

Provide a copy of all relevant approvals with the traffic management plan.

## 2.9 WARNING DEVICES

Take care when placing warning signs, work signs, traffic management devices, or plant and equipment within the road reserve to ensure that these do not interfere with or restrict sight lines, particularly at intersections and ensure that the devices are not obscured by trees or other objects.

Ensure that road work signs reflect the current conditions of the site. Remove or cover signs such as T1-5 (worker symbolic), temporary speed reductions and the like, when not appropriate, such as when no persons are on site. Refer to AS 1742 for guidance on the appropriate use of these signs.

### 2.9.1 Works in Progress Signs

For proposed works which are expected to be in progress for greater than 14 days, display signs, sized 1200 x 900mm with 100mm high black Helvetica medium lettering on a white background displaying the following details:

- The nature of the works.
- The start and end date of the works.
- The Contractor's business name.
- The Contractor's business phone number.
- The Contractor's after hours phone number.
- The name of the Traffic Management Plan supervisor.

Display these signs prominently at the extremities of all works in progress and in addition to the work

signs requirement. The signs remain the property of the Contractor.

### 2.9.2 Multi Panel Signs

The use of multi panel sign configuration for "Traffic Controller Symbolic" & "Prepare to Stop" being mounted on one multi sign frame shall conform to AS 1742.3.

The use of the "Prepare to Stop" sign is mandatory in conjunction with the symbolic traffic controller sign where traffic are required to stop at the controllers position, therefore DoI approves making this the exception to the "No multi sign rule".

These signs must be on the one frame either side by side or one above the other. The individual signs are to be 900 mm x 600 mm minimum each when used stand alone, but may be reduced in size on a multi panel sign frame provided that the legend and / or symbol size are not reduced.

DoI will allow a multi panel sign frame for this use only in accordance with the directions herein and those contained within AS 1742.3.

Mount signs on Oz Spike posts or similar, or set in concrete in accordance with the requirement for permanent speed sign installation.

## 2.10 NT SPECIFIC REQUIREMENTS FOR ROAD WORK SIGNS

### 2.10.1 Sign erection

Refer to the Definitions clause.

Refer to **Table 2.2 – Sign erection requirements.**

Ensure that signs are clean, free of damage and comprise of a minimum of Class 1 retroreflective material in accordance with AS/NZS 1906.1.

Duplicate all temporary work signs (place on both sides of roads within the work site) on all multilane work sites, irrespective of the duration of the works, unless there is insufficient room available to do so, such as the median width being not sufficient to accommodate the signs. Where necessary, seek direction from the Superintendent where this condition cannot be complied with.

### 2.10.2 Advance warning signs

In urban areas T1-1 (road work ahead) signs and T2-16/17 (end road work) signs at short term work sites are not mandatory, however, they may be used if deemed appropriate. Use these signs at all long term or rural work sites.

**Table 2.2 – Sign erection requirements**

Application	Requirements
Long term rural areas:	Place all signs a minimum 1 m lateral clearance from the travelled path and a minimum of 1.5 m from the lower edge of the sign to the ground.
Long term urban areas:	Place all signs a minimum of 2.2 m from the lower edge of the sign to the ground in locations where they could be obscured by parked vehicles, vegetation or trees or may interfere with pedestrian routes. On traffic islands or medians the heights for signs shall comply with the “short term all areas” requirements where it is deemed appropriate but only if they are not obscured by parked vehicles and if they do not interfere with pedestrian routes.
Short term all areas:	Display all signs prominently and place a minimum of 200 mm from the lower edge of the sign to the ground, except regulatory signs such as speed, no parking signs etc., which shall be mounted a minimum of 1.5 m from the lower edge of the sign to the ground. Place all signs a minimum of 2.2 m from the lower edge of the sign to the ground where they could be obscured by parked vehicles, vegetation or trees or may interfere with pedestrian routes.

Only use T1-25 (road work on side road) signs on major or arterial roads or highways where works are being conducted on a lower hierarchy road i.e. roads with lower volume or speeds that intersect with such a major or arterial road or highway. Do not use these signs on lower hierarchy roads that intersect with a major or arterial road or highway.

### 2.10.3 Star pickets & fence droppers

Do not use star pickets for support of road work signs, bunting, flagging, fencing, etc. within 9 m of the trafficked path. Issues of sign, bunting, flagging, fencing, etc. stability can be addressed by prudent use of properly manufactured sign legs, sand bags, Oz spike posts and or fence droppers.

Do not use star pickets or any other non-frangible items such as steel drums, for delineation or any other purposes within 9 m of the edge of the trafficked lanes. Bollards, cones and flagging are appropriate alternatives.

Fence droppers may be used as sign supports or legs and bunting or flagging supports on the condition that the droppers are securely embedded into the ground and the sign, bunting or flagging is sufficiently secured to the droppers. Maintain prudent use of end caps to ensure the minimisation of any hazards to workers and the public and the specified sign heights can be achieved.

Star pickets may be used for fencing support within the work site, provided appropriate action is taken to reduce any associated hazard for workers within the site and they are not within 9 m of the travelled path of motorists.

### 2.10.4 Non-Standard signs – Hold Point

Obtain specific approval from the Superintendent before using signs not included in AS 1742.3.

### 2.10.5 Variable message signs (VMS)

Where major disruptions or changes to the traffic part are likely to occur, provide electronic variable message signs in the following situations a minimum of 2 days before any changes occur, where changed conditions and or delays are to be experienced by the general public, particularly peak hour traffic;

- At all approaches to intersections,
- At approaches to detours and / or,
- At approaches to major works alterations.

Erect variable message signs on all approaches 7 days before “turn on” of new traffic signals.

Assume full responsibility for the safe location of the variable message signs.

Use electronic variable message signs capable of displaying a minimum text size as specified in AS 1742.3 and containing at least 3 lines with a minimum of 8 characters per line.

The Superintendent may provide details of the messages to be displayed and the locations of the variable message signs.

Do not, under any circumstances, use variable message signs for private advertising, within the NT Government road reserve or visible from the NT Government road reserve without the written approval of the Superintendent.

### 2.10.6 Multi Message Signs

Do not use multi message signs. Stand-alone signs must be used.

### 2.10.7 Work Zone Speed Limits - Mandatory

Where work zone speed limits are being proposed to be changed, the proposed temporary speed limits must be approved by the Superintendent prior to implementation of the proposed speed limits.

Erect speed limit signs in accordance with clause SIGN ERECTION.



All Traffic Management Practitioners must record in their Daily Diaries time, date, location photographs of each approach, of speed limit installations and removals for legal purpose. These logs are required to be sent to the DoI Permit Officer at the completion of each project or monthly for long term projects greater than 1 month, via the Roads Reception 8999 4699, or faxed to 8999 4682.

### 2.10.8 Temporary Speed Limits – Hold Point

Submit temporary speed limit authorisation applications to alter speed limits to the Superintendent, 2 working days prior to the implementation of temporary speed limits, for approval under the Control of Roads Act.

Place repeater speed limit signs along the road, which has a temporary speed limit imposed, after all intersections with other roads within the speed limited area.

Design the Traffic Management Plans so that speed limits lower than the following minimums are not required.

<b>Table 2.3 – Target Lowest Speed Limits</b>	
<b>Application</b>	<b>Target speed limit not lower than</b>
Urban or built up areas.	40 km/h
Bridge works, when restricting traffic to one lane and only in conjunction with a stop-traffic situation. A safety barrier conforming to the relevant Test Level in accordance with AS/NZS 3845 shall also be used.	40 km/h
All other rural works.	60 km/h unless site conditions warrant a lower speed limit.

### 2.10.9 Road Safety Barriers

Design, install and maintain all road safety barriers used within the NT Government's road reserve in accordance with AS 1742.3, AS/NZS 3845.1 and any other relevant and current Australian Standard associated with the works being proposed.

Failure to meet the requirements of the relevant and current standards may result in the project being suspended by DoI or other relevant authorities, such as NT Work Safe, without cost to that authority until the project meets the required safety standards.

## 2.11 EXCAVATIONS, STOCKPILES AND GRADIENTS WITHIN WORK ZONES AND CLEAR ZONES

### 2.11.1 NT WorkSafe Guideline in Relation to Excavations

Provide shoring to all trenching or excavations which are deeper than 1.5 m and where a person is required to enter unless an engineer certifies that shoring is not required. Provide a copy of the Engineer's certification on request.

Comply with the provisions of the Code of Practice for Excavation Works available from Safe Work Australia. Comply with the NT Work Safe Codes of Practice and Safe Work Australia Codes of Practice applicable to the works.

### 2.11.2 DoI requirements for excavations, stockpiles or other gradients

Comply with the following DoI requirements for excavations, stockpiles or other level change greater than 150 mm in addition to Appendix D of AS 1742.3:2009 Protection and delineation at excavation works.

Implement the minimum protection requirements in accordance with AS 1742.3 during each work day, however, if any excavations, stockpiles or other steps in level change greater than 150 mm are to be left in place longer than one work shift or are left unattended for any period of time, during any day, overnight or weekend and adequate clearance in accordance with AS 1742.3 is not available, protect them by prudent use of approved road safety barriers, backfilling, covering and or removing from site accordingly.

## 2.12 TEMPORARY PAVEMENT MARKING

Where new pavement surfacing or existing pavement resurfacing is being undertaken, install temporary raised reflective pavement markers at the end of each day and prior to the loss of daylight at 24 m maximum spacing.

If so instructed by the Superintendent, temporary line marking at the end of each day may also be required until completion of the works when the permanent line marking is reinstated.

Only use temporary raised reflective pavement markers that conform to AS 1742.3, Section 3.9.

For long term road construction works where sealed detours merge into existing sealed pavements, or where sealed side roads merge into sealed detours, line mark transition areas in accordance with the standard drawing for Line Marking CS 1520 and in accordance with AS 1742, including the setting out of arrows, letters, numerals and chevrons.

### 2.12.1 Removal of Temporary Line marking

All line removal works must be carried out in such a manner as to not endanger the health, safety or

amenity of employees, road users or the general public.

Carry out removal of markings in such a manner as to minimise damage to pavement surfaces.

Obliterate markings so as they are no longer recognisable as marking. When arrows, letters or figures are to be removed, the removal pattern must be in the shape of a rectangle or square to minimise confusion to the motorist, particularly in wet weather and poor lighting conditions.

The removed marking and the material and the material used to remove the marking must be contained, collected and disposed of in an environmentally acceptable manner. Refer to DLP Road Network Technical Directive RNDTD08-01 Removal of Line Marking.

## 2.13 TRAFFIC CONTROL - WITNESS POINT

Modify the Traffic Management Plan during the works to suit site conditions if required or requested by the nominated DoI Contact Officer.

**Witness Point** - The Superintendent must appraise all changes to the TMPs and TCDs prior to implementation of any changes, unless there is an urgent need for amendments to mitigate hazards. In situations where immediate hazard mitigation is necessary the changes may be implemented and the Superintendent advised of the changes as soon as practicable thereafter.

If an incident occurs within, adjacent to, on approach to or departure from the work site, make a photographic record of the traffic control devices, site conditions, placement of plant and equipment etc., as soon as practical after the event. Advise the Superintendent of the incident as soon as possible.

Only permit single lane operation of two way traffic when traffic is directed by accredited WZTM controllers and signs or portable traffic signals etc. are employed, dependant on the site conditions and after obtaining the appropriate approvals.

Organise Police control as required, or as requested by the Northern Territory Police should the need arise.

## 2.14 SIDE TRACKS FOR DETOURS

### 2.14.1 Construction

Provide side tracks for detours when it is impractical to provide for traffic on the existing road system. Design and construct side tracks to conform to AGRD Austroads Guide to Road Design and the following minimum standards:

**Table 2.4– Side Track Minimum Requirements Part 1**

Side track characteristic	Roadway Type		
	National Highway	Secondary Highway	Local Road
Carriageway Width	10 m	8 m	6 m
Design Speed	80 km/h	60 km/h	40 km/h
Horizontal Curve radius with 3% superelevation	250 m	150 m	50 m
Vertical Curve radius (crest)	2,500 m	1,000 m	400 m
Vertical Curve radius (sag)	1,000 m	600 m	400 m
Pavement Width	8 m	6 m	4 m
Gravel Pavement Thickness (when specified)	150 mm	100 mm	50 mm
Lateral Clearance to Obstruction (from edge of carriageway)	2.5 m	1.2 m	1.0 m

**Table 2.5 – Side Track Minimum Requirements Part 2**

Item	Requirement
Signs/Warning devices:	As in Traffic Control Plan.
Guideposts:	At all fills, curves and crests.
Flood gauge posts:	At all floodways.
Total length at any one time:	5 km max.
Side track type:	Gravelled/Sealed Refer to PSRs

Compact top 150 mm to 95% relative compaction.  
Match side tracks neatly to the existing road system.

Provide sufficient resources to direct and assist traffic, when side tracks become restricted.

Carry out immediate remedial works when traffic is delayed by poor side track conditions or surface condition is dangerous.

Provide and maintain adequate drainage. Ensure drainage measures do not cause or accelerate erosion.

## 2.14.2 Maintenance

Maintain the existing road network, and all side tracks, in use by the public.

Prevent dust nuisance by water spraying at regular intervals to keep surface moist.

Do not use waste oil as a dust suppressant.

Remove debris and rubbish.

Maintain road signs and guide posts in a clean state.

**Table 2.6 – Side Track Maintenance Requirements**

Surface type	Maintenance required
Sealed Surfaces:	Patch and repair all surfaces. Grade and roll shoulders.
Unsealed Surfaces:	Regrade and roll to maintain a comfortable riding quality at design speed.

## 2.15 ACCESS TO ADJACENT PROPERTIES AND SIDE ROADS

Maintain access to adjacent properties and side roads at all times to a level appropriate for the type and frequency of traffic.

Provide and erect proposed and approved signs detailing alternative access, only after approval from the Superintendent is obtained.

Ensure adequate access is maintained for pedestrians and cyclists as required, including delineated access if existing paths are being closed as part of the works.

## 2.16 TEMPORARY PEDESTRIAN ACCESS

Conform to: AS 1742.9 and AS 1742.10.

Maintain access for pedestrians, cyclists and persons with disabilities passing through and around the work site. Where existing paths are to be demolished or will become inaccessible or modified due to construction works, provide temporary access to a standard not less than the pre-existing or pre-construction standard.

Temporary access must;

- Be clearly delineated and have adequate width and height clearance.
- Be smooth, free draining and free of obstructions and loose material.
- Provide clear guidance where paths change direction.
- Be illuminated by temporary lighting in urban areas to assist path users where existing street lighting has been removed or affected by the works.
- Be arranged so that path users are clearly visible to vehicle drivers and plant operators at road crossing points.

## 2.17 TEMPORARY BRIDGING – HOLD POINT

Design and construct any temporary bridging in accordance with the Austroads Guide to Bridge Technology.

**Hold Point** - Obtain written approval from the Regional Manager, Road Projects prior to commencement of any such works.

Ensure all environmental approvals have been obtained prior to the commencement of the works.

**Hold Point** - Provide copies of approvals obtained by Contractor to the Superintendent prior to the commencement of the works.

Provide and erect signage, fencing, road safety barriers and or guard railing etc. to prevent accidental access to the feature being bridged.

## 2.18 CONTRACTOR'S PLANT AND EQUIPMENT - HOLD POINT

Provide public traffic right of way at all times unless traffic control is in use.

Keep parking and materials storage clear of trafficked areas and clear zones in accordance with applicable AUSTROADS guides.

Do not leave equipment or tools unattended as a hazard to the public.

**Hold Point** - On roads carrying significant traffic, floodlight the road and area within 50 m of the site when working at night, if approved by the Superintendent, to a ground level luminance of 10 lux minimum.

### 2.18.1 Mobile Plant - Broadband Alarm

#### Standards

AS 4742: Machine-mounted forward and reverse audible warning alarm (withdrawn)

ISO 9533: Earth-moving machinery - Machine-mounted audible travel alarms and forward horns  
- Test methods and performance criteria

#### Definitions

Broadband alarm: Pulsed acoustic signal that comprises a range of frequencies and sometimes referred to as quacker, woosher, non-tonal reversing beepers or white sound.

#### Broadband/White-Sound Alarm Requirement:

Provide all construction vehicles and mobile plant fitted with Broadband Alarms (White Sound) before commencement of works.

Ensure that installation and proper operations of the alarm/warning system is sufficient before commencement of works including but not limited to:

- All alarms clearly audible above the noise level of the machinery or vehicle.
- Automatically activated when reverse gear is selected.
- Directional nature of the broadband alarm is appropriate for works.

### 2.18.2 Rotating Beacons on Plant

Provide beacons or other vehicle mounted warning devices on the highest point of the cabin roof or superstructure of all plant and equipment and in accordance with clause 3.12 'Vehicle mounted signs and devices' of AS 1742.3 where these are being used within the road reserve. Fit beacons with globes rated at a minimum of 75 watts. Do not use strobe lights.

Ensure that the light is operational whenever the plant or equipment is working on, or within 9 metres of, the roadway.

Ensure that the light is visible from all approaches and not obscured by exhaust stacks, back hoe arms etc., or are covered in dust.

Protect the lights from damage by scrub etc.

### 2.19 ROAD WORK ZONE LENGTH

Conform to the requirements of AS 1742.3.

### 2.20 TRAFFIC SIGNAL AND COUNT STATIONS

#### 2.20.1 Traffic Signals

Prior to commencement of the works and for the duration of the works clear the work and co-ordinate with the DoI Traffic Section for the appropriate region.

This includes all works within the trafficked lanes;

- 150 m prior to the stop line
- 50 m past the stop line
- that affects the normal daily traffic flow at the intersection or for road reserve or median excavations greater than 150 mm
- within the area defined by the traffic signal poles and associated pits
- between the traffic signal poles and associated traffic signal control cabinet

#### 2.20.2 Traffic Count Stations

Count Stations have in-pavement detection systems installed and cutting off or closing traffic lanes can have an impact on their operation.

Prior to the commencement of work within the trafficked lanes within 50 m of traffic signals or within 20 m of a count station controller, clear the work and co-ordinate for the duration of the works with the DoI Traffic Section for the appropriate region.

A map of count station locations is available from Department of Transport, Transport Infrastructure Planning Division, contact 8924 7531, or from the Annual Traffic count reports at: [www.transport.nt.gov.au/publications/traffic-reports](http://www.transport.nt.gov.au/publications/traffic-reports)

### 2.21 PORTABLE TRAFFIC SIGNALS

Use portable traffic signals conforming to the requirements of AS 1742.3 and AS 4191. Complete the portable traffic signal authorisation form (available from DoI Traffic section) to seek formal approval from the Superintendent to use the proposed portable traffic signals and the proposed time settings.

Portable traffic signals are for short-term traffic control applications only. Where traffic signal control is being proposed for periods greater than 2 months in a single location, consider the installation of temporary traffic signals.

For the area under the control of portable traffic signals, limit the lengths to no more than 1150 m. Use the time settings in the Time Settings clause as a guide for red time clearance and maximum green times. Frequently observe the prevailing traffic conditions and vehicle speeds and amend the times for the site as appropriate. Submit the changes to the Superintendent as soon as practicable thereafter.

#### 2.21.1 Temporary Speed Limits – Hold Point

Impose a controlled area speed limit not exceeding 80 km/h if the portable traffic signals would otherwise be in a higher speed limit zone.

**Hold Point** - Work zone speed limits require approval from the Superintendent prior to implementation.

#### 2.21.2 Sight Distance

Maintain a sight distance on the approach to portable traffic signals of not less than 150 m. If this cannot be achieved, use appropriate advance warning signage to advise road users in advance of the sight line obstruction of the impending traffic signals ahead.

In cases where queuing traffic is extending past the advance warning signage, install further advance warning signs and speed zone signs further in advance, to prevent collisions at the end of the queue awaiting a green light. Avoid excessive traffic queuing by use of, and adjustment of, appropriate time settings on the portable traffic signals whenever possible.

### 2.21.3 Time Settings

**Table 2.7– General Time Settings**

Mode	All Red	Min. Green	Max. Green	Amber
Manual:	M	F	M	S
Fixed time:	S	F	S	S
Vehicle Actuated:	S	F	S	S
F: Fixed at 15 seconds. M: Set the manual control switch each cycle. S: Needs to be selected and preset by operator for each site.				

**Table 2.8 – Amber Time**

Approach Speed	Amber Time
Below 70 km/h	4 seconds
Above 70 km/h	5 seconds

**Table 2.9 - Red and Green Times**

All Red Period (s)	Max. Green Period (s)	Distance Between Stop Lines at traffic Signals (m) – Clearance speed 20 km/h	Distance Between Stop Lines at traffic Signals (m) – Clearance speed 40 km/h
2	30	0-30	0-50
5	35	34-45	50-90
10	35	45-75	90-150
15	40	75-105	150-210
20	40	105-135	210-270
25	45	135-165	270-330
30	45	165-195	330-390
40	50	195-250	390-500
50	50	250-310	500-620
60	60	310-365	620-730
70	70	365-415	730-830
80	80	415-465	830-930
90	90	465-525	930-1050
100	100	525-575	1050-1150

### 2.22 RESTORATION

Upon completion of works:

- Remove all temporary warning signage and other traffic control devices.
- Remove all temporary works and reinstate the areas to their original state, including the removal and disposal of seal and dragging windrows and debris back across the side track carriageway.
- Stabilize all areas impacted by the works to prevent erosion.
- Where applicable reseed with local native grasses and trees and shrubs.
- Comply with the requirements of the Environmental Approvals and Clearances issued by Dol, DLPE and DLRM, Environment Heritage and the Arts Division, Environmental Assessment and Policy Section, for the project.
- Reinstate permanent traffic control devices temporarily removed during the works.

### 2.23 OTHER REQUIREMENTS

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

### 3. EARTHWORKS AND DRAINAGE



#### 3.1 OUTLINE DESCRIPTION

This section specifies the maintenance requirement for drainage, and the maintenance requirement for formation and subgrade on periodic pavement maintenance projects.

Maintain pavement dimensions in accordance with Drawing No. CS 2100.

#### 3.2 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

#### 3.3 DEFINITIONS

Refer MISCELLANEOUS PROVISIONS section, Definitions clause.

#### 3.4 FORMATION WIDTH CLEARING

##### 3.4.1 Clearing

Clear the formation of the road a minimum width of 2 metres on each side past the outside batters of the table drains.

Recut the outer batters or table drains, ensuring the prevention of any excess materials from washing back into the table drains, offlet drains culverts or other drainage structures.

In rural and remote non-urban areas cleared vegetation free from declared weeds can be used on site for rehabilitation and erosion control works.

##### 3.4.2 Mulching

Mulch all cleared, weed free, vegetative matter in mechanical brush chippers to a maximum size of 100 mm as the clearing work proceeds. Do not stockpile cleared material for later mulching, unless this material is suitable for mulching. Acquire approval to stockpile from Superintendent or remove from site. Do not mulch declared weeds which are seeding or non-woody declared species. Otherwise bury or burn material on site. See Standard Specification for Environmental

Management for more details on stockpile management.

**STUMPS:** Stumps and other material unsuitable for mulching may be buried in disused gravel pits during rehabilitation of the pits.

**GRASSES:** Do not mulch grass clods, roots or other components containing viable propagules. This material may be buried in disused gravel pits.

**STOCKPILES:** Stockpile mulched material on the site at a maximum height of 2 m for use during reinstatement work.

**URBAN AREAS:** Stockpile mulch on the site for reuse and deliver surplus mulch as directed by the Superintendent (within 10 km of the site) for use in local landscaping projects.

**RURAL AREAS:** Stockpile mulch on the site for reuse and power blow surplus mulch into the adjacent natural vegetated areas adjacent to the works.

#### 3.5 EARTHWORKS IN CUT

##### 3.5.1 Description

Operations necessary for excavation, irrespective of the type of material and subsurface conditions, including:

- working cuttings so that material meeting standard fill requirements is used for the subgrade,
- disposal of excess excavated material,
- compaction of material below the subgrade surface, and
- shaping and trimming of formation within cuttings.

##### 3.5.2 Rock – Hold Point

**Hold point** - Obtain agreement from the Superintendent to the extent of the excavation.

Excavate rock encountered in the subgrade, formation, or drain.

Avoid forming pockets of shattered material below the level of the excavation.

Remove all loose material.

Trim the excavation to shed water and minimise erosion.

In subgrade, replace excavated material with select fill compacted to 95% relative compaction.

##### 3.5.3 Unsuitable Material and/or Weathered Rock – Hold Point

**Hold point** - Obtain directions from the Superintendent before works commence.

Excavate unsuitable material and/or weathered rock encountered in the subgrade, formation, or drain.

Avoid forming pockets of shattered material below the level of the excavation.

Remove all loose material.

Trim the excavation to shed water and minimise erosion.

In subgrade: Replace excavated material with select fills compacted to 95% relative compaction.

### 3.6 EARTHWORKS IN FILL

#### 3.6.1 Description

Earthworks in fill includes winning, hauling, placing and compacting material on all prepared areas including: Scours and Washouts.

General Filling, includes holes, pits and other depressions.

#### 3.6.2 Benching

Cut a bench at the toe of the lower side batter when natural surface inclines at steeper than eight horizontal to one vertical.

Ensure the bench slopes downwards towards the centre line of the road and is 3 m wide to provide a sound key for the toe of the fill.

Terrace the existing surface where side slopes are steeper than three horizontal to one vertical to provide a key for the fill.

#### 3.6.3 Construction Methods

Fill by any of the "Compacted Layer", "Rocky Material" or "Rock Fill" method.

Select appropriate method(s).

##### **Compacted Layer Method**

Use where material generally does not contain cobbles, boulders or broken rock.

- Deposit and spread the material in uniform level layers to a maximum thickness of 250 mm loose measurement for the full width of fill.
- Compact each layer to the specified compaction (refer Table 4.8 - Dry Density Ratios for Conformance) before placing the next layer.
- Use standard fill for the subgrade.

##### **Rocky Material Method**

Use where material contains some cobbles and boulders (maximum size 600 mm) with sufficient fines for the work to be free of voids.

- Break up rocks bridging between adjacent materials to prevent cavities being formed.
- Maximum rock dimension: 600 mm or one-half the height of fill at the section where the rock is placed.
- Spread material in layers approximately equal to the maximum rock size.
- Work the rocky material in each layer until it is firm and unyielding.
- Construct to the bottom of the subgrade layer.

##### **Rock Fill Method**

Use where material is predominantly cobbles or boulders with insufficient fines to fill voids.

- Place and work the material until interlock is achieved.
- Advance the fill by full width construction. Side dumping shall not be undertaken. The construction face will be concave, with the shoulder face well in advance of the centre, except when filling in swamps or soft material when the advancing face ends shall be convex.
- Rock Dimensions.
- Maximum vertical dimension: one - third of the height of fill being placed.
- Maximum horizontal dimension: one - half of the height of the fill being placed.
- Construct to 300 mm below the bottom of the subgrade layer. Within 300 mm of the bottom of the subgrade layer use the Compacted Layer Method or Rocky Material Method, with a maximum particle size of 150 mm.

### 3.7 FILL MATERIAL

#### 3.7.1 General Fill

Use the best locally available material.

Use fill material, whether cut or borrow, that is free of organic matter and has a minimum soaked CBR (California Bearing Ratio) of 20 at 95% MMDD (Maximum Modified Dry Density) (to AS 1289), and a plasticity index between 2 % and 15%.

#### 3.7.2 Standard Fill

Conform to the following properties:

<b>Table 3.1 – Standard fill properties</b>	
<b>Property</b>	<b>Value</b>
CBR 4 day soaked at 95% MMDD to AS 1289:	20 min.
Maximum Particle Size:	100 mm
Plasticity Index:	2 - 15%

#### 3.7.3 Select Fill

Select fill will be comprised of gravel, decomposed rock or broken rock, free from organic matter and lumps of clay.

Conform to the following:

<b>Table 3.2 – Select fill grading</b>	
<b>AS Sieve (mm)</b>	<b>% Passing (dry weight)</b>
75.00	100
9.50	30 - 100
2.36	15 - 65
0.075	5 - 25

**Table 3.3– Select fill properties**

Property	Value
CBR 4 day soaked at 95% MMDD to AS 1289:	30 minimum
Plasticity Index:	2 - 15% maximum
Linear shrinkage	2 – 6%.

### 3.8 REMOVAL OF EXCESS MATERIAL- HOLD POINT

Generally this work applies to the removal of unsuitable material such as silt, rubble, and sand, debris dumped on windrows, floodways, pavements and drains.

Work does not include new works in cut, or heavy excavation of rock.

Haul and dump and spread excess material:

- Not less than 125 m from the new road centre line, or
- To spoil dump sites specified. Clear site of organic material/topsoil prior to stockpiling material.
- Spread excess material, level to less than 1.5 m high. Stabilize to prevent erosion. Sheet with topsoil.

Ensure dumps do not dam surface water or streams or damage the works or other property.

Ensure dumping is not in streams nor within 25 m of a stream. Dump and spread the material in legally acceptable location using legal methods.

Comply with AAPA clearances.

Comply with environmental management approvals, including within the road reserve.

**Hold Point** - Obtain approval from Superintendent prior to hauling and dumping and spreading excess material.

### 3.9 PREPARATION AND MAINTENANCE OF SUBGRADE SURFACE

Trim surface to the compliance tolerances specified free of depressions and free draining.

Maintain and repair any damage to the prepared surface prior to placing further material.

### 3.10 EARTHWORKS FOR DRAINAGE

#### 3.10.1 Table Drains

Construct or rehabilitate and trim to the dimensions shown on the drawings.

Remove all obstructions including dead trees, fallen branches and regrowth.

Grade to prevent ponding of water.

Shape to direct water discharge into culverts, offlet drains or watercourses.

Grades shown below are as ratios of rise: run.

#### 3.10.2 Table Drain Offlets

Construct or rehabilitate and trim to the shape of a trapezoidal drain with maximum batter slope 1: 2.

Divert table drains into offlet drains at intervals not exceeding 150 m, or as specified. Refer to PROJECT SPECIFIC REQUIREMENTS.

Remove all obstructions including dead trees, fallen branches and regrowth.

Extend drains as far as required to prevent water ponding in the table drains, with length to be minimum 50 m.

Ensure the capacity of the offlet is not less than the capacity of the table drain, and is of similar cross section and dimensions.

Align and grade the offlet so that the water drains away without scour and damage, and to disperse water as sheet flow or into natural watercourses, at a gradient not to exceed 1:40 (1.5%).

Divert the table drain offlet drain neatly around natural obstacles such as large rocks and trees.

#### 3.10.3 Table Drain Blocks

Construct or rehabilitate and trim table drain blocks at offlets.

Construct blocks from standard fill conforming to the following requirements:

Plasticity Index: 6% minimum.

Length: To extend from edge of shoulder to top of outer table drain batter.

Width: 3 m minimum, at the top, measured parallel to the road centre line.

Height: To edge of shoulders.

Max. Slope: 1: 0.67 (1.5:1).

Compaction: Layers not exceeding 250 mm compacted thickness.

#### 3.10.4 Stop Berms

Construct or rehabilitate and trim stop berms at locations diverting the flow from table drains into a stream or culvert.

Construct berms from standard fill conforming to the following requirements:

Plasticity Index: 6 % minimum.

Height: To edge of shoulders.

Max. Slope: 1: 0.67 (1.5:1).

Compaction: Layers not exceeding 250 mm compacted thickness.

#### 3.10.5 Catch Drains

Construct or rehabilitate and trim catch drains. Carry out prior to formation, subgrade, and other drainage works.

Depth: 500 mm (minimum) into solid ground.

Gradients: Ensure free flow, prevent ponding of water, prevent scour.

Outlets: As terrain permits construct at frequent intervals to reduce scour. Construct a block on continuous grades to divert water into culverts or drains.



Offset: 2 m (minimum) and 4 m (maximum) beyond the edge of the cutting.

Divert the drain neatly around large rocks and trees.

### 3.11 REPAIR EXISTING FORMATION WIDTH

Cut back the existing formation and pavement as shown on the drawings by not less than 150 mm on each edge to sound densely compacted material to form a uniform edge (curved or straight where applicable).

Repair the formation width generally with material cut from the table drains to achieve the formation dimensions in accordance with Drawing No. CS 2100-3.

### 3.12 TRIM AND COMPACT UNPAVED AREAS

Shape, grade and compact verge areas as specified. Refer to PROJECT SPECIFIC REQUIREMENTS.

### 3.13 SURFACE FORMATION

Form the road generally with material cut from the table drains, in accordance with the typical cross section.

Allow for construction to the specified height above natural surface by local widening of table drains.

### 3.14 COMPACTION

Mix to a homogeneous material and compact with no compaction planes and free of cracking to conform to the Dry Density Ratios specified in the **Table 4.15 - Dry Density Ratios for Conformance** in CONFORMANCE TESTING and the conformance clauses in this section.

### 3.15 CONFORMANCE

#### 3.15.1 Tolerances

Finish earthworks and drainage to a smooth compacted and uniform surface within the limits in **Table 3.4 – Conformance Tolerances – Earthworks and drainage**.

#### 3.15.1 Proof Rolling – Hold Point – Witness Point

Proof roll all areas and obtain satisfactory results before ordering conformance testing of those areas.

**Hold Point** - Submit a proof rolling procedure to the Superintendent for approval including the method of preparing an area and the extent of proof rolling before commencing proof rolling.

**Witness Point** - Give the Superintendent not less than 24 hours' notice of the location and commencement time for the proof rolling.

**Table 3.4 – Conformance Tolerances – Earthworks and drainage**

Item	Requirement
Formation Width:	Not less than shown on the drawings.
Subgrade Surface:	As shown on the drawings.
Subgrade Width:	Not less than shown on the drawings.
Batter:	Not steeper than the specified slope.
Maximum variation:	At any point from specified plane of batter shall be 150 mm in earth and 300 mm in rock.
Table Drain Invert:	Maximum 75 mm above or below specified level, free of depressions capable of ponding water.

Plant Requirements; use plant in proof rolling procedures that comply with the following requirements:

Static smooth wheeled rollers with a mass of not less than 12 tonnes and a load intensity under either the front or rear wheels of not less than 6 tonnes per metre width of wheel.

Pneumatic tyred plant with a mass of not less than 20 tonnes and with a ground contact pressure under either the front or rear wheels of not less than 450 kPa per tyre and a ground contact area of not less than .035 m<sup>2</sup> per tyre.

Check areas for level tolerance and layer thickness before proof rolling.

Proof roll each layer immediately following completion of compaction. If proof rolling is carried out at a later time, water the surface and roll with the test roller prior to commencement of proof rolling.

Compliance; the proof rolling requirements are deemed to comply when an area withstands proof rolling without visible deformation or springing.

Remedial work; remove and reconstruct areas that deform or break up.

#### 3.15.2 Conformance Testing – Hold Point

Ordering procedures; refer to CONFORMANCE TESTING for testing requirements and test ordering procedures.

Subgrade surface will be tested only when it is within level tolerance and conforms to proof rolling.

Check subgrade surface levels prior to testing.

**Hold Point** – Obtain the Superintendent's approval of subgrade conformance prior to placing further material.

### 3.16 OTHER REQUIREMENTS

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 4. CONFORMANCE TESTING



### 4.1 OUTLINE DESCRIPTION

This section specifies the conformance testing criteria for use in road maintenance works.

### 4.2 GENERAL

The Contractor will be responsible for process control testing.

The Superintendent will carry out all conformance tests nominated to be the Superintendent's responsibility through Panel Period Contracts.

The Contractor will be responsible for ordering the conformance tests.

### 4.3 DEFINITIONS

#### Process Testing

The testing required to be carried out by the Contractor to ensure that the work is in accordance with the contract documents.

#### Conformance Testing

The testing to be carried out by the Superintendent to ensure that the work complies with the contract documents.

#### ITP

Inspection Test Plans

#### NATA

National Association of Testing Authorities

#### NTCP

NT Code of Practice – in NTMTM

#### NTMTM

NT Materials Testing Manual

#### NTTM

NT Test Methods – in NTMTM

### 4.4 TEST METHODS – HOLD POINT

The methods contained in the NTMTM shall take precedence over all other test methods and procedures, and are used in conjunction with relevant Australian Standards.

<http://www.nt.gov.au/infrastructure/publications/materialtesting/index.shtml> When testing cannot be performed to the test methods stated, these methods may be substituted with State Road Authority test methods so testing can be performed.

Where required tests are not included in the NTMTM use the appropriate Australian Standard.

**Hold Point** - The selected test methods must be approved by the Superintendent before testing is done.

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

### 4.5 ITP SUBMISSION – HOLD POINT

**Hold Point** - Submit: ITPs, detailing all procedures and test plans to be undertaken to complete the project, before commencing work.

### 4.6 SPECIFIC TESTS

Conduct field density testing using Nuclear Density Gauges in accordance with NTCP 102.1 and AS 1289.5.8.1.

Conduct CBR moulding using a compaction hammer conforming to the requirements of AS 1289.

### 4.7 PANEL PERIOD CONTRACTORS

The Principal has in place Panel Period Contracts with NATA (National Association of Testing Authorities) accredited testing companies. The Superintendent will provide a list of the Panel Period Contractors to be used for conformance testing on the contract when the contract is awarded. The Superintendent reserves the right to use other NATA accredited laboratories when panel contractors are unable to carry out specific tests.

### 4.8 ORDERING TESTING

When required, in accordance with the contract documents, order the conformance testing in writing directly from the Panel Period Contractors. Order all testing using the DoI Test Request Form. Include on the order the following information:

- Lot boundaries including start and finish chainages, length and width,
- Type of layer,
- Type of tests required,
- Date and time when lot will be ready for testing.

Start with the first Contractor on the list and rotate in sequence for each set of tests. Do not bypass any Panel Period Contractor on the list unless that Panel Period Contractor provides a written explanation that he is unable to carry out the required testing to the time frames listed in: Table - Testing and Reporting Completion Times. In this instance, the written explanation must be provided to the Superintendent at the same time as the order for testing. Panel Period Contractors that are unable to carry out the required testing will be placed at the end of the rotation sequence.

#### 4.8.1 Conformance Testing and Payment

The Superintendent will pay for all conformance testing directly to the Panel Period Contractor selected to perform the conformance tests required under the contract and nominated as the Superintendent's responsibility.

If any tests fail to meet specification, all retesting costs will be a negative variation to the contract. Failures in bitumen tests; refer to Superintendent.

When testing has been ordered and the site is not ready for testing at the time specified by the Contractor, the Contractor will bear the cost of time and travel incurred by both the Panel Period Contractor attending to conduct the conformance tests and the Superintendent, where applicable. The cost will be a negative variation to the contract.

#### 4.8.2 Process Testing

The Contractor is responsible for the ordering up and payment for all process tests carried out.

#### 4.9 NOTICE OF TESTING – WITNESS POINT

Give the Panel Period Contractor written notice in advance of each stage of the works requiring conformance testing, including re-testing.

**Witness Point** - Provide the Superintendent with a copy of the request for testing simultaneously with the request being sent to the Panel Period Contractor.

Any communication with the Panel Period Contractors, other than the ordering of testing or inquiring on the timing of test results, must be forwarded through the Superintendent.

Provide the Superintendent with the results of process control testing as identified in the relevant ITP with all requests for conformance testing.

**Witness Point** - Notify the Superintendent prior to any rework of failed lots.

#### 4.10 TEST FREQUENCIES

Refer to:

**Table 4.5 – Test Frequencies for Bitumen Spray Sealing**

**Table 4.6 – Asphalt Testing Frequencies - During Works**

**Table 4.7 – Asphalt Testing Frequencies - After Works Completed – Part 1**

**Table 4.8 – Asphalt Testing Frequencies - After Works Completed – Part 2**

**Table 4.9 - Test Frequencies For Soils – Part 1 of 2**

**Table 4.10 - Test Frequencies For Soils - Part 2 of 2**

**Table 4.11 - Test Frequencies For Aggregates And Pavement Surfaces**

**Table 4.12 - MMDD Curing Times**

**Refer to Clause 4.14 for Tables**

#### 4.11 CONFORMANCE TESTING RESULTS

The Panel Period Contractor will provide interim and NATA endorsed test results to the Contractor within the scheduled times (in working days – Monday to Friday) from the time of completion of all the field tests. The interim test results will comprise of final, completed test results and are not preliminary estimates. Interim test results may not be NATA endorsed. Testing and Reporting Completion times

Refer to: **Table 4.13 – Testing and Reporting Completion Times part 1 of 2**

**Table 4.13 – Testing and Reporting Completion Time part 2 of 2.**

**Refer to Clause 4.14 for Tables**

##### 4.11.1 Lot Testing

Conformance will be based on lots.

Give each lot a lot number.

Number the lots using a logical system. Maintain a register of all lots and lot numbers. Include the location of each lot on the lot register. Provide a copy of the lot register to the Superintendent upon request.

Lots defined by the contractor must be clearly marked out on the construction site.

Lots of work will be selected by the Contractor, based upon:

- A lot will represent no more than one shift's production
- A lot will be continuous and will have been brought to completion at the same time,
- A lot will be composed of essentially homogeneous material with no distinct changes in attribute values.

Each lot will be subject to conformance testing in accordance with NTCP 102.1.

Defective sections will be excluded from the lot to be tested and identified as a separate lot, and will also be subjected to lot testing.

Quality of the lot will be judged as conformance or non-conformance of each lot. This will be based on all tests conducted on the lot in accordance with NTCP 102.1.

Conformance of materials is based on samples from the finished works.

When lots fail to satisfy the conformance criteria, reprocess the entire lot and resubmit for retesting.

Should the lot under consideration be subdivided then each subdivision will be classed as a lot and each subdivided lot will be subject to lot testing.

Non-conforming lots which are subdivided after testing will be treated as separate lots and each and every subdivided lot will be retested.

#### 4.11.2 Conformance of Compaction for Soils

Density test locations will be selected by the laboratory on a stratified random basis in accordance with NTCP 103.1.

In situ density is expressed as a percentage of the Maximum Modified Dry Density. One Modified Dry Density test for each in situ density test will apply.

In situ density will be determined and reported in accordance with NTCP 102.1 and relevant Australian Standards.

A minimum of three tests will apply to each and every lot.

The Mean Dry Density Ratio (R) is calculated as follows:

$$R = \frac{\sum x_i}{n}$$

$x_i$  = an individual test result

$n$  = the number of results in the lot.

The Characteristic Mean Dry Density Ratio ( $R_c$ ) is calculated as follows:

$$R_c = R - ks$$

where:

$R$  = the mean dry density ratio for the lot

$k$  = the multiplier in the below Table. – MULTIPLIER VALUES FOR SOILS.

$s$  = the standard deviation.

The Standard Deviation ( $s$ ) is calculated as follows:

$$s = \sqrt{\frac{\sum (x_i - R)^2}{(n - 1)}}$$

where:

$x_i$  = an individual test result

$R$  = the mean of  $n$  results

$n$  = the number of test results in the lot.

When less than 6 tests are used to determine conformance of a lot the Mean Dry Density Ratios in **Table 4.15 - Dry Density Ratios for Conformance**, Column A apply.

When 6 or more tests are used to determine conformance of a lot the Characteristic Mean Dry Density Ratios in **Table 4.8 Dry Density Ratios For Conformance**, Column B, apply.

#### 4.11.3 Dry Density Ratios for Conformance

Refer to **Table 4.15 - Dry Density Ratios for Conformance**.

**Refer to Clause 4.14 for Tables**

#### 4.11.4 Table – Multiplier Values for Soils

**Table 4.2 – Multiplier Values for Soils**

Values of the Multiplier  $k$  for Characteristic Mean Dry Density Ratio ( $R_c$ )

Number of tests per lot (n)	k
6	0.50
7	0.54
8	0.56
9	0.59
10	0.61
15	0.68
20	0.72

#### 4.11.5 Conformance of Compaction for Asphalt

Relative compaction (R) is the percentage ratio of the in-situ density of the compacted asphalt and the reference density of the asphalt for a particular lot. The reference density will be the mean of the maximum density measurements determined from the asphalt testing for a particular lot.

The Characteristic Value of Relative Compaction ( $R_c$ ) is calculated as follows:

$$R_c = R - ks$$

where:

$R$  = the mean density ratio for the lot

$k$  = the multiplier in **Table 4.3 – Multiplier Values for Asphalt**.

$s$  = the standard deviation.

The Standard Deviation ( $s$ ) is calculated as follows:

$$s = \sqrt{\frac{\sum (x_i - R)^2}{(n - 1)}}$$

where:

$x_i$  = an individual test result

$R$  = the mean of  $n$  results

$n$  = the number of test results in the lot.

#### 4.11.6 Multiplier Values for Asphalt

<b>Table 4.3 – Multiplier Values for Asphalt</b>	
Values of the Multiplier k for Characteristic Mean Dry Density Ratio ( $R_c$ ) are shown in the following table.	
Number of tests per lot (n)	k
5 or less	0.0
6	0.719
7	0.755
8	0.783
9	0.808
10	0.828
The work represented by a lot will be assessed as the characteristic value of in-situ air voids where: – Characteristic Value of Air Voids (%) = $100 - R_c$	

#### 4.12 STABILISED LAYER CONFORMANCE

##### 4.12.1 Tolerances

For stabilised layers conform to the tolerances specified in **Table 4.4 – Stabilised Layers Conformance**

#### 4.12.2 Testing – Hold Point

**Hold point** - Superintendent to approve conformance of stabilised layer prior to priming. Refer to **Table 4.4**.

<b>Table 4.4 – Stabilised Layers Conformance</b>		
Attribute		Requirement
Dry Density Ratio:		Refer to the table DRY DENSITY RATIOS FOR CONFORMANCE in the Conformance Testing Section.
Stabiliser Application Rate/Content		±10% of the designated value averaged for each lot
Stabiliser Distribution:	[i]	Stabiliser content shall not vary by more than 0.5% absolute between top and bottom half of a layer at any location as determined in accordance with NTTM 204.8.
	[ii]	Stabiliser content shall not vary by more than ±0.5% from the designated value in any point.
Moisture Content during Compaction:	[i]	±1.5% of moisture content determined at preliminary trial.
	[ii]	±1.5% of optimum moisture content.
[i] apply if a preliminary trial is carried out (i.e. total area over 1000m <sup>2</sup> ) [ii] apply if a preliminary trial is not carried out (i.e. areas under 1000m <sup>2</sup> )		
Take samples for Liquid Limit, Plastic Limit, Linear Shrinkage, California Bearing Ratio from the unstabilised pavements.		

#### 4.13 OTHER REQUIREMENTS

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 4.14 ADDITIONAL TABLES

<b>Table 4.5 – Test Frequencies for Bitumen Spray Sealing</b>				
<b>Test No.</b>	<b>Property</b>	<b>Cutback Bitumen/ Emulsions</b>	<b>Straight Run Binder</b>	<b>Polymer Modified Bitumen</b>
AS/NZS 2341.2, AS/NZS 2341.3 AS/NZS 2341.4	Dynamic Viscosity (60°C)	Minimum 1 per project	Minimum 1 per project	-
	Dynamic Viscosity (135°C)	-	Minimum 1 per project	-
AS 2341.12	Penetration (25°C)	-	1 per project	-
AS/NZS 2341.13	Durability of base binder	1 per project	1 per project	
AG:PT/T103	Loss on Heating (%mass) max.	1 per project	1 per project	1 per project
AG:PT/T111	Dynamic Viscosity (165°C)	-	-	1 per 20 000L
AG:PT/T112	Flash Point (°C) min.	1 per project	1 per project	1 per project
AG:PT/T121	Consistency (60°C)	-	-	1 per 20 000L
AG:PT/T121	Stiffness at 15°C (kPa)		-	1 per 20 000L
AG:PT/T122	Torsional Recovery at 25°C, 30s (%)	-	-	1 per 20 000L
AG:PT/T124	Toughness at 4°C, 100mm(Nm) min.	1 per project	1 per project	1 per project
AG:PT/T131	Softening Point (°C)	-	1 per project	1 per 20 000L

**Table 4.6 – Asphalt Testing Frequencies - During Works**

Test Method No. (Standard No.)	Test Method (Aspect being tested)	Minimum Test Frequency	
		Daily Production <100 tonnes	Daily Production >100 tonnes
-	Mixing temperature	Every mix	Every mix
-	Laying temperature	Every 30 minutes	Every 30 minutes
-	Asphalt surface temperature at commencement of compaction	Every Mix	Every mix
AS/NZS 2891.7.1 AS/NZS 2891.7.3	Maximum Density	1 No.	1 per 100 t *
AS/NZS 2341.3	Viscosity of Binder	1 per shift	1 per shift
AS/NZS 2891.3.1	Bitumen content	1 No.	1 per 100 t *
AS/NZS 2891.3.2 AS/NZS 2891.3.3 or WA730.1	Particle size distribution	1 No.	1 per 100 t *
AS/NZS 2891.5	Stability	1 No.	1 per 100 t *
AS/NZS 2891.5	Flow	1 No.	1 per 100 t *
* One test per nominated tonnage or part thereof.			

**Table 4.7 – Asphalt Testing Frequencies - After Works Completed – Part 1**

Test Method No.	Test Method	Frequency
AS/NZS 2891.1.1 AS 2891.1.2 AS 2891.1.3	Thickness of layer	1 per core
AS/NZS 2891.8	Voids and density relationships for compacted asphalt mixes	1 per core
AS/NZS 2891.9.1 AS/NZS 2891.9.2 AS/NZS 2891.9.3	Determination of bulk density of compacted asphalt	1 per core
AG:PT/ T231	Deformation resistance of asphalt mixtures by the wheel tracking test	1 per Type per 1000 t

**Table 4.8 – Asphalt Testing Frequencies - After Works Completed – Part 2**

Carry out density testing as soon as practicable after completion of works. Conform to the following number of cores per lot:

Area (m <sup>2</sup> )	>5000	1000 – 5000	500 – 1000	50 – 500	<50
No. of Cores	1 per 1000m <sup>2</sup> or minimum 10	1 per 500m <sup>2</sup> or minimum 5	4	3	1

CONFORMANCE TESTING

**Table 4.9 - Test Frequencies For Soils – Part 1 of 2**

Type Of Test	General Fill	Standard Fill	Select Fill/Sand Clay Fill	Subgrade	Sub-Base	Basecourse	Bridge Backfill Using Std. Fill	Bridge Backfill Using Select Fill	Culvert Backfill Using Std. Fill	Culvert Backfill Using Select Fill
Field Density (FDD) by NTCP 102.1 and AS 1289.5.8.1	1 in 3,000 m <sup>2</sup> (min. of 3 tests per lot)	1 in 3,000 m <sup>2</sup> (min. of 3 tests per lot)	1 in 3,000m <sup>2</sup> (min. of 3 tests per lot)	1 in 1,000 m <sup>2</sup> (min. of 3 tests per lot)	1 in 1,000 m <sup>2</sup> (min. of 3 tests per lot)	1 in 1,000 m <sup>2</sup> (min. of 3 tests per lot)	3 tests per 100 m <sup>3</sup>	3 tests per 100 m <sup>3</sup>	3 tests per 10 m <sup>3</sup>	3 tests per 10 m <sup>3</sup>
Modified Compaction (MMDD) by AS 1289.5.2.1	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD	1 per FDD
Particle Size Distribution by AS 1289.3.6.1	-	-	1 per each 2,000 m <sup>3</sup>	-	1 in 5000 m <sup>2</sup> (min. of 1 test per lot)	1 in 5000 m <sup>2</sup> (min. of 1 test per lot)	-	1 per 300 m <sup>3</sup>	-	1 per 300 m <sup>3</sup>
Plasticity Index AS 1289.3.1.1, AS 1289.3.2.1, AS 1289.3.3.1	-	1 per each 2,000 m <sup>3</sup>	1 per each 2,000 m <sup>3</sup>	1 in 5,000 m <sup>2</sup> (min. of 1 test per lot)	1 in 5000 m <sup>2</sup> (min. of 1 test per lot)	1 in 5000 m <sup>2</sup> (min. of 1 test per lot)	1 per each 300 m <sup>3</sup>	1 per each 300 m <sup>3</sup>	1 per each 300 m <sup>3</sup>	1 per each 300 m <sup>3</sup>
Linear Shrinkage by AS 1289.3.4.1	-	1 per each 2,000 m <sup>3</sup>	1 per each 2,000 m <sup>3</sup>	1 in 5,000 m <sup>2</sup> (min. of 1 test per lot)	1 in 5000 m <sup>2</sup> (min. of 1 test per lot)	1 in 5000 m <sup>2</sup> (min. of 1 test per lot)	1 per each 300 m <sup>3</sup>	1 per each 300 m <sup>3</sup>	1 per each 300 m <sup>3</sup>	1 per each 300 m <sup>3</sup>
California Bearing Ratio by AS 1289.6.1.1	1 per each 2,000 m <sup>3</sup>	1 per each 2,000 m <sup>3</sup>	1 per each 2,000 m <sup>3</sup>	1 in 5 FDD (min.1 of test per lot)	1 in 5 FDD (min.1 of test per lot)	1 in 5 FDD (min.1 of test per lot)	1 per each 300 m <sup>3</sup>	1 per each 300 m <sup>3</sup>	1 per each 300 m <sup>3</sup>	1 per each 300 m <sup>3</sup>

\* run = 1 pass of cement spreader.

FDD = Field Density



<b>Table 4.10 - Test Frequencies For Soils - Part 2 of 2</b>			
<b>Type Of Test</b>	<b>Subgrade</b>	<b>Sub-Base</b>	<b>Basecourse</b>
Pavement Layer Thickness by NTTM 216.1	-	1 per FDD	1 per FDD
Ball Embedment by NTTM 215.1	-	-	1 in 5,000 m <sup>2</sup>
Pavement Degree of Saturation prior to Sealing by AS 1289	-	-	1 in 5,000 m <sup>2</sup>
Stabiliser Spread Rate by NTTM 204.7	1 per run *	1 per run *	1 per run *
Stabiliser Content by NTTM 204.1	1 per 1000 m <sup>2</sup> with a min. of 3 tests	1 per 1000 m <sup>2</sup> with a min. of 3 tests	1 per 1000 m <sup>2</sup> with a min. of 3 tests
Stabiliser Distribution by NTTM 204.8	1 per 1000 m <sup>2</sup> with a min. of 3 tests	1 per 1000 m <sup>2</sup> with a min. of 3 tests	1 per 1000 m <sup>2</sup> with a min. of 3 tests
Soluble Salt Content of Construction Water	-	1 per water source	-
* run = 1 pass of cement spreader. FDD = Field Density			

CONFORMANCE TESTING

**Table 4.11 - Test Frequencies For Aggregates And Pavement Surfaces**

Type Of Test	Aggregate	Pavement Marking	Pavement Surface
Particle Size Distribution by AS 1141.11.1	1 in 250 t	-	-
Los Angeles Abrasion Value by AS 1141.23	1 in 250 t	-	-
Particle Shape by AS 1141.14 at 2:1 ratio	1 in 250 t	-	-
Flakiness Index by AS 1141.15	1 in 250 t	-	-
Average Least Dimension by AS 1141.20.1, AS 1141.20.2 *	1 in 250 t	-	-
Sulphate Soundness by AS 1141.24	1 in 1,000 t	-	-
Percentage of Crushed Faces by AS 1141.18	1 in 250 t	-	-
Polished Aggregate Friction Value by AS 1141.40 or AS 1141.41	-	-	1 in 20,000 m <sup>2</sup>
Surface Texture Depth by NTTM 305.1	-	-	1 in 5,000 m <sup>2</sup>
Skid Resistance by NTTM 304.1	-	-	As nominated by Superintendent
Roughness	-	-	As nominated by Superintendent
Retroreflectivity of Pavement Marking by NTTM 404.1 or NTTM 404.3	-	1 per 1,000 m	-
Wear Assessment of Road Marking Paints – Image Analysis to AS 4049.3:2005 Appendix K, Method A Photographic Method	-	As nominated by Superintendent	-
* Take Average Least Dimension samples only from the stockpile on the project site.			

**Table 4.12 – MMDD Curing Times**

Material Type	Plasticity	Field Moisture Content (FMC)	Curing time – min.
Non plastic Sand	PI < 2	Any	2 hours
Non Plastic Gravels Absorbent stone	PI < 2	FMC < 2 % MC, below OMC	6 hours
Low Plasticity Gravel and Sands	PI up to 10	FMC < 2 % MC, below OMC	6 hours
Medium Plasticity Gravel and Sands	PI 10 to 20	FMC < 1 % MC, below OMC	12 hours
Heavy clays	20 +	FMC < 2 % MC, below OMC	24 hours up to 7 days
MC = Moisture Content      FMC = Field Moisture Content			
Irrespective of FMC all materials must be cured for a minimum of 2 hours after preparation.			
Check and report sub-base and basecourse thickness to nearest 5 mm at each modified compaction test sample site.			

CONFORMANCE TESTING

**Table 4.13 – Testing and Reporting Completion Times Part 1 of 2**

Attribute being tested	Time Allowed for Interim Report in Working Days (Monday to Friday)	Time Allowed for NATA Endorsed Report in Working Days (Mon to Fri)
<p>** Time for completion may be extended by each additional day required for the curing of materials and each additional overnight stay.</p> <p>For work in remote areas the testing and reporting completion times may be increased by a maximum of 2 days, subject to approval by the Superintendent.</p>		
<b>SOILS</b>		
Field Density	3	5
Modified Compaction	** 3	5
Modified Compaction – Oversize	** 3	
Pavement Layer Thickness	2	4
Particle Size Distribution	3	5
Plasticity Index (Liquid Limit, Plastic Limit)	** 3	
Linear Shrinkage	3	
Moisture Content	1	3
CBR – Soaked (Completion time includes Modified Compaction)	** 7	9
Cement Content of Stabilised Materials (Heat of Neutralisation)	3	5
Cement Content (EDTA Method)	6	8
Lime/Cement Content of Uncured Soil (EDTA Method)	6	
Lime Content of Stabilised Materials (E.D.T.A Method)	6	
Bitumen Content of Stabilised Materials	2	4
Stabiliser Spread Rate	1	3
Soluble Salt Content of Construction Water	2	4
Standard Ball Penetration Test	1	3
Unconfined Compressive Strength (7 Day result) excluding compaction	8	10
<b>AGGREGATE</b>		
Specific Gravity	2	4
Particle Size Distribution	2	
Particle Shape, by Proportional Calliper	2	
Flakiness Index	2	
Average Least Dimension (Direct Measurement)	2	
Clay and Fine Silt (Settling Method)	2	
Particle Density and Water Absorption of Fine Aggregate	3	5
Particle Density and Water Absorption of Coarse Aggregate	3	
Sulphate Soundness	8	10

## CONFORMANCE TESTING

Table 4.14 – Testing and Reporting Completion times Part 2 of 2		
Attribute being tested	Time for Interim Report	Time for NATA Endorsed Report
AGGREGATE (continued)		
Los Angeles Value	2	4
Pavement Surface Texture Depth	2	
Crushed Particles	2	
CONCRETE		
Consistency of Concrete – Slump Test	1	3
Making, Curing and Compressive Strength (28 day result)	*** 29	31
Making, Curing and Compressive Strength (7 day result)	*** 8	10
ASPHALT		
Bitumen Content and Aggregate Grading	3	5
Stability and Flow of Mix	3	
Air Voids and Density Relationship	4	6
Density of Thin Lift Asphalt by Nuclear Gauge	2	4
Bulk Density of Asphalt	4	6
Kinematic Viscosity of Bitumen	3	5
BITUMEN		
Dynamic Viscosity (60°C)	1	3
** Time for completion may be extended by each additional day required for the curing of materials and each additional overnight stay.	*** Time for completion is related to the curing time specified.	
For work in remote areas the testing and reporting completion times may be increased by a maximum of 2 days, subject to approval by the Superintendent.		

**Table 4.15 - Dry Density Ratios for Conformance**

<b>Works Components</b>	<b>A Mean Dry Density Ratio (R) in % ("n" is 3 to 5)</b>	<b>B Characteristic Mean Dry Density Ratio (R<sub>c</sub>) in % ("n" is 6 or greater)</b>	
Natural surface to subgrade, fill, batters, table drain blocks, fill for water course, unpaved areas	90.0 or greater 89.9 or less	90.0 or greater 89.9 or less	Conformance Non-conformance
Subgrade, sub-base, unsealed base, shoulders, select fill, levees, structures and culverts in fill, bridge foundation backfill, bridge abutment fill	95.0 or greater 94.9 or less	95.0 or greater 94.9 or less	Conformance Non-conformance
Sealed basecourse	100.0 or greater 99.9 or less	99.0 or greater 98.9 or less	Conformance Non-conformance
Stabilised basecourse	98.0 or greater 97.9 or less	97.0 or greater 96.9 or less	Conformance Non-conformance
Backfill all test excavations with the material and density ratio specified for that layer stabilised with at least 3% cement (by mass).			

## 5. GRADING AND GRAVEL SHEETING

### 5.1 STANDARDS

Conform to the following standards and publications unless specified otherwise:

- AS 1141- Methods for sampling and testing aggregates.
- AS 1289- Methods of testing soils for engineering purposes
- NTMTM- NT Materials Testing Manual.

### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and RFT.

### 5.2 OUTLINE DESCRIPTION

This section specifies the maintenance requirement for gravel sheeting on unsealed roads, the maintenance grading of unsealed roads, and the maintenance grading of shoulders and verges of sealed roads, including the associated drainage. Drainage is specified in EARTHWORKS AND DRAINAGE, and measured as per that section when not associated with road maintenance.

### 5.3 GRADING GENERALLY

Provide a finished graded surface free of ruts, corrugations, depressions, excess loose material and debris.

Maintain pavement dimensions in accordance with Drawing No. CS 2100.

### 5.4 GRAVEL SHEETING GENERALLY

Provide a finished gravel surface trimmed and tightly compacted, conforming to standards in CONFORMANCE TESTING.

Maintain pavement dimensions in accordance with Drawing No. CS 2100.

The standard drawing showing the typical cross section shows the ideal carriageway width and actual widths may vary on individual roads. Maintain the existing carriageway width of individual roads in the contract. This may, in some cases, require extra passes of the grader or other equipment.

Do not grade over the crown of the road. Maintain the profile as per the standard drawing.

## 5.5 PERFORMANCE REQUIREMENTS

### 5.5.1 Maintenance grading of unsealed roads

For works associated with maintenance grading of unsealed roads and verges the following table indicates the expected maximum achievable daily production per grader under normal weather conditions.

<b>Table 5.1 – Maintenance grading of unsealed roads</b>		
<b>Work Type</b>	<b>Distance</b>	<b>Number of passes</b>
Opening Grade	40km	Minimum 1 Pass
Carriageway Grade	15km	Minimum 4 passes
Grade Between Inverts	10km	Minimum 7 passes
Full Maintenance Grade	5km	Minimum 9 passes
Grade and Roll	12km	Minimum 7 passes
Grade, Water and Roll	8km	Minimum 7 passes
Rip and Re-compaction	2km	As required

### 5.5.2 Maintenance grading of unsealed shoulders on sealed roads

For works associated with maintenance grading of unsealed shoulders and verges on sealed roads the following table indicates the expected maximum achievable daily production per grader under normal weather conditions

<b>Table 5.2 – Maintenance grading of unsealed shoulders on sealed roads</b>		
<b>Work Type</b>	<b>Distance</b>	<b>Number of passes</b>
Dry Grade	7km	Minimum 3 passes
Full Maintenance Grade	5km	Minimum 5 passes
Part Maintenance Grade	10km	Minimum 3 passes
Grade and Roll	10km	Minimum 3 passes
Grade, Water and Roll	6km	Minimum 3 passes
Rip and Re-compaction	3km	Minimum 5 passes

## 5.6 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

## 5.7 DEFINITIONS

Refer to Definitions in MISCELLANEOUS PROVISIONS.

## 5.8 MATERIALS

### 5.8.1 Natural Gravel

Obtain material from sources of naturally occurring deposits. in accordance with the Material Extraction Areas and Water Sources clause in MISCELLANEOUS PROVISIONS.

Produce required properties by crushing, screening, mixing or other processes necessary.

Ensure particles are tough, durable and of a tightly binding nature free of organic or other deleterious matter.

Natural gravel to conform to **Table 5.3 – Natural Gravel Particle Sizes** and to **Table 5.4 – Natural Gravel Properties**.

<b>Table 5.3 – Natural Gravel Particle Sizes</b>				
<b>AS Sieve (mm)</b>	<b>Percentage Passing</b>			
	<b>Type 1</b>	<b>Type 2 *</b>	<b>Type 3 *</b>	<b>Type 4</b>
75.0	100			100
37.5	80-100	100		80-100
19.0	50-80	70 - 100	100	60-100
9.5	35-65	50 - 80	70 - 100	50-95
4.75	25-50	35 - 65	50 - 80	40-80
2.36	15-40	25 - 50	35 - 65	30-65
0.425	7-20	10 - 30	15 - 35	20-50
0.075	3-13	4 - 16	6 - 20	5-25
* Grading Types 2 and 3 are for Base and Shoulder.				

<b>Table 5.4 – Natural Gravel Properties</b>				
<b>Attribute</b>	<b>Application</b>			
	<b>Northern Area - Sealed base</b>	<b>Southern Area – Sealed Base*</b>	<b>Unsealed Base And Shoulder Material</b>	<b>Sub-Base</b>
Liquid Limit (LL)	25% max	30%	35% max	30% max
Plasticity Index (PI)	1-6%	1 - 10%	4 – 12 %	1- 10%
Linear Shrinkage (LS)	0-3%	0 - 6%	2 – 8 %	0-6%
PI x % passing 0.425 mm Sieve	180 max	300 max	400 max	400 max
California Bearing Ratio (CBR) 4 day soaked (AS 1289)	80 min	80 min	50 min	30 min
at a relative density of	100% MMDD	100% MMDD	95% MMDD	95% MMD D
(Highest CBR value to be reported)				
Los Angeles Abrasion (LAA) Loss	50 max	50 max	60 max	60 max
Note: Southern Area- Sealed Base* applies to south of a line connecting Birrindudu - Dunmarra - Wollogorang.				

### 5.8.2 Fine Crushed Rock

Manufacture from clean, hard durable rock free from natural gravel, clay, loam or other deleterious substances. Fine crushed rock to conform to **Table 5.5 – Fine Crushed Rock Sizes** and to **Table 5.6 – Fine Crushed Rock Properties**.

<b>Table 5.5 – Fine Crushed Rock Sizes</b>	
<b>AS Sieve (mm)</b>	<b>Percentage Passing</b>
37.5	100
19.0	90-100
13.2	75-90
9.5	60-80
4.75	38-60
2.36	25-45
0.425	12-26
0.075	6-14

<b>Table 5.6 – Fine Crushed Rock Properties</b>	
Liquid limit (LL)	25% max
Plasticity Index (PI)	1-6%
Linear Shrinkage (LS)	1-3%
Dust Ratio (DR) (% passing 0.075mm)/(% passing 0.425mm) x 100	25-50
CBR, 4 day soaked at 100% MMDD	100 min (AS 1289)
Los Angeles Abrasion (LAA) loss: Coarse grained rock Fine grained rock	35max 25%max
PI x % passing 0.425mm sieve	180 max

### 5.8.3 Blends of Natural Gravel and Fine Crushed Rock

Not permitted in urban areas for sealed pavements.

Material to conform to the Natural Gravel tables.

### 5.8.4 Sand Clay

Obtain Sand Clay from sources of naturally occurring deposits.

Material to conform to the requirements in **Table 5.7 – Sand Clay Grading** and in **Table 5.8 – Sand Clay Properties**.

<b>Table 5.7 – Sand Clay Grading</b>	
<b>AS sieve (mm)</b>	<b>Percentage Passing</b>
4.75	80 - 100
2.36	60 - 100
0.425	30 - 60
0.075	14 - 28

<b>Table 5.8 – Sand Clay Properties</b>	
<b>Property</b>	<b>Required value</b>
Plasticity Index	20% maximum for sealed pavements 15 % maximum for unsealed pavements.
Linear Shrinkage	1% - 8%.
CBR, 4 day soaked at 95 % MMDD	50 minimum.(AS 1289)

## 5.9 GRAVEL SHEETING

### 5.9.1 Terminology

The term gravel sheeting refers to the sheeting of pavement and shoulders with gravel, sand clay or other suitable approved materials.

### 5.9.2 Gravel Resheeting – Lots greater than 600m<sup>2</sup>

Gravel sheet pavement and shoulders in section lots greater than 600 m<sup>2</sup>.

Locate and push up gravel material in accordance with the Material Extraction Areas and Water Sources clause in MISCELLANEOUS PROVISIONS.

Use gravel material complying with the Materials clause in this section.

Load, haul to site and dump gravel material.

Place, mix, compact and trim the material to the specified layer thickness in accordance with this section.

### 5.9.3 Stockpile Gravel Material

Locate, push up and stockpile gravel material in accordance with the Material Extraction Areas and Water Sources clause in MISCELLANEOUS PROVISIONS.

Stockpile materials complying with the Materials clause in this section.

Trim stockpile to a uniform shape for ease of measurement.

### 5.9.4 Gravel Resheeting from Stockpile

Gravel sheet pavement and shoulders in section lots greater than 600 m<sup>2</sup>.

Load from existing stockpile, haul to site and dump gravel material.

Place, mix, compact and trim the material to the specified layer thickness in accordance with this section.

### 5.9.5 Gravel Repairs to Wash outs and Blow outs

Gravel sheet repair pavement and shoulder wash outs and blow outs in section lots less than 600m<sup>2</sup>.

Locate and push up gravel material in accordance with the Material Extraction Areas and Water Sources clause in MISCELLANEOUS PROVISIONS.

Use gravel material complying with the Materials clause in this section.

Load, haul to site and dump gravel material.

Place, mix, compact and trim the material to the specified layer thickness in accordance with this section.



### 5.9.6 Gravel Repairs to Wash outs and Blow outs from Stockpile – Lots less than 600m<sup>2</sup>

Gravel sheet repair pavement and shoulder wash outs and blow outs in section lots less than 600m<sup>2</sup>.

Load from existing stockpile, haul to site and dump gravel material.

Place, mix, compact and trim the material to the specified layer thickness in accordance with this section.

### 5.9.7 On-Formation Placing and Mixing

Place material in uniform layers over subgrade surface or lower layers of the pavement.

Remove segregated and contaminated material from the site.

Manually remove materials such as timber, branches, roots and the like.

Do not place material on a previous layer that has:

- become waterlogged or cracked; and/or
- otherwise deteriorated.

Mix the material uniformly throughout with water to achieve a moisture content within 2 % of the optimum for the specified conforming Dry Density Ratio.

Ensure water is clean and free from oil, alkali, organic or any other deleterious substances, and that the total soluble salts content is less than 3,000 mg/litre, total dissolved salts. Provide evidence of construction water salt contents.

### 5.9.8 Compaction

Compact in uniform layers not less than 100 mm nor greater than 200 mm compacted thickness.

Achieve a homogeneous mass with no compaction planes.

Conform to the Dry Density Ratios specified in **Table 4.15 - Dry Density Ratios for Conformance** in CONFORMANCE TESTING.

### 5.9.9 Trim Final Pavement Surface

Trim with a dense textured surface, free of laminations.

Remove sticks and any loose material.

Ensure surface is free of cracking.

Do not introduce new material to the surface after final compaction.

Where pavement thickness is 200 mm or greater, scarify to not less than 100 mm depth and recompact where finish not achieved.

Where pavement thickness is less than 200 mm scarify and recompact to full depth where finish not achieved.

## 5.10 CONFORMANCE OF GRAVEL SHEETING

### 5.10.1 Tolerances

Final surfaces shall conform to the following:

**Table 5.9 – Final Surfaces Tolerances**

Straight Edge Deviation:	Maximum 5 mm in 3 m.
Compacted Thickness:	Not less than shown on the drawings.
Width:	Not less than shown on the drawings.

### 5.10.2 Proof rolling procedure - Hold Point

**Hold Point** - Submit a proof rolling procedure to the Superintendent for approval including the method of preparing an area and the extent of proof rolling.

### 5.10.3 Proof rolling notice - Witness Point

**Witness Point** - Give the Superintendent not less than 24 hours' notice of the location and commencement time for the proof rolling.

Proof roll all areas and obtain satisfactory results before ordering conformance testing of those areas.

Plant Requirements; use plant in proof rolling procedures that comply with the following requirements:

Static smooth wheeled rollers with a mass of not less than 12 tonnes and a load intensity under either the front or rear wheels of not less than 6 tonnes per metre width of wheel.

Pneumatic tyred plant with a mass of not less than 20 tonnes and with a ground contact pressure under either the front or rear wheels of not less than 450 kPa per tyre and a ground contact area of not less than .035 m<sup>2</sup> per tyre.

Check areas for level tolerance and layer thickness before proof rolling.

Proof roll each layer immediately following completion of compaction. If proof rolling is carried out at a later time, water the surface and roll with the test roller prior to commencement of proof rolling.

Compliance; the proof rolling requirements are deemed to comply when an area withstands proof rolling without visible deformation or springing.

Remedial work; remove and reconstruct areas that deform or break up.

### 5.10.4 Conformance Testing – Hold Point

Ordering procedures; refer to CONFORMANCE TESTING for testing requirements and test ordering procedures.

Only the finished compacted base and shoulder conforming to proof rolling and layer thickness will be tested.

**Hold Point** – Obtain the Superintendent's approval for pavement conformance prior to any surfacing work.

Backfill and compact all test holes with cement stabilised quality material which is the same as the layer being tested.

#### 5.10.5 Ride Quality

Surface roughness (IRI) to be less than 2.4.

Ride quality requirements represents an absolute upper limit and all field values to be less than a value specified.

Lotting and averaging out of field values not permitted.

Rectify all areas where Surface Roughness exceeds specified level.

### 5.11 MAINTENANCE GRADING OF UNSEALED PAVEMENTS

Refer to **Table 5.1 – Maintenance grading of unsealed roads** in Performance Requirements in this work section.

#### 5.11.1 Opening Grade

Open roads to conventional vehicles by grading after damage by rain.

Any undamaged pavement may be by-passed by the grader.

Where damaged pavement is encountered, grade the pavement running surface to remove corrugations and fill in ruts, holes and depressions.

Repair scours. Recover material from the batters and drains at scours to restore shape to the formation.

Repair creek crossings and floodways leaving no windrow on either side.

In the case of saturated table drains, it may only be possible to open grade the centre of the pavement, removing sand and debris to the shoulder.

#### 5.11.2 Maintenance Grade – Carriageway

Grade the carriageway pavement and shoulder surface.

Cut the pavement and shoulders to remove all corrugations and fill in all ruts, holes and depressions.

Spread the trimmed material evenly across the full width of the carriageway to a thickness of 25 to 40 mm to fill depressions and to obtain the typical cross section as shown on the Drawing No. CS 2100.

#### 5.11.3 Maintenance Grade – Between inverts

Grade the area between the inverts of both table drains.

Remove all obstructions including dead trees, fallen branches and regrowth from area to be graded.

Win material from the area between the inverts of both table drains and the edges of the shoulder. Ensure that vegetation material is not included.

Cut the pavement and shoulders to remove all corrugations and fill in all ruts, holes and depressions.

Spread the accumulated material uniformly over the pavement and shoulders to a thickness of 25 to 40 mm to fill depressions and to obtain the typical cross section as shown on the Drawing No. CS 2100.

Reinstate table drain blocks in accordance with EARTHWORKS AND DRAINAGE.

#### 5.11.4 Maintenance Grade – Between Batters

Grade the road formation width between the tops of both outer batters.

Remove all obstructions including dead trees, fallen branches and regrowth from areas to be graded.

Win suitable material from the area between the tops of outer batters and the edges of the shoulder. Ensure that vegetation material is not included.

Cut the pavement and shoulders to remove all corrugations and fill in all ruts, holes and depressions.

Spread the accumulated material uniformly over the pavement and shoulders to a thickness of 25 to 40 mm to fill depressions and to obtain the typical cross section as shown on the Drawing No. CS 2100.

Remove windrows from table drains, offset drains, creek crossings, floodways and culvert entrances and outlets.

Reinstate table drains and table drain blocks in accordance with EARTHWORKS AND DRAINAGE.

#### 5.11.5 Full Maintenance Grade

Grade the road formation width between the tops of both outer batters.

Remove all obstructions including dead trees, fallen branches and regrowth from area to be graded.

Remove windrows which contain vegetation or other unsuitable materials by spreading them evenly outside of the outer batters.

Win material from windrows which contain suitable material and the area back to the edge of the shoulder. Ensure that vegetation material is not included.

Cut the pavement and shoulders to remove all corrugations and fill in all ruts, holes and depressions.

Spread the accumulated material uniformly over the pavement and shoulders to a thickness of 25 to 40 mm to fill depressions and to obtain the typical cross section as shown on the Drawing No. CS 2100.

Remove windrows from table drains, offlet drains, creek crossings, floodways and culvert entrances and outlets.

Reinstate table drains, offlet drains, table drain blocks, catch drains and benches in cut in accordance with EARTHWORKS AND DRAINAGE, and cut new offlet drains where water ponds or where directed by the Superintendent.

#### 5.11.6 Grade and Roll

Mainly associated with damp or wet roads.

Grade the area between the inverts of both table drains.

Remove all obstructions including dead trees, fallen branches and regrowth from area to be graded.

Win material from the area between the inverts of both table drains and the edges of the shoulders. Ensure that vegetation material is not included.

Cut the pavement and shoulders to remove all corrugations and fill in all ruts, holes and depressions.

Spread the accumulated material uniformly over the pavement and shoulders to fill depressions and to obtain the typical cross section as shown on the Drawing No. CS 2100.

Roll the surface to achieve a uniform and tightly bound surface free of corrugations, ruts and depressions.

Compact with a minimum of 10 passes of a 15 tonne multi tyred roller. Passes to be distributed evenly over the carriageway, and to be between the outer edges of the shoulders.

Reinstate table drain blocks in accordance with EARTHWORKS AND DRAINAGE.

#### 5.11.7 Grade Water and Roll

Grade the area between the inverts of both table drains.

Remove all obstructions including dead trees, fallen branches and regrowth from area to be graded.

Win material from the area between the inverts of both table drains and the edges of the shoulders. Ensure that vegetation material is not included.

Cut the pavement and shoulders to remove all corrugations and fill in all ruts, holes and depressions.

Spread the accumulated material uniformly over the pavement and shoulders to fill depressions and to obtain the typical cross section as shown on the Drawing No. CS 2100.

Wet mix and roll to produce a uniform and tightly bound surface free of corrugations, ruts and depressions.

Compact with a minimum of 10 passes of a 15 tonne multi tyred roller. Passes to be distributed

evenly over the carriageway, and to be between the outer edges of the shoulders.

Reinstate table drain blocks in accordance with EARTHWORKS AND DRAINAGE.

#### 5.11.8 Rip and Re-compaction

Grade the road formation width between the tops of both outer batters.

Remove vegetation from areas to be graded, and remove windrows which contain vegetation or other unsuitable materials by spreading them evenly outside of the outer batters.

Win material from windrows which contain suitable material and the area back to the edge of the shoulder. Ensure that vegetation material is not included.

Cut the pavement and shoulders to remove all corrugations and fill in all ruts, holes and depressions.

Spread the accumulated material uniformly over the pavement and shoulders to fill depressions and to obtain the typical cross section as shown on the Standard Drawing.

Scarify and/or rip the full width of the pavement and shoulders, mixing both won and in-situ materials to obtain a uniform homogenised blend of 150 mm compacted thickness.

Wet mix blended materials and compact to minimum 95% of maximum modified dry density (MMDD). Trim and finish to produce a uniform and tightly bound surface free of ridges etc.

Reinstate table drains, offlet drains and table drain blocks in accordance with EARTHWORKS AND DRAINAGE.

#### 5.11.9 Reformation and Re-compaction

Grade the road formation width between the tops of both outer batters.

Remove vegetation from areas to be graded, and remove windrows which contain vegetation or other unsuitable materials by spreading them evenly outside of the outer batters.

Win material from windrows which contain suitable material and the area back to the edge of the shoulder. Ensure that vegetation material is not included.

Cut the pavement and shoulders to remove all corrugations and fill in all ruts, holes and depressions.

Spread the accumulated material uniformly over the pavement and shoulders to fill depressions and to obtain the typical cross section as shown on the Drawing No. CS 2100.

Top up with nominated compacted depth gravel material conforming to the Materials clauses of the specification.

Scarify and/or rip the full width of the pavement and shoulders, mixing both won and in-situ

materials to obtain a uniform homogenised blend of 150 mm compacted thickness.

Wet mix blended materials and compact to minimum 95% of MMDD. Trim and finish to produce a uniform and tightly bound surface free of ridges etc.

Reinstate table drains, offlet drains and table drain blocks in accordance with EARTHWORKS AND DRAINAGE.

## **5.12 MAINTENANCE GRADING OF UNSEALED SHOULDERS, BATTERS AND DRAINAGE OF SEALED ROADS**

Refer to **Table 5.2 – Maintenance grading of unsealed shoulders on sealed roads** in Performance Requirements in this work section.

Provide a finished surface free of ruts, corrugations, depressions, excess loose material, and debris and level with the sealed surface.

Attain and maintain pavement dimensions with standard Drawing No. CS 2102.

Ensure that there is no shoulder material left on the seal.

Remove all vegetation from area to be graded.

### **5.12.1 Drainage Maintenance Grade**

Grade the road formation width between the top of the outer batter and edge of shoulder.

Reinstate table drains, offlet drains and table drain blocks in accordance with EARTHWORKS AND DRAINAGE.

Remove all obstructions, including dead trees, fallen branches and re-growth from areas to be graded and remove windrows which contain vegetation or other unsuitable materials by spreading them evenly outside of the outer batters.

Win material from windrows which contain suitable material and the area back to the edge of the shoulder. Ensure that vegetation material is not included.

Spread the accumulated material uniformly over the verge and finish to the standard shape.

### **5.12.2 Grade and Roll**

A grade and roll operation will generally be ordered following rain, resulting in sufficient moisture in the shoulder material to gain effective compaction.

Grade the area between the invert of the table drain and the edge of seal.

Remove all obstructions including dead trees, fallen branches and re-growth from area to be graded.

Win suitable material from the area between the invert of table drain and the edge of the shoulder. Ensure that vegetation material is not included.

Spread the accumulated material uniformly over the shoulder and finish to the standard shape,

level with the top of the seal to provide a smooth transition between the shoulder and the seal.

Roll the shoulder surface to achieve a uniform and tightly bound surface free of corrugations, ruts and depressions.

Compact with a minimum of 4 passes of a 15 tonne multi tired roller, evenly on each shoulder.

Take care not to damage the seal when cutting or spreading. If the seal is damaged repair the damage with cold mix.

Remove all material from the sealed surface after each day's work with a power broom, prior to removing work area signs.

### **5.12.3 Grade Water and Roll**

Grade the area between the invert of the table drain and the edge of seal.

Reinstate table drain blocks in accordance with EARTHWORKS AND DRAINAGE.

Remove all obstructions including dead trees, fallen branches and regrowth from area to be graded.

Win suitable material from the area between the invert of table drain and the edge of the shoulder and ensure that vegetation material is not included.

Spread the accumulated material uniformly over the shoulders and finish to the standard shape, level with the top of the seal to provide a smooth transition between the shoulder and the seal.

Provide thorough mixing with water and rolling to produce a uniform and tightly bound surface free of corrugations, ruts and depressions.

Compact with a minimum of 4 passes of a 15 tonne multi tired roller, evenly on each shoulder.

Take care not to damage the seal when cutting or spreading. If the seal is damaged repair the damage with cold mix.

Remove all materials from the sealed surface after each day's work with a power broom, prior to removing work area signs.

### **5.12.4 Rip and Re-compaction**

Grade the road formation width between the top of the outer batter and edge of seal.

Reinstate table drains, offlet drains and table drain blocks in accordance with EARTHWORKS AND DRAINAGE.

Remove vegetation from areas to be graded, and remove windrows which contain vegetation or other unsuitable materials by spreading them evenly outside of the outer batters.

Win suitable material from windrows or batters and ensure that vegetation material is not included.

Spread the accumulated material uniformly over the shoulder and finish to the standard shape, level with the top of the seal to provide a smooth transition between the shoulder and the seal.

Scarify and/or rip the full width of the shoulder, mixing both won and in-situ materials to obtain a uniform homogenised blend of 150 mm compacted thickness.

Wet mix blended materials and compact to minimum 95% of MMDD. Trim and finish to produce a uniform and tightly bound surface free of corrugations, ruts and depressions.

Take care not to damage the seal when cutting or spreading. If the seal is damaged repair the damage with cold mix.

Remove all material from the sealed surface after each day's work with a power broom, prior to removing work area signs.

#### **5.12.5 Reformation and Re-compaction**

Grade the road formation width between the tops of both outer batters.

Remove vegetation from areas to be graded, and remove windrows which contain vegetation or other unsuitable materials by spreading them evenly outside of the outer batters.

Win material from windrows which contain suitable material and the area back to the edge of the shoulder. Ensure that vegetation material is not included.

Cut the pavement and shoulders to remove all corrugations and fill in all ruts, holes and depressions.

Spread the accumulated material uniformly over the pavement and shoulders to fill depressions and to obtain the typical cross section as shown on the Drawing No. CS 2100.

Top up with nominated compacted depth gravel material conforming to the Materials clause in this work section.

Scarify and/or rip the full width of the pavement and shoulders, mixing both won and in-situ materials to obtain a uniform homogenised blend of 150 mm compacted thickness.

Wet mix blended materials and compact to minimum 95% of MMDD. Trim and finish to produce a uniform and tightly bound surface free of ridges etc.

Reinstate table drains, offlet drains and table drain blocks in accordance with EARTHWORKS AND DRAINAGE.

#### **5.13 PROTECTION OF RAILWAY LINES**

Prevent damage to railway lines and other railway assets when maintenance equipment crosses at railway crossings.

Lift grader blade and rippers during crossing.

Remove any dirt and debris deposited onto tracks by maintenance equipment crossing.

Advise the appropriate rail authority immediately if railway line tracks are damaged.

#### **5.14 REMOVAL OF ROAD MATERIALS FROM CATTLE GRIDS**

Remove any gravel or fill material which enters cattle grids during maintenance operations.

#### **5.15 PROTECTION OF ROAD FURNITURE**

Remove, protect, store, replace any road furniture damaged during the work and reinstate all removed or damaged road furniture items within the work zone as the work proceeds.

#### **5.16 OTHER REQUIREMENTS**

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 6. STABILISATION MAINTENANCE

### 6.1 OUTLINE DESCRIPTION

This section specifies the stabilisation requirements of materials for use in sealed and unsealed roads, shoulders, verges and inverts, and the in-situ wet mixing of existing pavement and shoulders by pulverisation.

### 6.2 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

### 6.3 DEFINITIONS

#### Optimum Moisture Content

The amount of water by mass, expressed as a percentage of the dry mass of the material, at which maximum modified dry density (MMDD) is obtained with the stabiliser added.

### 6.4 MATERIALS

#### 6.4.1 Stabiliser

Lime: Hydrated  $\text{Ca(OH)}_2$  or Quicklime  $\text{CaO}$  conforming with AS 1672.1.

Do not use agricultural lime (Calcium Carbonate).

Cement: To AS 3972 - type GP or GB.

Supply and store as specified in product Safety Data Sheet (SDS).

#### 6.4.2 Additives – Hold Point

**Hold Point** - Use additives only with the approval of the Superintendent.

Follow manufacturer's recommendations when using retarders, water reducing or other additives.

#### 6.4.3 Water

Ensure water is clean and free from oil, alkali, organic matter and other deleterious substances, and that the total soluble salts content is less than 3,000 mg/litre (total dissolved salts).

For Southern Regions amend the maximum salt content as instructed by the Superintendent.

#### 6.4.4 Curing Agent

Surface applied curing membrane other than the use of water to be:

Bitumen emulsion ARS Grade 320, or

Cut-back bitumen Class AMC 2 or AMC 3.

#### 6.4.5 Materials to be stabilised

Stabilise the existing subgrade layer or the existing pavement and shoulder layer.

Refer to EARTHWORKS AND DRAINAGE and GRADING AND GRAVEL SHEETING for specification for top-up materials properties.

#### 6.4.6 Materials to be Wet Mixed

Pulverise and wet mix the existing pavement and shoulder layer including seal.

### 6.5 IN-SITU STABILISATION

#### 6.5.1 Preparation of Subgrade Layer

Remove the top 150 mm base course layer, or other nominated requirements, and stockpile to one side of formation for re-use. Refer to PSRs.

Avoid contamination of base-course material.

Extend the base-course preparation 5 m each end of the required section.

Shape and trim the surface to alignment, levels and cross sections necessary to produce the final subgrade levels and compacted thickness.

#### 6.5.2 Preparation of Pavement and Shoulder Layer

Scarify the existing pavement sections and new material, where necessary, full depth before spreading.

Tyne the surface lightly when quicklime is used.

Compact lightly to reveal irregularities in the spread material and to permit the stabilising equipment to traverse the area without excessive displacement of the surface.

Shape and trim the surface to the alignment, levels and cross-sections necessary to produce the final levels and compacted thickness.

#### 6.5.3 Commencement & Continuity of Work

Complete full width stabilisation in one day.

Cease stabilising during the following conditions:

- Wet weather or if rain is likely to fall.
- Windy periods which could cause loss of stabiliser, or dust nuisance.

#### 6.5.4 Spreading – Hold Point

Select the spread rate to achieve an unconfined compressive strength of 1.5 to 2.0 MPa.

Spread the cement using a computerised cement spreader.

Calibrate and check the spread rate prior to commencement.

Adopt the following rate for 150 mm thickness layers for tender purposes:

Cement: 6 kg/m<sup>2</sup>

Hydrated Lime: 8 kg/m<sup>2</sup>

**Hold Point** - Assess spread rate based upon test results of materials to be stabilised. Obtain the Superintendent's approval of the spread rate.

#### QUICKLIME

Water the spread material sufficiently to allow full slaking. Avoid over-watering.

**LIME SLURRY**

Mix the lime slurry initially in a separate paddle mixer or similar.

Use a mechanical sprayer with agitation to maintain a lime/water ratio within  $\pm 10\%$  of the initial ratio.

Lime/water ratio: Generally between 1:2 (i.e. 1 tonne per 2,000 litres) and 1:0.8 (i.e. 1 tonne per 800 litres), measured by mass.

**6.5.5 Mixing – Hold Point**

Use plant capable of:

- mixing the stabiliser with the nominated material uniformly over the full depth to be stabilised; and
- adding water uniformly to the materials while mixing with application rate between 0 to 10% (by mass) of the material being mixed.

Use purpose designed pavement re-claimer with an undercut rotor stabiliser.

**Hold Point** – For small areas in remote locations obtain Superintendent's approval for use of alternative plant suitable for the particular situation, including rotary hoes and graders.

Mix until uniform in colour and free of lenses, pockets or clumps of stabiliser.

Pulverise clayey material until at least 90% passes 19 mm sieve.

Add water to the materials during mixing to achieve a moisture content suitable for compaction.

**CEMENT STABILISATION**

Commence compaction and finishing immediately following satisfactory mixing.

**LIME STABILISATION**

Shape the treated layer to the approximate section after satisfactory mixing and lightly compact.

Cure for a period of 24 to 72 hours.

Commence final mixing.

Add water during final mixing if necessary to achieve moisture content suitable for compaction.

Mix until uniform in colour and free of lenses, pockets or clumps of lime.

**6.5.6 Compaction**

Compact parallel to the centre line of the pavement and for the full depth of the stabilised layer.

Commence compaction at the lower edge of the pavement and work progressively towards the crown or the higher edge.

Allow for progressive and uniform overlap between passes.

Wet the surface lightly after compaction to reduce moisture loss and lay the dust when necessary.

**CEMENT STABILISATION**

Complete the compacting and finishing within two hours of adding water.

**6.5.7 Finishing**

Finish the final surface to a smooth, dense, closely knit surface, free from compaction planes and cracks and finished to the tolerances specified.

Do not fill or add material to the surface of the pavement to meet tolerance requirements.

Maintain the surface material at not less than its optimum moisture content during all finishing operations.

Reconstruct non-complying areas at no cost to the Principal.

**6.5.8 Construction Joints****LONGITUDINAL JOINTS**

Minimise longitudinal joints by stabilising the full width of traffic lanes or wider as one continuous operation.

Keep the joints straight or following the road curvature as appropriate.

**TRANSVERSE JOINTS**

Form joints following any break in excess of two hours in the continuity of the stabilisation operations.

Cut the end of the material to a plane face at an angle not exceeding 45 degrees from the vertical.

Check the surface adjacent to the joint with a straight edge prior to recommencement and further cut back the joint as necessary to achieve surface tolerance.

**6.5.9 Curing**

Keep the finished surface damp, without leaching, until further construction or curing operations are carried out.

Alternatively cure by applying a bitumen emulsion or a bitumen primer as specified.

Apply the bituminous curing membrane as soon as possible after mixing and compaction but no later than 24 hours after relative compaction results are available.

Application rate for bitumen emulsions: 0.3 to 0.45 litres/m<sup>2</sup>.

Maintain clear of vehicular traffic for four days.

**6.6 PULVERISATION AND WET MIXING**

Prepare pavement and shoulder layer, mix, compact, and finish the layer all in accordance with the in-situ stabilisation clauses.

Break up and pulverise the existing pavement and shoulder layer including the existing sealed surface with a pavement re-claimer to a maximum particle size of 37.5 mm, incorporating the broken-up seal into the layer.

Use reclaimer plant capable of pulverising previous cement stabilised layers.

Make allowance for 2% Cement added and mixed to the existing materials. Allow for transportation of the material in the rate for the works.

## 6.7 CONFORMANCE

### 6.7.1 Tolerances

For stabilised and wet mix layers conform to the tolerances specified in GRADING AND GRAVEL SHEETING and with the following:

<b>Table 6.1 – Conformance of stabilisation - additional tolerances</b>	
<b>Property</b>	<b>Required value</b>
Dry Density Ratio:	Refer to <b>Table 4.15 - Dry Density Ratios for Conformance</b> in CONFORMANCE TESTING
Stabiliser Application Rate/Content:	±10% of the designated value averaged for each lot
Stabiliser Distribution:	Do not vary the stabiliser content by more than 0.5% absolute between top and bottom half of a layer at any location as determined in accordance with NTTM 204.8.
Moisture Content during Compaction:	±1.5% of optimum moisture content.

Samples for Liquid Limit, Plastic Limit, Linear Shrinkage, CBR will be taken from the unstabilised pavements.

### 6.7.2 Testing – Hold Point

Average one test per 1000 m<sup>2</sup> for the layer under consideration with a minimum number of three tests.

#### STABILISER APPLICATION RATE

The Contractor is responsible for checking the application rate.

Determine the stabiliser application rate in accordance with NTTM 204.7.

Determine the stabiliser content in accordance with NTTM 204.1.

Refer to CONFORMANCE TESTING for test frequencies.

Correct application deficiencies by the application of additional stabiliser and remixing if mixing has already commenced.

#### STABILISER CONTENT

The Superintendent will carry out conformance testing.

## COMPACTION

The Superintendent will carry out conformance testing.

Check areas for level tolerance and layer thickness before testing.

Sample only from the finished compacted pavement complying with level tolerance and layer thickness.

Proof roll all areas with maximum pneumatic tyre roller units.

Remove all areas that breach up or deform and reconstruct as specified.

Dry Density Ratios will be determined 24 hours after final compaction.

Backfill test holes within 24 hours of testing with new stabilised material.

**Hold Point** – Obtain the Superintendent approval for conformance of the stabilised layer prior to priming.

### 6.7.3 Surface Roughness

Surface roughness testing will be carried out by the Superintendent at the discretion of the Superintendent.

## 6.8 OTHER REQUIREMENTS

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.



## 7. SPRAY SEALING MAINTENANCE

### 7.1 OUTLINE DESCRIPTION

This section specifies the requirement for bituminous spray seal work for areas greater than 300m<sup>2</sup>.

Refer to BITUMINOUS SURFACE MAINTENANCE for details of spray sealing work for areas less than 300m<sup>2</sup>, patching work using hot mix and cold mix asphalts and crack sealing work.

### 7.2 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

#### 7.2.1 Australian Standards

AS 1141	Methods for sampling and testing aggregates
AS 1160	Bitumen emulsions for construction and maintenance of pavements
AS 1742	Manual of uniform traffic control devices
AS 1906.3	Retroreflective materials and devices for road traffic control purposes – Raised pavement markers (retroreflective and non-retroreflective)
AS 2008	Residual bitumen for pavements
AS 2106	Methods for the determination of the flash point of flammable liquids (closed cup) - General
AS 2157	Cutback bitumen
AS/NZS 2341	Methods of testing bitumen and related roadmaking products
AS 2341.6	Methods of testing bitumen and related roadmaking products - Determination of density using a hydrometer
AS 2341.9	Methods of testing bitumen and related roadmaking products - Determination of water content
AS 2341.13	Methods of testing bitumen and related roadmarking products – Long-term exposure to heat and air
AS 3568	Oils for reducing the viscosity of residual bitumen for pavements

#### 7.2.2 Austroads

AGPT04H-08 Austroads Guide to Pavement Technology – Part 4H: Test Methods.

AGPT04K-09 Guide to Pavement Technology – Part 4K: Seals.

AGPT-T190-14 Specification Framework for Polymer Modified Binders.

AP-G41-15 Bituminous Materials Sealing Safety Guide.

AP-T235-13 Guide to the Selection and Use of Polymer Modified Binders and Multigrade Bitumens.

AP-C87-15 Austroads Glossary of Terms.

ASTM D 1298-12b Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.

#### 7.2.3 Other

NTMTM NT Materials Testing Manual.

ASTM American Society for Testing Materials.

NT Weeds Management Act.

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

### 7.3 DEFINITIONS

Refer to Definitions in BITUMINOUS SURFACE MAINTENANCE.

### 7.4 SCOPE

Spray sealing treatments for routine maintenance include:

- Prime,
  - Primerseal,
  - Initial Seal or Reseal,
  - With conventional bitumen, cutback bitumen or bitumen emulsion binder,
  - With modified binder,
  - Incorporating geotextile fabric reinforcement,
- Spray sealing work consists of:
- Supply and delivery of materials,
  - Storage and handling of raw materials,
  - Precoating of aggregate,
  - Preparation of pavement surfaces,
  - Preparation of bituminous materials,
  - Application of primer and/or primer binder and/or binder,
  - Spreading and rolling of aggregate,
  - Removal of loose aggregate.

#### 7.4.1 Cycle and Pedestrian shared Path Maintenance

All relevant design principles contained in Austroads Guide to Road Design Part 6A: Pedestrian and Cyclist Paths must be integrated in the design of cycle ways, pathways and associated infrastructure. Refer to Design drawings (if any) and conform to local Council

requirements. Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 7.5 MATERIAL REQUIREMENTS

### 7.5.1 Aggregates

Aggregates must be clean, hard, durable, skid resistant, dry crushed stone, or gravel of uniform quality free from declared weeds and their seeds and other deleterious material, and conform to the properties specified. Minimum two crushed faces.

Nominate source of aggregate supply. Submit to the Superintendent current NATA endorsed test result certificates providing evidence that the nominated aggregate supply conforms to specified properties. Aggregate used for testing must be sampled from project site.

Conform to **Table 7.4 - Aggregate Grading and Average Least Dimension**, and to **Table 7.5 - Aggregate Properties**.

**Refer to Clause 7.22 for Tables**

### 7.5.2 Cutter and Flux

Cutter is to be Kerosene or Jet A1 Aviation Turbine Fuel – conform to **Table 7.1 – Cutter oil properties**. Do not use diesel products.

**Table 7.1 – Cutter oil properties**

Property	Min.	Max.	Test Method
Density at 15 °C, km/m <sup>3</sup>	775	830	ASTM D1298 AS/NZS 2341.6
Distillation Initial Boiling Point °C	140	-	ASTM D86
Distillation Final Boiling Point °C	-	280	ASTM D86
Flash Point °C (Penkys-Martens closed cup)	38	-	AS 2106.2
Water content, % by volume	-	0.1	AS/NZS 2341.9
Viscosity, mPa.s at 40 °C	-	2.0	ASTM D445
Refer AS 3568 – 1999 Table 1 for complete table.			

### 7.5.3 Precoat and adhesion agents

Precoat and Adhesion Agents are to be in the concentrated form and not contain Diesel as part of the mixture.

Precoat all aggregates to conform to the following:

Precoat mixture is to be 100/0/100/1 and not contain Diesel as part of the mixture.

Bitumen residue (by mass): 50%.

Kerosene (by Mass) 50%

Adhesion agent (by mass): minimum 1%

### 7.5.4 Bitumen

Standard Classes of bitumen to conform to the requirements of AS 2008.

Manufacture all AS 2008 bitumens in a refinery and have NATA endorsed certificates of manufacture.

Durability Value, in accordance with AS/NZS 2341.13 – Long-term exposure of bitumen to heat and air, shall be a minimum of 7 days with no maximum value.

Multigrade bitumen to comply with AGPT-T190-14 *Specification framework for polymer modified binders*.

### 7.5.5 Cut Back Bitumen

Conform to the requirements of AS 2157 and **Table 7.6 - Cut Back Bitumen Properties**.

Designation is by AMC class.

**Refer to Clause 7.22 for Tables**

### 7.5.6 Bitumen Emulsion

A rapid setting bitumen emulsion made with bitumen Class 320.

Refer to PROJECT SPECIFIC REQUIREMENTS in the Request for Tender document for details of type of emulsion to be used.

Conform to the requirements of AS 1160.

Utilise within 90 days of manufacture.

Spraying temperature: 60% bitumen content 30 to 60° C.

Generally Bitumen emulsion to be;

Type; CRS

Binder Grade; 170

%Binder; 60

### 7.5.7 Polymer Modified Binder

A mixture of Standard Class bitumen and elastomeric polymer or crumb rubber additive.

All conformance testing to be carried out in accordance with Australian Standard Test Methods.

Base binders for the production of PMB must meet the specification limits outlined in **Table 7.7 – Base Binder for Polymer Modified Bitumen** from the refinery. All base binders must be tested for conformance to ensure compliance before manufacture into PMB's.

Polymer Modified Binders must conform to the requirements outlined in **Table 7.8 – Polymer Modified Binders for Sprayed Sealing Applications**.

**Refer to Clause 7.22 for Table**

Manufacture of Polymer Modified Binders must meet the requirements of the "Guide to Manufacture, Storage and Handling of Polymer Modified Binders, Australian Asphalt Pavement Association, 2013".

## 7.6 SPRAYERS AND PERSONNEL

Sprayers must have current calibration accredited by a tester nominated on the Australian Asphalt Pavement Association website. All calibrated sprayers must be listed on the Australian Asphalt Pavement Association website. A copy of the calibration certificate must be with the vehicle at all times.

Calibrate sprayers yearly.

Ensure sprayer driver and operator are skilled and trained with an understanding of sprayer calibration and an appreciation of the requirements of the work.

Ensure relevant personnel understand the types and quantities of the various materials and mixtures to be used.

Bitumen Spraying plant and equipment must be in good working condition at all times.

## 7.7 PREPARATION OF PAVEMENT

Remove raised reflective pavement markers. Repair any damage to the pavement surface caused by the removal of raised reflective markers with an emulsion/sand mixture before sealing.

Sweep the pavement surface to remove loose stones, dust, dirt and foreign matter immediately before spraying.

Do not use steel brooms on fine crushed rock type or low plasticity type materials or on airstrips.

Maintain the prepared surface.

Extend sweeping clear of the area to be sealed.

Remove adherent patches of foreign material with a steel scraper.

Dampen the prepared surface lightly immediately before spraying (for priming and primersealing only).

Remove water from the surface of primed or sealed pavements before applying binder.

Do not allow traffic on the prepared surface.

## 7.8 SETTING OUT

Mark out by string line or paint.

Include pavement widening.

## 7.9 BINDER COAT REQUIREMENTS

### 7.9.1 General

The Contractor must rectify bleeding or flushing seals during the defined defects period where

binder application rates were applied at greater than 105% of the designated volume.

### 7.9.2 Prime, primer seals and enrichment coats

Provide bitumen complying with; **Table 7.8 – Polymer Modified Binders for Sprayed Sealing Applications.**

Generally bitumen class 320 for cut back as follows:

Prime: AMC 0 to AMC 00

Primer Seal: AMC 5 to AMC 6

Enrichment Coat: CRS 170/60

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS in the RFT for cut back requirements.

Cut-back bitumen to be mixed on site.

Heat bitumen to a temperature appropriate for achieving final spraying temperature making allowance for incorporation of the unheated cutter.

Add unheated cutter to heated bitumen and circulate until a homogeneous mixture is achieved.

Spray immediately circulation is complete.

Allow at least three days to elapse after priming before applying the binder coat. Ensure primer soaks in and dries off before applying binder coat.

Keep traffic off the primed surface for 3 days after priming. Use a primer seal if traffic cannot be kept off surface for 3 days.

### 7.9.3 Straight Run Binder Coats

Provide bitumen Class 320 complying to AS 2008 as follows:

#### Cross Reference

Austroads Technical Report AP-T68/06 – Update of the Austroads Spray Seal Design Method

Austroads - Guide to the Selection and Use of Polymer Modified Binders and Multigrades – AP-T235-13 (2013)

Standard Specification for Roadworks, Spray Sealing (Department of Infrastructure) AS2008 - Bitumen for Pavements (2013)

#### Definitions

S10E – A class of polymer modified bitumen, used for spray seal work, with an elastomeric modifier, conforming to specified binder properties in the Standard Specification for Roadworks It must be manufactured from bitumen that conforms to the classes in AS2008.

SAMI – Strain Alleviating Membrane Interlayer. A layer of seal sprayed onto an existing cracked surface, prior to asphalt resurfacing.

### Priming and Primer Sealing

Region	Binder Type
All	Class C240/C320*

\* - applied in cutback form

### Tack Coat and Enrichment

Region	Binder Type
All	CRS170/60*

\* - applied in emulsion form

### Initial Seal Work

Region	Binder Type
Darwin, Katherine, East Arnhem Tennant Creek, Alice Springs	S10E

### Resealing Work

Region	Binder Type
All	S10E

### SAMI Work (Using 14mm aggregate)

Region	Binder Type
All	S25E

Selection of binder type other than those specified above can be considered in special circumstances and to the approval of the Executive Director Civil Construction (Chief Engineer) Civil Services. For example, resealing a heavily cracked surface may require a S20E or S25E binder type or crumb rubber S45R.

Material properties for S10E binders and other binder types are contained in the Standard Specification for Roadworks, Spray Seal section.

For further guidance refer to Austroads - Guide to the Selection and Use of Polymer Modified Binders and Multigrades (TT1357 2012)

Heat to spraying temperature but do not exceed the maximum. Avoid heating bitumen in quantities excess to requirements

Prevent foaming.

Ensure product meets the requirements of the specification at point of delivery.

#### 7.9.4 Polymer Modified Binder Coats

Provide bitumen in conformance with **Table 7.8 – Polymer Modified Binders for Sprayed Sealing Applications** blended with the required polymer as follows:

Prepare the product in a manufacturing or blending plant that complies with the "Guide to the Manufacture, Storage and Handling of Polymer

Modified Binders, Australian Asphalt Pavement Association, 2013".

- Initial seal coat: Class S10E
- Reseal coat: Class S10E

Store, mix, heat and spray the polymer modified binder as recommended by the polymer manufacturer.

Both coats of two coat seals shall contain polymer.

Allow for adhesion agent in Bitumen item.

#### 7.9.5 Binder Coats, Tender Quantities

Spray Rates: Calculated using Austroads Design Method.

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS for spray rates used as a basis for calculating tender quantities.

#### 7.10 SAMPLING OF BINDER

##### 7.10.1 Test Request

Darwin Urban areas – Test requests are to be sent to the panel period contractor to witness sampling and arrange testing.

All other areas - the supplier is to sample and deliver the sample to DoI staff within 48 hours.

##### 7.10.2 Supply of Sampling Containers

Supply all sampling containers as required for sampling purposes.

- Sample containers are to be leak proof and having a capacity of not less than one litre.
- Sample containers must be clean, rust free and capable of receiving a product at high temperatures.

##### 7.10.3 Definition of Sampling

- A sample is three containers of product collected at the same time from the same supply source.
- One sample container is for the Contractors analysis.
- Two sample containers are for the Department to analyse.
- Note: Refer to the Superintendent for requirements if samples are non-conforming.

##### 7.10.4 Frequency of Samples

Refer to CONFORMANCE TESTING.

##### 7.10.5 Collection of Samples - Witness Point

Take samples prior to addition of adhesion agents.

Conformance test sampling is to be collected at point of delivery.

Ensure bulker has adequate sampling cocks installed so as samples can be taken on transfer

from the bulker to the sprayer. Do not take samples from the spray wagon.

**Witness Point** – Take samples from the point of delivery on transfer from the bulker to the sprayer or as directed. Where transfer is for works in the urban area or for small works ensure that conformance testing is ordered and samples are taken at the point of transfer from bulker to sprayer.

All sampling must be in accordance with Australian or Austroads standards. The supplier is to perform the sampling. Ensure staff carrying out sampling are competent in sampling methods.

Ensure sampling techniques do not allow contamination of the samples.

Where samples are not collected, 10% reduction adjustments (**Table 21.1 Payment Adjustments** in MEASUREMENT AND PAYMENT) will apply to the total materials represented.

Refer to **Table 7.8 – Polymer Modified Binders for Sprayed Sealing Applications**.

#### 7.10.6 Identification of Samples

Mark samples with the following information on the container at the time of collection.

- Container number.
- Sample number.
- Date and time of sample taken.
- Designation or Classification of Materials.
- Sample Temperature.
- Tanker/Sprayer Identification Number.
- Name of Supplier.
- Road Name and number.
- Site Identification.
- Location and Chainage.

#### 7.10.7 Storage and Delivery of Samples

Store all samples taken to prevent accidental damage or contamination. Submit sample containers at the completion of each days spraying.

#### 7.10.8 Stockpile Sites

Refer to Stockpiles clause in MISCELLANEOUS PROVISIONS.

### 7.11 SUPPLY OF AGGREGATE

Supply and deliver aggregate into stockpiles at the locations specified in the PROJECT SPECIFIC REQUIREMENTS section of the RFT.

The quantity of aggregate delivered is to be within 5 % or 20 m<sup>3</sup> of the specified quantity, whichever is the lesser.

### 7.12 PRECOATING AGGREGATE

All aggregates used must be dry before precoating.

No precoat is required for SAMI and Emulsion seals, unless stated in the response schedules.

Apply a uniform film of precoating material to the aggregate.

Aggregate which has been excessively precoated will be rejected.

Precoating is to take place at preapproved site stockpile locations unless otherwise approved by the Superintendent.

All precoating must be performed with a powered shaking screen deck precoater which removes dust, dirt and oversize materials and evenly applies precoat to the aggregate.

### 7.13 ADHESION AGENT - MANDATORY

Use 1% adhesion agent in the binder. Written Superintendent approval must be obtained for variation of this rate.

Circulate in binder for 20 minutes before spraying.

Provide the Superintendent a copy of the Safety Data Sheet information of the adhesion agent prior to its intended use.

### 7.14 SPRAYING – WITNESS POINT

**Witness Point** - Give the Superintendent 48 hours' notice of intention to spray bitumen.

Store bitumen at lowest practical temperature and for the shortest possible duration.

Comply with the following temperature control requirements for polymer modified binders:

**Table 7.2 – Temperature control requirements for polymer modified binders**

Property	Straight Run Binder	Polymer Modified Binder
Temperature at point of spraying	175 to 185 °C	180 to 200 °C
Holding time at spraying temperature	7 days maximum	2 days maximum
Temperature for medium term storage	130 to 150 °C	140 to 160 °C
Holding time for medium term storage	30 days	7 to 10 days

Seek approval to vary these requirements.

Remove bitumen from the site when temperature limits are exceeded.

#### 7.14.1 Atmospheric Conditions

Commence spraying only when pavement temperature:

- is in excess of 20°C, or
- has been in excess of 15°C for at least one hour.

For cutback work, commence spraying when pavement temperature is in excess of 10 °C.

For emulsion work, commence spraying when pavement temperature is in excess of 5 °C.

Cease spraying if rain threatens, or in windy or dusty conditions.

Protect the work in the event of a sudden change in weather by closing the affected section of road or by rigidly controlling traffic speed.

#### 7.14.2 Preparing the Sprayer

Circulate the mixture.

Check the horizontal and vertical alignment and the cleanliness of the spraybar and its extensions.

Determine the appropriate number of nozzles for the width to be sprayed. Ensure the end nozzles fitted are EAN18W.

Check that the nozzles in use are symmetrical about the sprayer.

Check the alignment and setting of the nozzle to ensure that the fans of material from intermediate nozzles are parallel and at an angle of 30° to the centre line of the spraybar. Ensure that the fans from the end nozzles are parallel to each other and at an angle of 45 degrees to the centre line of the spraybar.

Set the height of the spraybar so that the lower faces of the nozzles are 250 mm (or that specified on the calibration certificate) above the pavement when the sprayer is full.

Fit an end shield to the spraybar when necessary to prevent spraying material on the kerb, or to counter any wind effects which would compromise uniform spraying.

Position the guide rod to conform to the setting out and edges of spray. Check by making a dummy run.

#### 7.14.3 Application Spray Rates – Hold Point

Application spray rates shall be determined by the Superintendent, using appropriate Austroads design methods.

For new seals and reseals, supply the following to the Superintendent, 3 working days prior to the planned commencement of sealing, to allow the spray rates to be calculated:

- Particle Size Distribution (1 per 250 tonne - minimum 3 tests)

- Average Least Dimension (ALD) (1 per 250 tonne - minimum 3 tests)
- Flakiness Index (FI) of the aggregate, (1 per 250 tonne - minimum 3 tests)
- Ball Penetration testing (for new seal work)
- Dryback results (for new seal work)

Refer to Conformance Testing for sampling requirements of aggregates.

**Hold Point** – Do not commence spraying until the spray rates are advised by the Superintendent.

Spray rates to be at 15 °C adjusted in accordance with **Table 7.9 - Bitumen Equivalent Volumes**.

For primers, primer seals and polymer modified binders, the rate of application refers to the whole of the mixture, including all modifiers, cutback materials, combining oils and adhesion agents. For enrichments and emulsion seals, the rate of application refers to the whole of the mixture.

#### 7.14.4 Preparation for Sprayer Run – Witness Point

Record the volume and temperature of the sprayer contents while it is on level ground.

Supply Sprayer Tank dips before and after each sprayer run.

**Witness Point** - Allow visual inspection when requested.

Determine the length of sprayer run from the available quantity in the sprayer and the application rate. Ensure the area to be sprayed is not greater than the area that can be covered by aggregate in the loaded trucks.

Start and finish each spray run on a protective strip of paper placed on the pavement. The paper to be wide enough to ensure the sprayed material is being discharged correctly over the full width of spray. Place sufficient protective paper to protect road fixtures.

Place paper on the pavement and masking around areas to be sprayed or wherever the sprayer is stationary on the road pavement.

Seal joins are only allowed where line marking is to be placed. No joins are allowed in wheel paths.

Excess overspray and spills must be removed before sealing works proceed.

#### 7.14.5 Installation of Temporary Pavement Markers

Temporary Pavement Markers to conform to AS 1906.3.

Spacings of temporary pavement markers to be in accordance with AS 1742.

#### 7.14.6 Sprayer Run

Attain uniform spraying speed before spraying commences.

Avoid an excess or deficiency of material due to faulty overlap at longitudinal joints when spraying a road in half-widths.

Overlap to be 300 mm with an intermediate nozzle.

Do not use end nozzles on an overlap.

Make allowances for "Fog Spraying" when joining to existing seals.

Cease spraying before the level of material in the tank falls to a level which reduces the full discharge of the pump.

Remove and dispose of all paper as per the EMP.

Clean off any sprayed material from road fixtures.

#### 7.14.7 Hand Spraying

Plan work to minimise the requirement for the use of a hand sprayer.

Any strips of pavement not adequately covered with sprayed material to be sprayed later with the hand attachment.

### 7.15 APPLICATION OF AGGREGATE – HOLD POINT

Supply current test results of materials to be used.

Load aggregate into tip trucks using an approved aggregate loader which removes dust, dirt and oversize stone while applying precoat.

**Hold Point** - Obtain approval from the Superintendent for use of the proposed aggregate loader before commencing aggregate loading operations.

Apply aggregate to sprayed binder within:

- 10 minutes where the pavement temperature is 20°C or greater.
- 5 minutes where the pavement temperature is between 15 and 20°C.

Polymer Modified Binders: Apply aggregate within 5 minutes irrespective of pavement temperature.

Apply aggregate to emulsion coat before the emulsion breaks.

Spread the aggregate evenly and uniformly over the sprayed surface at a rate of 900/ALD m<sup>2</sup>/m<sup>3</sup>. Seek approval for variations to this rate.

Use a mechanical spreader.

Rerun or hand cover bare or insufficiently covered places after the first spreading.

Aggregate spread in excess of the application rate designated in the procedure will be removed and stockpiled at full cost to the Contractor.

#### 7.15.1 Aggregate Spread Rates

Spread the aggregate evenly and uniformly over the sprayed surface at a rate complying with **Table 7.3 – Aggregate spread rates**.

Use a mechanical automated spreader, manual spreader boxes are not to be used.

Rerun or hand cover bare or insufficiently covered areas after the first spreading.

Remove all excess aggregate.

<b>Table 7.3 – Aggregate spread rates</b>		
<b>Straight Run Binder Coats</b>		
Aggregate Size	Traffic Volume	Application Rate
10mm and greater	>200 vehicles/day	900/ALD m <sup>2</sup> /m <sup>3</sup>
10mm and greater	< 200 vehicles/day	850/ALD m <sup>2</sup> /m <sup>3</sup>
7mm and less		900/ALD m <sup>2</sup> /m <sup>3</sup>
<b>Polymer Modified Binder Coats</b>		
Aggregate Size	Traffic Volume	Application Rate
10mm and greater	>300 vehicles/day	750/ALD m <sup>2</sup> /m <sup>3</sup>
10mm and greater	< 300 vehicles/day	800/ALD m <sup>2</sup> /m <sup>3</sup>
7mm and less		160 – 200 m <sup>2</sup> /m <sup>3</sup>
<b>Two Coat Seals</b>		
Aggregate Size		Application Rate m <sup>2</sup> /m <sup>3</sup>
10		1050 – 1100 / ALD
7 (ALD known)		1100 – 1150 / ALD
5 or 7 (no ALD)		250 - 300
5 or 7 (no ALD)		175 - 225

### 7.15.2 Rolling Rate

Roll the treated surface with self-propelled rubber tyred rollers with a minimum tyre pressure of 600 kPa and a minimum wheel load of 1 tonne.

Roller speed on the first pass to be between 5 and 10 km/h, with subsequent passes between 15 and 25 km/h.

Conform to the following:

- Entire area to receive one roller pass immediately after covering.
- 75% of rolling within 1 hour of covering.
- 100% of rolling within 2 hours of covering.

Minimum Rolling Rate: 1 roller hour per 2,000 litres of binder.

Ensure a uniform distribution of aggregate. Drag broom to distribute surplus aggregate but do not dislodge embedded aggregate. Drag broom before 50% of rolling is complete. Drag brooms are not to be rotary brooms.

For two coat treatments, double the specified rolling rate if the second coat is to be applied immediately or the surface is not to be trafficked.

Roll in daylight hours only.

Sweep all loose aggregate from the carriageway at completion of rolling.

Ensure aggregate on the final surface is uniformly distributed and firmly held by the binder.

Adjust drag broom to distribute surplus aggregate, but not to dislodge embedded aggregate. Ensure aggregate on the final surface is uniformly distributed, and firmly held by binder.

Re-roll the surface after sweeping to ensure uniform bedding of aggregate in binder.

### 7.15.3 Rolling Rate Airstrips

Roll the treated surface with at least one self-propelled rubber tyred roller with a minimum weight of 20 tonnes.

Rubber Tyred Minimum Rolling Rate: One 20 tonne roller hour per 800 litres of binder.

Steel Drum Roller Minimum Rolling Rate: One pass on the second coat.

Ensure a uniform distribution of aggregate. Drag broom to distribute surplus aggregate but do not dislodge embedded aggregate. Drag broom before 50% of rolling is complete. Drag brooms are not to be rotary brooms.

Ensure aggregate on the final surface is uniformly distributed and firmly held by the binder.

Roll in daylight hours only.

Using a suction type broom to sweep all loose aggregate from the carriageway at completion of rolling, remove from site.

Re-roll the surface after sweeping to ensure uniform bedding of aggregate in binder.

### 7.16 TRAFFIC ON RESEALS

Cross reference: PROVISION FOR TRAFFIC, Workzone Traffic Management, Traffic Escort Vehicle- Reseal Works.

Co-ordinate work to minimise traffic delays.

Prohibit traffic:

- until at least 3 passes of a roller has taken place or until sufficient rolling has taken place to prevent damage to the applied seal, whichever is greater; and
- from adjacent strip of roadway during spraying.

Sweep all loose aggregate from the carriageway at completion of rolling.

### 7.17 WASTE MATERIAL

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

In urban areas, remove all excess aggregate by suction broom. Ensure no aggregates are distributed onto the verge.

Remove from the site and legally dispose of all waste material.

Clean and remove all aggregate from the shoulders and verges in urban areas.

### Urban areas aggregate removal / sweeping regime:

**Initial** sweep after rolling has concluded

**Second** sweep after 24 hours

**Third** sweep after 48 hours.

Sweep all aggregate from the extremities of the shoulders in rural areas.

### 7.18 REPORTING

#### 7.18.1 Spraysheets

Supply to the Superintendent at the end of each days production spraysheets that record the following information for all spray runs conducted.

- Contractors Name
- Project Details
- Contract Number
- Specification schedule number
- Road Name
- Product Type Sprayed
- Precoat type used, Precoat litres / m<sup>3</sup>
- Aggregate supplier, Aggregate Type, Aggregate size
- Run number, Start Time of spray run



- Pavement Temperature, Ambient Temperature
- Start Chainage of spray run – actual km of road
- End chainage of spray run – actual km of road
- Total Length, Width of spray run
- Total area of spray run
- Temperature of product at spraying
- Start Dip, End Dip
- Total sprayed hot, Correction factor, Total sprayed cold
- Application rate cold
- Ordered application rate
- Percent of application rate ordered
- Number of rollers used
- Bitumen sample number
- Signature of contractor representative
- Signature section for client representative

## 7.19 CONFORMANCE

### 7.19.1 Tolerances

Final surfaces shall conform to the following:

Aggregates are to conform to **Table 7.5 - Aggregate Properties**. Refer to Clause 7.22 for Tables

Skid resistance determined by NTTM 304.1.

Final surfaces with non-conforming skid resistance will be rejected.

Rectify non-conforming work by methods approved by the Superintendent. Rectification work is at the Contractor's expense, including the cost of testing.

Remove from the site binder which has been overheated or has deteriorated or become contaminated prior to its application to the road.

Spray rates applied at less than 95% or more than 105% of the rate indicated in the procedure will be rectified by resurfacing at the Contractor's expense inclusive of all materials.

### 7.20 ADJUSTMENT TO VOLUMES FOR SPRAY RATES

This includes the prime coat, enrichment coat, emulsion coat, primerseal and seal coats.

Refer to **Table 7.9 - Bitumen Equivalent Volumes** and MEASUREMENT AND PAYMENT CLAUSES for schedules of adjustments.

### 7.21 OTHER REQUIREMENTS

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

7.22 TABLES

**Table 7.4 - Aggregate Grading and Average Least Dimension**

Sieve Size (mm)	% Passing (Dry Mass)					
	Nominal Size of Aggregate					
	20 mm	16 mm	14 mm	10 mm	7 mm	5 mm
26.5	100					
19.0	85 - 100	100				
16.0	-	80 - 100	100			
13.2	0 - 15	0 - 20	85 - 100	100		
9.5	0 - 5	0 - 2	0 - 15	85 - 100	100	
6.7	0 - 2		0 - 5	0 - 15	85 - 100	100
4.75			0 - 2	0 - 5	0 - 15	85 - 100
2.36				0 - 2	0 - 5	0 - 15
1.18					0 - 2	0 - 5
<b>Min. ALD *</b>	<b>12.0mm</b>	<b>9.5mm</b>	<b>8.0mm</b>	<b>5.5mm</b>	<b>3.5mm</b>	<b>2.5mm</b>
* Refer to Test Methods AS 1141.20.1, AS 1141.20.2. - Direct Measurement.						

**Table 7.5 - Aggregate Properties**

Aggregate Property	Traffic Count (Annual Average Daily Traffic (AADT): Two Lanes)		
	Less than 300 VPD *	300 to 6,000 VPD	More Than 6,000 VPD
AS 1141.14 Misshapen Particles: Calliper Ratio 2:1	25 % max	15 % max	12 % max
AS 1141.15 Flakiness Index	35 max	30 max	25 max
AS 1141.23 Los Angeles Abrasion (LAA):			
Fine Grained Aggregate	30 % max	25 % max	20 % max
Coarse Grained Aggregate	40 % max	35 % max	30 % max
AS 1141.24 Sulphate Soundness	15 % max	12 % max	10 % max
AS 1141.40, AS 1141.41 Polished Aggregate Friction Value	40 min	40 min	45 min
* VPD (Vehicle per day).			
AS 1141.18:	Crushed particles in coarse aggregate derived from gravel. Ensure 80% minimum by mass is classified as crushed particles.		
AS 1141.25.1	Degradation factor – Source rock (Washington Degradation Test). Igneous rocks shall have a minimum value of 50.		
AS 1141.26	Secondary minerals content in igneous rocks shall not exceed 25 %.		
AS 1141.29	Accelerated soundness index by reflux. Igneous rocks shall have a minimum value of 94.		
AS 1141.50	Resistance to stripping of cover aggregates from binders. The maximum stripping value of precoated aggregate (precoat shall contain 1 % adhesion agent.) shall be 10 %.		

<b>Table 7.6 - Cut Back Bitumen Properties</b>			
<b>Class AS 2157</b>	<b>Viscosity (Dynamic) At 60°C Pa.sec</b>	<b>Approximate Parts Bitumen To Cutter</b>	<b>Spraying Temperature deg. C</b>
<b>Light</b>			
AMC 00	0.008 - 0.016	100 - 100	Ambient
AMC 0	0.025 - 0.05	100 - 80	35 - 55
AMC 1	0.06 - 0.12	100 - 50	60 - 80
<b>Medium</b>			
AMC 2	0.22 - 0.44	100 - 40	75 - 100
AMC 3	0.55 - 1.10	100 - 30	95 - 115
AMC 4	2.0 - 4.0	100 - 20	110 - 135
<b>Heavy</b>			
AMC 5	5.5 - 11.0	100 - 12	120 - 150
AMC 6	13.0 - 26.0	100 - 7	135 - 160
AMC 7	43.0 - 86.0	100 - 3	150 - 175

<b>Table 7.7 – Base Binder for Polymer Modified Bitumen</b>		
<b>Property</b>	<b>Specification limit minimum</b>	<b>Specification limit maximum</b>
Viscosity at 60°C, Pa.s	140	380
Viscosity at 135°C, Pa.s	0.25	0.65
Penetration at 25°C (100g, 5s), <i>pu</i> ( <i>pu</i> unit is 0.1mm)	40	
Flashpoint °C	250	N/A
Matter Insoluble in toluene, percent mass	N/A	1.0
Short Term effect of heat and air (Rolling Thin film Oven Test) Viscosity of residue at 60°C as a percentage of original	N/A	300
Long term effect of Heat and air, days	7	
Density at 15°C, t/m <sup>3</sup>	TBR	

**Table 7.8 – Polymer Modified Binders for Sprayed Sealing Applications**

Test Method	Binder Property	PMB Class					
		S10E	S20E	S25E	S35E	S45R	S55R
	<b>PEFORMANCE RELATED PROPERTIES</b>						
AGPT/T121	Consistency at 60 °C (Pa.sec) min.	400	2000	6000	350	1800	4000
AGPT/T121	Stiffness at 15 °C (kPa) max.	140	130	95	160	180	140
AGPT/T131	Softening Point (°C) min.	48	65	80	48	55	62
AGPT/T132	Compression Limit at 70 °C, 2kg (mm) min.	NA	NA	NA	NA	0.2	0.2
	<b>INDEX PROPERTIES</b>						
AGPT/T121	Elastic Recovery at 60 °C, 100s (%) min.	NA	NA	85	NA	25	35
AGPT/T121	Elastic Recovery at 15 °C, 100s (%) min.	NA	NA	65	NA	30	50
AGPT/T124	Toughness at 4 °C, 100mm (Nm) min.	TBR	TBR	TBR	TBR	TBR	TBR
	<b>HANDLING PROPERTIES</b>						
AGPT/T103	Loss on Heating (% mass) max.	0.6	0.6	0.6	0.6	0.6	0.6
AGPT/T111	Viscosity at 165 °C (Pa.sec) max.	0.55	0.55	0.8	0.55	4.5	4.5
AGPT/T112	Flash Point (°C) min.	250	250	250	250	250	250
	<b>PRODUCTION CONTROL</b>						
AGPT/T122	Torsional Recovery at 25 °C, 30s (%) min.	22	50	52	16	25	30
AGPT/T141	Rubber Content by analysis (%)	NA	NA	NA	NA	TBR	TBR
Note 1. Class of PMB: S=Sealing, E=Elastomeric Polymer, R=Granulated Crumbed Rubber							
Note 2. NA means not applicable for that PMB class, TBR = To be reported							
Note 3. AG:PT Test Methods are available from Austroads Guide to Pavement Technology Part 4H: Test Methods							
Note 4. Manufacturers to target consistency of 450 Pa.sec at 60 °C for S10E, within the range 400 to 600 Pa.sec.							
Note 5. Manufacturers to target consistency of 3200 Pa.sec at 60 °C for S20E, within the range 2000 to 5000 Pa.sec.							

**Table 7.9 - Bitumen Equivalent Volumes**

Equivalent Volumes of Bituminous Material Measured at Higher Temperature Converted to 15°C (15°C Converted Higher Temperature).  
Interpolate to determine equivalent volumes at temperatures other than those shown.

TEMP.(°C)	FACTOR
15	1.0000 (1.0000)
40	0.9844 (1.0158)
50	0.9782 (1.0223)
60	0.9720 (1.0288)
70	0.9659 (1.0353)
80	0.9597 (1.0420)
90	0.9537 (1.0486)
100	0.9476 (1.0553)
110	0.9416 (1.0620)

TEMP.(°C)	FACTOR
120	0.9356 (1.0688)
130	0.9296 (1.0757)
140	0.9237 (1.0826)
150	0.9178 (1.0896)
160	0.9119 (1.0966)
170	0.9060 (1.1038)
180	0.9002 (1.1109)
190	0.8944 (1.1181)
200	0.8886 (1.1253)
210	0.8829 (1.1326)

## 8. BITUMINOUS SURFACE MAINTENANCE

### 8.1 OUTLINE DESCRIPTION

This section specifies the repairs and minor rehabilitation to existing bituminous surfaces and pavements with asphalt, and includes the repair of potholes, edge defects, surface deformations and cracks.

This section specifies the requirement for sealing works of less than 300m<sup>2</sup> in area.

### 8.2 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

Refer to Standards in SPRAY SEALING.

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

#### Traffic Escort

Refer to PROVISION FOR TRAFFIC, WorkZone Traffic management, Traffic Escort Vehicle – Reseal works.

### 8.3 DEFINITIONS

Reference should be made to AUSTROADS – AP-C87-15 Austroads Glossary of Terms to give definitions on all aspects of Bituminous Surfacing works where required.

#### Adhesion agent

A substance used for the purpose of promoting the adhesion between binder and aggregate.

#### ASTM

American Society for Testing and Materials.

#### Coarse grained aggregate

Where the average grain size of the constituent minerals is greater than 1mm. The average grain size is determined optically under a petrographic microscope or by calibrated hand lens.

#### Cold Mix Asphalt

A premix, blended from bitumen, aggregate, sand, and mineral filler, and having a flux oil in the binder. It is workable at ambient temperatures.

#### Cutter

A light petroleum distillate (kerosene) added to bitumen to temporarily reduce its viscosity.

#### Dol

Department of Infrastructure.

#### Fine grained aggregate

Where the average grain size of the constituent minerals is less than 1 mm. The average grain

size is determined optically under a petrographic microscope or by calibrated hand lens.

#### Flux oil

A petroleum distillate added to bitumen produce a long term reduction in its viscosity.

#### Hot mix asphalt

A hot mixed homogeneous blend of bitumen, aggregates, sand, mineral fillers produced at an approved asphalt plant. It is delivered, placed and compacted hot.

Ensure that the asphalt has a current mix design to the requirements of AGPT Part 4B Asphalt.

#### Job mix

The mix utilised for asphalt surfacing which is determined from laboratory testing of proposed materials and complies with the specified properties.

#### NATA

National Association of Testing Authorities.

#### NTCP

Northern Territory Code of Practice.

#### NTMTM

Northern Territory Materials Testing Manual.

#### NTTM

Northern Territory Test Methods.

#### Pavement Profiling

The use of a pavement profiler to remove worn, oxidised, aged or out of shape pavements, and for correcting poor surface conditions to make the pavement suitable for re-sheeting or resealing.

#### PMB

Polymer Modified Binder.

#### Precoating material

A material used for precoating aggregate to promote adhesion of bitumen. Do not use diesel.

#### Prime

An application of a Primer to a prepared base without cover aggregate to provide penetration of the surface temporary waterproofing and to obtain a bond between the pavement and the subsequent seal or asphalt. It is a preliminary treatment to a more permanent bituminous surface. Do not use diesel products.

#### Primerseal

An application of primer binder with a fine cover aggregate to a prepared base to provide penetration of the surface and retain a light cover aggregate. Do not use diesel products.

#### Reseal

A seal applied to an existing sealed, asphalt or concrete surface.

#### Regulation patching

Surface repairs and shape correction without dig-out and/or squaring up, will usually not be straight

sided due to irregularities in the pavement and feathering repair techniques.

### **Reconstruction patching**

Repairs with profiling, dig-out and/or squaring up, may be confined to the surface course or extend through all courses.

### **Seal**

A sprayed application of bituminous binder into which aggregate is incorporated. May include more than one application of binder and aggregate, and may include geotextile fabric.

### **Wearing surface**

The section of pavement upon which the traffic travels. This includes the layer(s) of asphalt or spray seal in a flexible pavement above the base.

## **8.4 IDENTIFICATION AND TYPES OF FAILURES**

The Superintendent will identify the defect and then order the appropriate method of repair by issue of a Contractor Service Request (CSR).

Defect types are grouped into one of the following modes of pavement distress;

### **Deformations:**

Includes: corrugations, depressions, rutting, and shoving.

### **Cracks**

Cracks promote water entry and can be a primary cause of other defects including deformations and potholes.

### **Edge breaks**

Occur along the interface of a sealed pavement and unsealed shoulder.

### **Potholes**

Steep sided or bowl shaped cavities or delaminations extending into layers below the wearing course, usually due to failures associated with an aged, cracked or debonded bituminous surface.

### **Patch**

An area of pavement surface where the original has been replaced or covered.

### **Surface texture deficiencies**

Includes polishing, ravelling, bleeding. Generally rectified by reseal not specified in this section.

## **8.5 REPAIR OPERATIONS**

Undertake repair operations to rectify identified distress modes.

### **8.5.1 Pothole Patching**

Applies to potholes, delaminations, and edge break defects.

Hole must be meticulously cleaned before repair, all loose and unbounded material must be removed.

Trim edges to sound material, creating angle sides to the bottom.

Tack coat the sides, bottom and lip of pothole for a minimum width of 20 mm with bitumen emulsion. Remove excess tack coat. Place patching material in layers no greater than 3 times the nominal size, and thoroughly compact.

Finish the pothole slightly higher than adjacent pavement surface, between 3 mm and 5 mm.

Level the patch by hand raking, motor grader or pull type blade.

Remove all loose aggregate around the edges of the patch so patch can be raked and rolled to a smooth junction with the old surface.

Compact asphalt material with hand tamper for small holes and where possible, compact by using a rammer or vibrating plate.

Compact large patches with a vibrating smooth drum roller.

Hot mix can be topped with a light application of sand to prevent pick up. Remove all waste materials from the road reserves and dispose in an approved manner.

### **8.5.2 Temporary patching – Hold Point**

**Hold point** - Temporary patching with aggregate and emulsion requires approval of the Superintendent. For such work, keep traffic off the patch until patch is stable.

### **8.5.3 Regulation Patching**

Patch defect areas where only the surface needs repair. Applies to deformations.

The Superintendent will specify the suitable type of hot mix asphalt for the patch material in the CSR.

Remove all debris and any loose materials on the pavement.

Repair any potholes or cracks as required, refer other clauses.

Apply a tack coat to the area under repair at the application rate to suit surface conditions.

Supply, place, spread and compact the asphalt in layers until finished surface is flush with the existing surface.

Compact in layers approximately 3 times the size of the mix aggregate and bring up to surface in layers level with the intended surface profile.

Compact smaller holes with vibrating plate compactor and/or mechanical tampers.

Compact larger patches with a small vibrating roller.

Depending on the size of the patch, level by hand raking, a pull type drag, or paver.

Remove all aggregate larger than the feather edge so that the edges of the patch can be raked and rolled to a smooth junction with the old surface.

Brush off and remove all loose material from area.

#### 8.5.4 Reconstruction Patching

Patch defect areas requiring squaring up and or the removal of distressed pavement.

The Superintendent will specify the suitable type and size hot mix asphalt for patch material in the CSR.

Excavate the area to the required depth with reclaimer/profiler plant, and clean excavation of all loose aggregate, dust and water.

Cut back the edges of the hole to sound material, cut the side vertically in order to provide shoulders against the movement of the patch, and square the bottom.

Square up the surface shape of the patch to provide a neat appearance. Refer to Pothole patching clause.

Apply a tack coat to the sides and bottom of the hole. Avoid applying too much tack coat so as not to induce a condition known as a fatty patch.

Supply, place, spread and compact the asphalt in layers in the hole until finished surface is flush with existing surface.

Compact in layers approximately 3 times the size of the mix aggregate and bring up to surface in layers level with the intended surface profile.

Depending on the size of the patch, level by hand raking, a pull type drag, or paver.

Remove all aggregate larger than the feather edge so that the edges of the patch can be raked and rolled to a smooth junction with the old surface.

Compact larger patches with a small vibrating roller.

Depending on the size of the patch, level by hand raking, a pull type drag, or paver.

Remove all waste materials from the road reserve. Waste stock piles are not permitted for any duration.

#### 8.5.5 Reconstruction Patching – Alternative Method

Obtain the prior approval of the Superintendent to use this method of reconstruction patching where asphalt is not locally available.

Excavate the distressed pavement to sound material or to a depth of 300 mm.

Square up the surface shape of the patch to provide a neat appearance.

Clean the excavation of all loose material, dust and water.

Cut back the edges of the hole to sound material. Cut the sides vertically in order to provide shoulders against movement of the patch, and square the bottom.

If sound material is not reached at 300 mm depth, stabilise the subgrade 150 mm deep with 3%

cement for granular materials or 3% lime for clay materials. (Allow 10 kg/ m<sup>2</sup> for 150 mm depth).

Supply, place, spread, mix and compact base course gravel in 100 mm maximum layers until flush with the existing surface.

Broom the surface of the patch and remove waste material from the site.

Apply spray seal or emulsion to the patch and overlap the existing surfacing by 100 mm.

Apply 10 mm size aggregate to the surface.

Rectify any failure of the surfacing at no additional cost.

#### 8.5.6 Crack Sealing

For cracks wide enough to be treated, first clean the crack with air pressure, and then fill with a binder having viscosity low enough to enable it to be poured or worked into cracks.

Do not undertake crack sealing when wet.

Take care to ensure that the cutback bitumen, bitumen emulsion, rubberised bitumen or latex modified bitumen used does not bridge across the crack at the surface.

Assist the binder to penetrate cracks by using a squeegee.

Lightly sand the surface to prevent traffic picking up surplus binder if necessary.

For wide cracks, first clean the crack and fill with fine asphalt or bituminous slurry.

Large areas with fine cracks and minimal pavement distortion will be spray sealed, slurry sealed or resurfaced with plant mix, in accordance with other sections of the specification.

### 8.6 MATERIALS

#### 8.6.1 Aggregates

The combined particle size distribution to be in accordance with **Table 8.7 – Mix Proportions**

**Refer to Clause 8.19 for Tables**

#### COARSE AGGREGATES

Ensure that coarse aggregates are clean, hard, high strength, angular, skid resistant, durable crushed stone of uniform quality and free from laminated particles, clay and other aggregations of fine material, soil, organic matter and any other deleterious material. Conform to the following:

Proportion of misshapen particles: 15 % maximum at 2:1 calliper ratio.

Los Angeles Abrasion (LAA);

- Fine grained aggregate: 30% maximum loss.
- Coarse grained aggregate: 35% maximum loss.
- Sulphate Soundness: 12% maximum loss.
- Polished Aggregate Friction Value: 45 minimum.



## FINE AGGREGATES

Ensure that fine aggregates are clean, hard, sharp, washed, durable natural sand and/or material manufactured from crushed stone of uniform quality and free from clay and other aggregations of fine material, soil, organic matter and any other deleterious material.

### 8.6.2 Mineral Filler

A finely divided mineral material, hydrated lime or cement with a particle size smaller than 0.075 mm.

Use filler that is dry, free from lumps, clay, organic material or any other deleterious material, and complies in all other respects with the requirements of AS 2150.

### 8.6.3 Bituminous Binder

Standard Classes of bitumen to conform to the requirements of AS 2008.

Durability Value in accordance with AS 2341.13 – *Long-term exposure of bitumen to heat and air* shall be a minimum of 7 days with no maximum value.

### 8.6.4 Bitumen Emulsion

A rapid setting bitumen emulsion made with bitumen.

### 8.6.5 Cut Back Bitumen/Prime

Conform to the requirements of AS 2157 and **Table 7.6 - Cut Back Bitumen Properties**.

Designation is by AMC class.

**Refer to Clause 7.22 for Table**

### 8.6.6 Cutter

Cutter to be Kerosene.

Do not use diesel products

### 8.6.7 Precoat and Adhesion Agents

Precoat all aggregates to conform to the following:

- Adhesion agent (by volume): minimum 1 % precoat.
- Bitumen residue (by mass): minimum 50 % precoat.
- Kerosene (by mass): 50%
- Viscosity (Dynamic) at 60°C: 0.003 to 0.020 Pa.

## 8.7 SAMPLING OF BINDER

### 8.7.1 Supply of Sampling Containers

Supply all sampling containers as required for sampling purposes.

- Sample containers are to be leak proof and having a capacity of not less than two litres.
- Sample containers must be clean, rust free and capable of receiving a product at high temperatures.

### 8.7.2 Definition of sampling

- Refer to NTMTM
- A sample is three containers of product collected at the same time from the same supply source.
- One sample container is for the Contractor's analysis.
- Two samples containers are for the Department to analyse.

### 8.7.3 Frequency of samples

Refer to CONFORMANCE TESTING and to Conformance clauses in this section.

### 8.7.4 Additive

An additive may be proposed provided that full details of the type of additive are provided and the mix design standards of the Proportioning Of Mixes clauses in this section are attained.

## 8.8 PROPORTIONING OF MIXES FOR HOT MIX ASPHALT

### 8.8.1 Mix Type for Hot Mix Asphalt

The Superintendent will order Rural and/or Urban Mix Type Number with issue of CSR.

### 8.8.2 Manufacture of Hot Mix Asphalt

Mix in a plant capable of producing asphalt that complies with the approved design mix.

Bitumen temperature: 135°C to 160°C prior to mixing.

Heat aggregates to such a temperature that when filler and binder are added, the temperature of the mixed asphalt is between 135°C and 170°C.

### 8.8.3 Mix Assessment and Approval of Hot Mix Asphalt Types

Provide current mix design to Level 1 and Level 3 as per AGPT Part 4 B Asphalt.

Conform to the minimum mix requirements as shown in **Table 8.1 - Properties of Hot Mix Asphalt**.

<b>Table 8.1 - Properties of Hot Mix Asphalt</b>		
<b>Marshall Characteristics</b>	<b>Rural</b>	<b>Urban</b>
Compactive effort (number of blows each end of specimen):	50	75
Stability of mix (kN):	5 min.	10 min.
Flow (mm):	2 – 5	2 – 5
Air voids (%):	3 – 7	3 – 7
Voids in mineral aggregate (%):	14 min.	14 min.
Wheel tracking 10000 passes	5 + or - 1	5 + or - 1

Conform to **Table 8.7 – Mix Proportions, Table 8.8 – Aggregate and Mineral Filler Mix Proportions** and **Table 8.9 – Total Mix Proportions of Cold Mix Asphalt**.

**Refer to Clause 8.19 for Tables**

## **8.9 PROPORTIONING OF MIXES FOR COLD MIX ASPHALT**

### **8.9.1 Mix Type for Cold Mix Asphalt**

The Superintendent will order the Mix Type Number with issue of a CSR.

### **8.9.2 Manufacture of Cold Mix Asphalt**

Dry mix aggregate and mineral filler to provide a homogenous blend.

Add bituminous binder until the specified percentage is reached.

Carry out further mixing until a minimum of 90 % of the coarse aggregate particles are coated.

Add additional bitumen so that a satisfactory mix can be achieved, if so directed by the Superintendent.

Refer to **Table 8.8 – Aggregate and Mineral Filler Mix Proportions** and **Table 8.9 – Total Mix Proportions of Cold Mix Asphalt**.

**Refer to Clause 8.19 for Tables**

**Table 8.2 - Specification Limits for the Binder Mix of Cold Mix Asphalt**

Bitumen	100 parts
Flux	Between 5 and 15 parts, depending on location and climatic conditions. Will be specified on the CSR.
Cutter	10 parts

## **8.10 SURFACE PREPARATION**

### **8.10.1 Existing Bitumen and Concrete Surfaces**

Remove all vegetation, loose and extraneous matter.

### **8.10.2 Tack Coat**

Apply a fine spray of bitumen emulsion lightly and evenly over the whole of the area to be covered with asphalt.

Hand spray only in areas where it is impractical to use a spray bar.

Application rate: Residual Binder 0.2 to 0.6 litres/m<sup>2</sup>.

Allow the tack coat to 'break' before laying the asphalt.

Clean and tack coat existing asphalt face against which new work is to be laid.

## **8.11 TRANSPORT AND SUPPLY**

Insulate the bodies of trucks, block out corners with timber, and cover the body with a fitted tarpaulin when transporting distance is over 20 km or when temperatures are below 20°C.

## **8.12 SPREADING AND LAYING**

Lay the final surface layer at a uniform thickness, and as one continuous operation.

Construct a transverse joint whenever the operation ceases.

Remove from site, prior to initial rolling, asphalt which has cooled below the required initial rolling temperature.

Hand spread in locations where mechanical spreading is not practical, and to correct localised depressions or irregularities.

Take the asphalt directly from the spreader hopper or dump asphalt onto metal sheets or existing hard clean surfaces. Do not dump asphalt directly onto the area where it is to be spread.

Complete the work as one continuous operation.

Remove from site all excess or spilt asphalt.

### **8.12.1 Minimum Temperatures of Hot Mix Asphalt**

Conform to the minimum laying and initial rolling temperatures.

Cease laying asphalt during heavy or continuous rain, or in wet conditions where the material will not adhere or key to the surface.

Laying temperature: 135°C.

Initial rolling temperature: 105°C.

### **8.12.2 Joints Generally**

Minimise the number of longitudinal and transverse joints.

Offset joints in multiple layer work by at least 100 mm so that joints in the surface course do not overlay joints in the previous course.

Overlap the finished asphalt by 25 to 75 mm when spreading.

Push the overlap asphalt back immediately to form a ridge along the joint.

Roll the ridge to form a smooth joint.

Remove excess asphalt prior to final rolling.

Prevent the accumulation of coarse particles along the joint by raking.

### **8.12.3 Transverse Joints**

Form by cutting the end of the spread material to a vertical face and remove loose material.

Check the surface adjacent to the joint with a straight edge and correct any surface defects immediately.

Treat the face of the joint with bitumen emulsion tack coat prior to spreading adjacent section.

Provide ramps of compacted asphalt (maximum grade 5% relative to pavement grade) when joints are left overnight on trafficked pavements.

#### 8.12.4 Longitudinal Joints

Keep joints straight or follow the line of curvature.

Minimise the unsupported length left overnight.

Rectify broken sections of unsupported edge by cutting a vertical face before resuming laying.

Treat the face of the joint with bitumen emulsion tack coat prior to spreading adjacent section.

Longitudinal joints shall not be left overnight on a pavement in use by traffic.

Transverse Match of Overlay to Existing Pavement:

- Saw cut existing asphalt pavement 20 mm depth along the match line of joint.
- Remove taper wedge of existing asphalt pavement along the overlay side of match joint.
- Feather the asphalt overlay down to the existing pavement to achieve a maximum slope of 1 in 40 and for the full width of the pavement.
- Ensure depth of overlay above existing pavement in taper wedge area is not less than 20 mm.

### 8.13 COMPACTION

#### 8.13.1 General

For large patches, compact by using at least two rollers, one pneumatic tyred and one tandem steel wheeled.

Provide additional steel wheeled roller(s) for each additional 30 tonne (or part thereof) spread in excess of 30 tonne per hour.

Stand compaction plant clear of new asphalt surface.

Plant or vehicles which have fuel or oil leaks are to be removed from site.

Defer rolling if excessive displacement of the asphalt occurs but only until the asphalt has cooled sufficiently to permit rolling to continue.

Do not use chemicals or detergents in rollers; use water only. Sanding of the asphalt area is required for rolling purposes.

Remove sand before opening to traffic.

#### 8.13.2 Initial Rolling

Roll immediately behind the spreader using a steel wheeled roller having a minimum weight of 8 tonnes and a maximum unit load on the rear drum equivalent to 55 kN/m width of drum.

Provide steel wheeled rollers with adjustable scrapers and keep the drums moist with water.

Prevent the mix from sticking to the drums.

Avoid ponding of water on the pavement surface.

#### 8.13.3 Intermediate Rolling

Roll with a self-propelled pneumatic tyred roller of at least 10 tonnes mass, a minimum tyre pressure of 550 kPa and a minimum total load of 1 tonne on each tyre. Increase the load to 2 tonnes per tyre where practicable.

Ensure tyre pressures are uniform and maintained within 5% of the specified figure.

Rolling surfaces to be smooth.

#### 8.13.4 Final Rolling

Roll with a steel wheeled roller as used for initial rolling.

#### 8.13.5 Joint Compaction

Compact all joints and edges.

Roll all joints.

Overlap joints in adjoining runs by a minimum of 1m.

#### 8.13.6 Rolling Speed

Steel wheeled roller: 1.5 m/sec. maximum, steady and uniform.

Pneumatic tyred roller: 0.75 m/sec. maximum for the first pass. 4.5 m/sec. maximum for subsequent passes.

Avoid abrupt stops and starts.

#### 8.13.7 Vibrating Plant

<b>Table 8.3 - Vibrating Plant Specifications</b>	
<b>Property</b>	<b>Requirement</b>
Mass:	6 tonnes minimum.
Drum width:	1.5 m minimum.
Vibrating frequency:	2,000 – 3,000 cycles per minute.
Amplitude range:	0.4 – 8.0 mm.

Initial passes (not less than two) to be non-vibrating.

Provide steel wheeled rollers with adjustable scrapers and keep drums moist with water.

Disengage vibrator when accelerating, decelerating or standing.

#### 8.13.8 Deep Lift Rolling Pattern

Applies to asphalt placed in layers exceeding 75 mm compacted thickness.

Asphalt to be placed and compacted in layers not exceeding 150 mm maximum.

Commence rolling not less than 300 mm clear of the edge of asphalt that is laterally unsupported.

Advance outwards towards the edge in 100 mm increments.

Delay rolling within 200 mm of an unsupported edge to allow mix cooling and minimise distortion.

Complete rolling in such time that specified densities are obtained.

### 8.13.9 Hand Tampers

Compact by vibratory plates or hand tampers in location inaccessible to rollers.

Side tamp before rolling the edge of all asphalt which is not laterally supported.

Finish hand tamped surfaces smoothly, conforming to machine finished areas.

## 8.14 CONFORMANCE

### 8.14.1 Conformance Testing

The Contractor will be responsible for process control testing.

The Superintendent will carry out all conformance testings through Panel Period Contracts.

The Contractor will be responsible for ordering the conformance tests.

### 8.14.2 Tolerances

Conform to the following:

Surface to be smooth, dense and true to shape.

- Thickness: Not less than specified.
- Surface levels: 0 to + 10 mm maximum deviation from design level.
- Straight edge deviation: 5 mm maximum in 3 m.
- Surface roughness: IRI 2.4 maximum.
- Skid resistance: Not less than specified in NTTM 304.1.
- Bitumen content: Maximum variation 0.3% by mass.
- Job mix: Within the following variation limits.

<b>Table 8.4 - Job Mix Variation Limits</b>	
<b>AS Sieve (mm)</b>	<b>% Passing (By Mass)</b>
4.75 or larger	+ or – 7
2.36	+ or – 5
1.18 to 0.30.150	+ or – 4
0.15	+ or – 3
0.075	+ or – 2

### 8.14.3 Conformance Sampling and Testing

Sample materials as directed by Superintendent

### 8.14.4 Asphalt Testing Frequencies

For large patching works, conform to the testing frequencies in **Error! Reference source not found.**

### 8.14.5 Conformance of compaction (Lot Testing)

Base the conformance of compaction on lots, determined from cores.

- Subdivide all items of work into lots.
- Give each lot a lot number.
- Number the lots using a logical system.

- Maintain a register of all lots and lot numbers.
- Include the location of the lot on the lot register.

**Table 8.5 - Asphalt Testing Frequencies**

<b>Test Method No.</b>	<b>Test Method</b>	<b>Minimum Test Frequency</b>
AS/NZS 2891.3.1 AS/NZS 2891.3.2 AS/NZS 2891.3.3	Bitumen content	1 per 50 t
-	Mixing temperature	Every mix
-	Laying temperature	Every 30 minutes
AS/NZS 2891.7.1 AS/NZS 2891.7.3	Density	1 per 50 t
AS/NZS 2891.1.1 AS 2891.1.2 AS 2891.1.3	Thickness	1 per density
AS/NZS 2891.3.1 AS/NZS 2891.3.2 AS/NZS 2891.3.3	Particle size distribution	1 per 50 t
	Viscosity	1 per 10,000 L
AS/NZS 2891.5	Stability of mix	1 per 50 t
AS/NZS 2891.5	Flow	1 per 50 t
AS/NZS 2891.8	Air voids	1 per 50 t
AS/NZS 2891.8	Voids in mineral aggregate	1 per 50 t

Lots of work will be selected by the Contractor, based upon:

- Lot will represent no more than one shift's production.
- Lots will be continuous and have been brought to completion at the same time.
- Lot will be composed of homogeneous material with no distinct changes in attribute values.

Each lot will be subject to conformance testing.

Lots will be checked for level tolerance.

Quality of the lot will be judged as conformance or non-conformance of each lot including all tests conducted on the lot.

When lots fail to satisfy the conformance criteria, payment adjustments or rejection of the lot shall be in accordance with the Payment Adjustments clause in Measurement and Payment.

Should the lot under consideration be subdivided then class each subdivision as a lot and subject each subdivided lot to lot testing.

Treat non-conforming lots which are subdivided after testing as separate lots and retest each and every subdivided lot.

Core sample locations will be selected by the laboratory on a stratified random basis in accordance with NTCP 103.1. Supply copies of the completed stratified random selection with each compaction report.

There shall be 6 cores per lot.

Refer to CONFORMANCE TESTING, Conformance Testing Results, Conformance of Compaction for Asphalt.

Conform to the following limits of characteristic Value of Air Voids:

<b>Table 8.6 - Limits of Characteristic Value of Air Voids</b>			
	<b>Light traffic</b>	<b>Medium traffic</b>	<b>Heavy traffic</b>
Conformance	3.0 – 9.0	3.0 – 9.0	3.0 – 8.0

The Conformance Of Compaction clause only applies to a specified asphalt thickness of 30 mm or greater.

Backfill all core holes with asphalt conforming to the specified properties for the subject mix, and compact to the required density.

#### 8.14.6 Surface Roughness

Surface roughness testing will be carried out by the Superintendent at the discretion of the Superintendent.

### 8.15 SPRAY SEALING – AREAS LESS THAN 300M<sup>2</sup>

Comply with the SPRAY SEALING section with the following exceptions:

#### 8.15.1 Binder Coat Requirements

##### PRIME AND PRIMER SEALS

Cut-back bitumen to be mixed on site.

Heat bitumen to a temperature appropriate for achieving final spraying temperature making allowance for incorporation of the unheated cutter.

Add unheated cutter to heated bitumen and circulate until a homogeneous mixture is achieved.

Spray immediately circulation is complete.

Allow at least three days to elapse after priming before applying the binder coat. Ensure primer soaks in and dries off before applying binder coat.

Provide Standard Class 320 bitumen, cut back as follows:

Prime:	AMC	00
Primer Seal:	AMC	6

### STRAIGHT RUN BINDER COATS

Provide Standard Class 320 bitumen as follows:

- Primerseal coats
- Seal coat for geotextile seal or re-seal

Heat to spraying temperature but do not exceed the maximum. Avoid heating bitumen in quantities excess to requirements.

Prevent foaming.

### POLYMER MODIFIED BINDER COATS

Provide conforming bitumen blended with the required polymer as follows:

Prepare the product in a manufacturing or blending plant that complies with the AGPT. T190

- Initial seal coat: Class S10E
- Reseal coat: Class S10E

Provide test results from a NATA registered testing facility - when requested, of the properties of the binder modified with the nominated type and quantity of polymer.

Store, mix, heat and spray the polymer modified binder as recommended by the polymer manufacturer.

Both coats of two coat seals shall contain polymer.

#### 8.15.2 Spraying – Hold Point

##### APPLICATION SPRAY RATES

Ensure current test results are supplied to the Superintendent before spraying begins.

Spray rates to be at 15°C adjusted in accordance with **Clause 7.22, Table 7.9 - Bitumen Equivalent Volumes**.

For primers, primer seals and polymer modified binders, the rate of application refers to the whole of the mixture, including all modifiers, cutback materials, combining oils and adhesion agents.

For enrichments and emulsion seals, the rate of application refers to the residual bitumen.

Determine the application spray rates using appropriate Austroads design methods.

**Hold Point** – Do not commence spraying until the Superintendent is advised and gives approval to the proposed application spray rates.

Supply the following to the Superintendent to enable the proposed spray rates to be approved.

- Average Least Dimension (ALD),
- Flakiness index (FI) of the aggregate

Ensure samples are taken from stockpiles of material that are to be used, generally from site stockpiles.

### 8.15.3 Preparation for Sprayer Run – Witness Point

Record the volume and temperature of the sprayer contents while it is on level ground.

Supply Sprayer Tank dips before and after each sprayer run.

**Witness Point** - Allow visual inspection when requested.

Determine the length of sprayer run from the available quantity in the sprayer and the application rate. Ensure the area to be sprayed is not greater than the area that can be covered by aggregate in the loaded trucks.

Start and finish each spray run on a protective strip of paper placed on the pavement. The paper to be wide enough to ensure the sprayed material is being discharged correctly over the full width of spray. Place sufficient protective paper to protect road fixtures.

Place paper on the pavement and masking around areas to be sprayed or wherever the sprayer is stationary on the road pavement.

Seal joints are only allowed where line marking is to be placed. No joints are allowed in wheel paths.

Excess overspray and spills must be removed before sealing works proceed.

### 8.15.4 Sprayer Run

Attain uniform spraying speed before spraying commences.

Avoid an excess or deficiency of material due to faulty overlap at longitudinal joints when spraying a road in half-widths.

Overlap to be 300 mm with an intermediate nozzle.

Do not use end nozzles on an overlap.

Make allowances for “Fog Spraying” when joining to existing seals.

Cease spraying before the level of material in the tank falls to a level which reduces the full discharge of the pump.

Remove and dispose of all paper as per the EMP.

Clean off any sprayed material from road fixtures.

### 8.15.5 Hand Spraying

Plan work to minimise the requirement for the use of a hand sprayer.

Any strips of pavement not adequately covered with sprayed material to be sprayed later with the hand attachment.

### 8.15.6 Application Of Aggregate – Hold Point

Supply current test results of materials to be used.

Load aggregate into tip trucks using an approved aggregate loader which removes dust, dirt and oversize stone while applying pre-coat.

**Hold Point** - Obtain approval from the Superintendent for use of the proposed aggregate loader before commencing aggregate loading operations.

Apply aggregate to sprayed binder within:

- 10 minutes where the pavement temperature is 20°C or greater.
- 5 minutes where the pavement temperature is between 15 and 20°C.

Polymer Modified Binders: Apply aggregate within 5 minutes irrespective of pavement temperature.

Apply aggregate to emulsion coat before the emulsion breaks.

Spread the aggregate evenly and uniformly over the sprayed surface at a rate of 900/ALD m<sup>2</sup>/m<sup>3</sup>. Seek approval for variations to this rate.

Use a mechanical spreader.

Rerun or hand cover bare or insufficiently covered places after the first spreading.

Aggregate spread in excess of the application rate designated in the procedure will be removed and stockpiled at full cost to the Contractor.

### 8.15.7 Rolling Rate

Roll the treated surface with self-propelled rubber tyred rollers with a minimum tyre pressure of 600 kPa and a minimum wheel load of 1 tonne.

Roller speed on the first pass to be between 5 and 10km/h, with subsequent passes between 15 and 25 km/h.

Conform to the following:

- Entire area to receive one roller pass immediately after covering.
- 75% of rolling within 1 hour of covering.
- 100% of rolling within 2 hours of covering.

Minimum Rolling Rate: 1 roller hour per 1,500 litres of binder.

For two coat treatments when the second coat is to be applied immediately, the total rolling on the first coat shall be double that specified.

Roll in daylight hours only. Sweep the surface after rolling. Ensure a uniform distribution of aggregate.

Adjust drag broom to distribute surplus aggregate, but not to dislodge embedded aggregate. Ensure aggregate on the final surface is uniformly distributed, and firmly held by binder.

Re-roll the surface after sweeping to ensure uniform bedding of aggregate in binder.

#### **8.16 TRAFFIC ON RESEALS**

Co-ordinate work to minimise traffic delays.

Prohibit traffic:

- until at least 3 passes of a roller has taken place or until sufficient rolling has taken place to prevent damage to the applied seal, whichever is greater; and
- from adjacent strip of roadway during spraying.

Sweep all loose aggregate from the carriageway at completion of rolling.

#### **8.17 WASTE MATERIAL**

Remove from the site and dispose of all waste material in legal waste disposal facility.

#### **Specification Reference**

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

#### **8.18 OTHER REQUIREMENTS**

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

8.19 TABLES

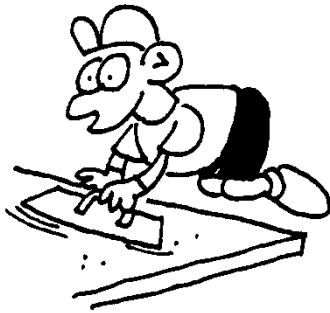
<b>Table 8.7 – Mix Proportions</b>				
<b>Mix Type</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
	<b>Dense Graded</b>			
	<b>% Passing (Dry Mass)</b>			
<b>AS Sieve (mm)</b>	<b>5 mm</b>	<b>10 mm</b>	<b>14 mm</b>	<b>20 mm</b>
53.0	-	-	-	-
37.5	-	-	-	-
26.5	-	-	-	100
19.0	-	-	100	95 – 100
13.2	-	100	85 – 100	75 – 90
9.5	-	90 - 100	70 – 85	60 – 80
6.7	100	70 - 90	62 – 75	50 – 70
4.75	85 - 100	58 - 76	53 – 70	40 – 60
2.36	55 - 75	40 - 58	35 – 52	25 – 43
1.18	38 - 57	27 - 44	24 – 40	18 - 35
0.60	26 - 43	17 - 35	15 – 30	14 - 27
0.30	15 - 28	11 - 24	10 – 24	9 - 21
0.15	8 - 18	7 - 16	7 - 16	6 – 15
0.075	4 - 11	4 - 7	4 – 7	3 – 7
Bitumen binder (% by mass)	5.0 - 7.0	4.5 - 6.5	4.6 - 6.5	4.0 – 6.0
Compacted thickness (mm)	10 - 25	25 - 40	35 – 55	50 – 80
Bitumen film thickness (min micron)	8.5	8.5	8.5	8.5
The grading curve shall be smooth and shall not vary from the outer one third of the range between the specified limits for one sieve size to the opposite outer one third of the range between the specified limits for an adjacent sieve size.				



<b>Table 8.8 – Aggregate and Mineral Filler Mix Proportions</b>				
Conform to the following mix proportions				
<b>Mix Type</b>	<b>CM 1</b>	<b>CM 2</b>	<b>CM 3</b>	<b>CM 4</b>
	<b>Dense Graded</b>			
<b>AS Sieve (mm)</b>	<b>7 mm</b>	<b>10 mm</b>	<b>14 mm</b>	<b>20 mm</b>
	<b>% Passing (Dry Mass)</b>			
53.0	-	-	-	-
37.5	-	-	-	-
26.5	-	-	-	100
19.0	-	-	100	95 – 100
13.2	-	100	85 - 100	-
9.5	100	90 - 100	70 - 85	58 – 74
6.7	90 - 100	-	-	45 – 60
4.75	70 - 90	58 - 70	46 - 65	37 – 50
2.36	45 - 60	35 - 50	28 - 45	22 – 36
1.18	-	22 - 38	15 - 30	12 – 26
0.60	15 - 30	12 - 27	10 - 23	6 – 20
0.30	10 - 20	6 - 16	5 - 17	4 – 15
0.15	4 - 14	4 - 14	3 - 11	2 – 10
0.075	3 - 8	2 - 6	2 - 5	1 – 5
Total %	100	100	100	100
The grading curve shall be smooth and shall not vary from the outer one third of the range between the specified limits for one sieve size to the opposite outer one third of the range between the specified limits for an adjacent sieve size.				

<b>Table 8.9 – Total Mix Proportions of Cold Mix Asphalt</b>				
Conform to the following mix proportions.				
<b>Mix Type</b>	<b>CM 1</b>	<b>CM 2</b>	<b>CM 3</b>	<b>CM 4</b>
	<b>Dense Graded</b>			
<b>Size</b>	<b>7 mm</b>	<b>10 mm</b>	<b>14 mm</b>	<b>20 mm</b>
<b>Material</b>	<b>% Of Total Mix</b>			
Aggregate and filler %	94.2 – 95.2	94.8 – 95.8	95.0 – 96.0	95.3 – 96.3
Residual binder %	4.8 - 5.8	4.2 - 5.2	4.0 - 5.0	3.7 - 4.7
Total Mix %	100	100	100	100

## 9. CONCRETE MAINTENANCE



### 9.1 OUTLINE DESCRIPTION

This section specifies miscellaneous minor repairs or replacement of concrete structures such as stormwater side entry pits, wing/head walls, kerbs and gutters, cycle/footpaths etc. and does not apply to buildings, bridges or concrete pavements.

### 9.2 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

Refer to Waste Disposal clause in MISCELLANEOUS PROVISIONS section.

### 9.3 MATERIALS – HOLD POINT

**Hold point** - Provide manufacturer's test certificates for quality of cement, aggregate and reinforcement.

#### 9.3.1 Cement

Type GP or GB to AS 3972.

Store cement in watertight containers or shelters until used.

Do not mix or store special cement with normal Portland cement.

#### 9.3.2 Fine Aggregate

Clean, hard, tough, durable, uncoated grains, homogeneous in quality, free from clay, dirt and organic material.

#### 9.3.3 Coarse Aggregate

Clean, hard, durable, crushed stone or gravel, free from clay, dirt and organic material.

#### 9.3.4 Water

Clean and free from oil, alkali, organic or other deleterious substances.

### 9.3.5 Chemical Admixtures – Hold Point

**Hold point** - Do not use admixtures without obtaining prior written approval from the Superintendent.

Admixtures and their use must conform to AS 1478.1.

Where two or more chemical admixtures are proposed for incorporation into a concrete mix, their compatibility must be certified by the manufacturers.

Store admixtures in accordance with the manufacturer's recommendations.

### 9.3.6 Reinforcement – Hold Point

Conform to AS/NZS 4671.

Supply, cut, bend and fix steel reinforcement as specified.

Secure reinforcement and bar supports to prevent displacement during construction and concrete placement.

**Hold Point** - Do not place concrete until the reinforcement has been inspected by the Superintendent.

### 9.3.7 Recycled Crushed Glass (RCG)

Clean, hard, durable RCG free from clay, dirt and organic material. Source the material from glass food and beverage containers, drinking glasses, and window (or flat) glass and plain ceramic. Do not use glass from hazardous waste containers, reinforced and laminated glass, light bulbs, fluorescent tubes and cathode ray tubes. The source glass must be free of debris and contaminants such as paper and cardboard, plastic, fabrics, residues from original contents and toxins.

Use RCG conforming to Specification for Recycled Crushed Glass as an Engineering Material Section 9 available at:

<http://www.nt.gov.au/infrastructure/techspecs/index.shtml>

### 9.4 EQUIPMENT

The Contractor will provide all general and specialised equipment, tools and materials, to carry out and test the Work. The Contractor must be fully equipped on each attendance call.

### 9.5 CONCRETE

#### 9.5.1 Ready-mix Concrete

Unless otherwise specified, Production Assessment in accordance with AS 3600 shall be used.

Register the project with the concrete supplier for submittal of Production Assessment data and nominate the Superintendent for receipt of this information.

Supply concrete with the following properties unless specified otherwise:

Compressive strength: N25

Aggregate size: 20 mm

Slump: 80 mm, + or - 15 mm.

The Superintendent reserves the right to carry out independent sampling and testing of concrete.

### 9.5.2 Job-mixed Concrete

Use Project Assessment in accordance with AS 3600.

The Contractor will be responsible for sampling and testing.

Provide concrete with properties as specified for ready-mix concrete.

Determine the quantities of materials to be used by mass or by equivalent dry loose volume.

Provide and maintain gauges for measurement of the materials.

The Superintendent reserves the right to carry out independent sampling and testing of concrete.

### 9.5.3 Addition of Admixtures

Refer to clause Materials - Chemical Admixtures.

Chemical admixtures may only be added subsequent to slump test compliance confirmation. A further slump test post admixture addition may also be required.

Where Superintendent approval has been granted for the addition of superplasticiser at the plant prior to dispatch of concrete, a slump test of each batch must be performed and recorded by a NATA accredited testing laboratory prior to the addition of the superplasticiser. The slump test report must record the time of the addition of the superplasticiser, amount of superplasticiser added and product identification.

Do not add chemical admixtures unless the exact amount required is measured using a regularly maintained and calibrated device of the required accuracy.

Make allowance for the reversion time of superplasticisers.

Delay the addition of superplasticisers as long as practicable before the concrete is discharged from the mixer.

Agitate concrete for at least 5 minutes following the addition of superplasticiser before dispensing.

## 9.6 FOUNDATIONS

Provide a foundation compacted to 95 % relative density within 150 mm of the base of concrete.

## 9.7 CONSTRUCTION

### 9.7.1 General

Repair, reinstate or replace concrete structures to match existing dimensions, cross sections and grade or as otherwise directed by the

Superintendent. Work to be all inclusive and include but not limited to; saw cutting, excavation and removal of broken sections, disposal of waste material, formwork, reinforcement, etc.

### 9.7.2 Kerbs and Gutters

Repair, reinstate or replace damaged kerb and gutter as integral units to match existing dimensions and grades, as per Standard Drawing CS 1203.

### 9.7.3 Cycle and Pedestrian shared Path Maintenance

All relevant design principles contained in AUSTROADS must be integrated in the design of cycle ways, pathways and associated infrastructure (Austroads guide to Road Design Part 6A: Pedestrian and Cyclist Paths). Refer to Civil design drawings (if any) and conform to local Council requirements.

Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender

## 9.8 FORMWORK – WITNESS POINT

Formwork to be accordance with AS 3610.1. Design and construct forms so that they are mortar tight, have adequate strength and removable without damaging the concrete.

Formwork material to be suitable for the purpose and finish specified.

Build forms true to line and braced in a substantial and non-yielding manner.

**Witness Point** - Do not place concrete until the formwork has been inspected by the Superintendent.

## 9.9 HANDLING AND PLACING – WITNESS POINT – HOLD POINT

**Witness Point** - Give the Superintendent sufficient notice so that inspection may be made before and during pouring concrete.

**Hold Point** - Provide verification that all constituent materials, formwork, falsework, reinforcement, and environmental conditions comply with all requirements. Do not cast any concrete without that verification.

Do not place concrete if the temperature of the concrete exceeds 35°C, or if the ambient air temperature exceeds 40°C.

Place and compact concrete within the times shown in **Table 9.1 - Maximum concrete placing time after adding mixing water** after the addition of the mixing water to the mix:

**Table 9.1 - Maximum concrete placing time after adding mixing water**

Concrete temperature at time of placing	Maximum Time (minutes)
25 to 28°C	75
28 to 32°C	60
32 to 35°C	45

Place concrete in a continuous operation between construction joints so that the face of the concrete is in a plastic state when succeeding concrete is placed against it.

Do not allow concrete to free-fall from a height greater than 1.5 m.

Place all concrete in dry weather unless otherwise approved.

Vibrate concrete to remove entrapped air, but avoid over-vibration that may cause segregation.

For each truck of premixed concrete provide an identification certificate on delivery listing the information required by AS 1379 and any other particular requirements for special class concrete.

## 9.10 JOINTING

### 9.10.1 Construction Joints

Roughen and clean the face of hardened concrete before placing fresh concrete against it. Remove soft material, foreign matter and laitance. Thoroughly moisten the joint surface.

### 9.10.2 Expansion / Contraction Joints

Joints to be 10 mm wide over full length and filled with a bitumen impregnated fibrous filler.

Provide vertical transverse expansion/contraction joints as follows:

- Footpaths: 6 m spacing maximum.
- At junctions with other concrete structures
- Inverts: 15 m spacing maximum.
- All other works: As shown on the drawings.

### 9.10.3 Tooled Joints

Provide tooled joints as follows:

- Transverse vertical grooves 20 mm depth minimum.
- Joints at right angles to outer edge of concrete works.
- Footpaths: 2 m spacing maximum.
- Kerbs/Inverts: 3 m spacing maximum.
- All other works: As shown on the drawings.

## 9.11 SURFACE FINISHES

Finish surfaces to a smooth and even colour.

Remove free surface water during final screeding of unformed surfaces.

Round off exposed edges and corners.

Protect exposed surfaces from rain until final set has occurred.

Conform to **Table 9.2 – Concrete finishes.**

<b>Table 9.2 – Concrete finishes</b>		
Type	Description	Application
S1	Left rough to give key but not honeycombed or porous	Surfaces to be rendered.
S2	Wood float	As specified.
S3	Steel trowel without polish	Internal surfaces subject to foot traffic. Kerb and gutter.
S4	Wood float and broomed finish - broom finish - broom across direction of traffic	Surfaces subject to vehicular traffic.
S6	Steel float followed by moist hair broom	Surfaces subject to foot traffic.
F1	Remove mortar fins, etc., repair minor blow holes by bagging where approved or rub down with Carborundum stone	Formed surfaces exposed to view.
F2	Off forms	-
F3	Exposed RCG	Application of RCG to be hand spread once application of the exposed mix has been bull floated  RCG to be measured 1000 grams per square meter, or as otherwise specified by the Superintendent.  Colour and size of RCG to be specified by Superintendent

### 9.11.1 Curing

Protect and cure all exposed surfaces immediately after the concrete has taken its initial set.

Maintain all surfaces, including those within loosened formwork, in a moist condition by:

- flooding;
- continuous spraying with water; or
- other methods approved by the Superintendent.

Prevent staining during the curing process of all concrete surfaces that will be visible in the completed works.

Continuously maintain the protection and curing of each element for the minimum time specified by AS 3600 to provide the concrete with durability corresponding to the specified exposure classification.

Do not use curing compounds in lieu of moist curing unless approved.

#### 9.11.2 Backfilling

Backfill areas around the concrete with specified material.

Compact the backfilling in layers not exceeding 150 mm compacted thickness.

Reinstate damaged grassed areas with topsoil and grass seed to match existing surrounds.

#### 9.12 PATCH REPAIR OF CONCRETE STRUCTURES

Remove spalled and unsound concrete to expose a sound surface. Where necessary remove damaged steel reinforcement and replace as required.

Saw cut outer perimeter of the repair to a depth of at least 15 mm in order to prevent featheredging.

Scabble and wash down the surrounding sound concrete surface to ensure removal of all contamination.

Pre wet the prepared concrete substrate and steel reinforcement and apply a bonding agent to enhance the bond at the repair interface.

Erect formwork as per FORMWORK clause and cure as per CURING clause.

#### 9.13 RAIN DAMAGE

Remove and replace rain damaged concrete.

#### 9.14 EXISTING SERVICES – HOLD POINT

**Hold Point** - Obtain the Superintendent's approval before altering the line or level of existing services.

Place an expansion joint between concrete works and service.

#### 9.15 CONFORMANCE

Refer to the DRAINAGE MAINTENANCE for culvert structures and pits.

Conform to **Table 9.3 – Concrete Conformance - Tolerances**.

<b>Table 9.3 – Concrete Conformance - Tolerances</b>	
<b>AS Measured</b>	<b>Tolerance</b>
Finished level:	+ or - 15 mm from the specified level.
Invert level:	+ or - 5 mm from the specified level.
Straight edge deviation of surface:	3 mm maximum in 3 m, or 6 mm maximum in 15 m.
Alignment:	+ or - 10 mm from the specified alignment.
Chainage at vehicle crossing	+ or - 150 mm
Width of vehicle crossing:	+ or - 25 mm.

#### 9.16 DEFECTIVE CONCRETE AND MATERIALS

Concrete which is not placed, cured or finished as specified, does not have the specified strength or other specified properties, is not sound, dense, durable or crack-free will be considered defective.

Bear all cost and delays resulting from the rejection of concrete and subsequent rectification.

Remove the concrete to a point agreed with the Superintendent at which a visually and structurally acceptable construction joint can be made, and the defective element rebuilt.

Repair defective surface finishes if approved by the Superintendent. Approval will not be given if the defective area is too extensive or the techniques proposed are not adequate to ensure a visually acceptable and durable repair.

#### 9.17 MAINTENANCE CLEANING

High pressure water may be used for cleaning of concrete paths and structures.

Clean surfaces at a pressure rating that will provide an even, streak free cleaned surface without causing damage.

Chemicals may be used to remove specific types of stains or to ease cleaning and must be used in accordance with the product SDS and environmental requirements.

Mask or protect adjacent surfaces.

#### 9.18 OTHER REQUIREMENTS

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 10. DRAINAGE MAINTENANCE

### 10.1 OUTLINE DESCRIPTION

This section applies to the repair or replacement of precast concrete box culverts including inlet and outlet structures and precast concrete pipe culverts not exceeding 1950 mm nominal diameter.

### 10.2 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

### 10.3 DEFINITIONS

#### Culvert

An underground pipe, box or arch constructed in an embankment or trench.

#### Culvert Skew Angle

The angle between a line drawn perpendicular or radial to the road centre line and the centre line of the culvert.

#### Culvert Chainage

The chainage measured along the road centre line at its intersection with the culvert centre line.

#### Large Box Culverts

Precast box culverts and link slabs having spans greater than 1200 mm, heights greater than 1200 mm or fill heights exceeding 1600 mm.

#### Recycled Crushed Glass (RCG)

RCG conforming to Specification for Recycled Crushed Glass as an Engineering Material section 9. available at:

<http://www.nt.gov.au/infrastructure/techspecs/index.shtml>

## 10.4 MATERIALS

### 10.4.1 Conformance

Conform to requirements specified in CONFORMANCE TESTING.

The Contractor will be responsible for process control testing.

The Superintendent will carry out all conformance testing nominated to be the Superintendent's responsibility through Panel Period Contracts.

The Contractor will be responsible for ordering the conformance tests.

Ensure that all pipes and box culverts are indelibly marked with a Standards Australia conformance stamp.

Pipes and box culverts not stamped shall be removed from site at the Contractor's expense.

### 10.4.2 Precast Reinforced Concrete Pipes

Use flush joint type pipes with external rubber bands.

Ensure that pipes are clearly marked as to their class.

### 10.4.3 Precast Reinforced Concrete Box Culverts – Hold Point - Witness Point

Use box culverts of the inverted U type suitable for installation on a cast-in-situ concrete slab.

Design and supply box culverts which have a span not greater than 1200 mm, height not more than 1200 mm and a fill height not more than 1600 mm in accordance with AS 1597.1.

Design all other box culverts in accordance with AS 1597.2.

Use Standard Vehicle Loadings including NT Standard Road Train, with addition of the HLP 400 Abnormal Vehicle Loading on all National Highways, and HLP 320 on all other routes.

Provide culverts designed for exposure classification in accordance with the Exposure Classification Table in AS 5100.5. Refer to *Error! Reference source not found.*

**Hold Point** - Provide drawings showing complete reinforcement and dimensions with tolerances and obtain the Superintendent's approval prior to fabricating any units. Provide manufacturer's certification that the provided culverts comply with the applicable sections of AS 5100.5 and with AS 1597. Certify that the design is reflected accurately by the shop drawings and that the design is adequate to resist all specified loads and the soil loads pertaining to the site.

Provide a table of construction axle loads versus minimum required cover for each box culvert size.

**Witness Point** - Give the Superintendent notice prior to casting concrete.

### 10.4.4 Corrugated Steel Pipes, Pipe Arches and Arches

Supply in accordance with the details specified. Assemble in accordance with the manufacturer's instructions.

### 10.4.5 Bedding

A clean granular material free from sticks, stones and other deleterious material with a Plasticity Index less than 6, conforming to the following Table Material Size.

RCG conforming to Specification for Recycled Crushed Glass as an Engineering Material Section 9, and clean granular material free from sticks, stones and other deleterious material with a Plasticity Index less than 6, conforming to **Table 10.1 – Bedding Material Size**.

<b>Table 10.1 – Bedding Material Size</b>	
<b>AS Sieve (mm)</b>	<b>Percentage Passing by Dry Mass</b>
19.0	100
2.36	50 – 100
0.60	20 – 90
0.30	10 – 60
0.15	0 – 25
0.075	0 – 10

#### 10.4.6 Concrete

Conform to the requirements of CONCRETE MAINTENANCE.

#### 10.4.7 Mortar

Use one part fresh cement and three parts clean sharp sand mixed with potable water to yield a stiff but workable mixture.

#### 10.4.8 Select Fill

Conform to the requirements of EARTHWORKS AND DRAINAGE.

### 10.5 CONSTRUCTION OF CULVERTS AND STRUCTURES

#### 10.5.1 Setting Out – Hold Point

Measure culvert length along the invert to the outside face of headwalls.

Measure pits and/or manholes to the inside face of the wall.

Finished surface levels for kerbside structures are measured at the top of the kerb.

Set out the culvert and/or structure with pegs before construction.

**Hold Point** - Obtain the Superintendent's approval for the setting out before construction.

#### 10.5.2 Excavation – Witness point

Excavate in whatever material is encountered.

Use of explosives must be in accordance with MISCELLANEOUS PROVISIONS.

Pump, bail, sheet, shore and brace as necessary.

Divert water when necessary.

Rectify foundations which are affected by rain or surface water entering the excavation.

The total width of trench at and below the level of the top of the pipe shall be the width of culvert plus 300 mm minimum clearance each side.

Backfill with select fill up to the specified level if the trench is excavated too deep. Any such backfilling will be at the Contractor's expense.

**Witness Point** - Excavate unsuitable material below specified level if directed by the Superintendent.

Replace with select fill, compacted as specified.

#### 10.5.3 Culverts in Fill under Construction

Place and compact fill to Manufacturer's instructions and design specifications. Use select fill. Refer to PROJECT SPECIFIC REQUIREMENTS in the RFT. Conform to compacted layer method in earthworks. conform to compacted layer method EARTHWORKS.

Re-excavate the fill in accordance with the Excavation clause to permit the construction of the culvert.

#### 10.5.4 Construction Loading on Culverts

Provide the minimum compacted thickness of cover specified in **Table 10.4 - Minimum Required Cover Thickness in Metres** before allowing traffic to cross a culvert.

**Refer to Clause Error! Reference source not found. for Tables**

Do not permit construction vehicles having axle loads greater than 10 tonnes to cross large box culverts under any depth of fill unless specific certification is provided by the culvert crown unit manufacturer that the culverts have been designed to cope with those loads.

#### 10.5.5 Bedding

Place bedding 75 mm compacted thickness for the full width of the trench or 0.6 m greater than the width of the culvert for non-trench conditions.

Compact bedding to 90 % relative compaction.

Shape the bedding to hold pipes in position during compaction of additional fill.

Place and compact a further (haunching) layer of bedding of 150 mm compacted thickness over the full width of the previous layer after the pipe is in position.

Consider increasing thickness of haunching for large pipe culverts under high fills, to upgrade maximum bedding factor given in Table 5 of AS/NZS 3725.

#### 10.5.6 Laying Generally

Lay culverts commencing from the downstream end.

End caps, when used, shall provide a tight waterproof seal.

#### 10.5.7 Laying Pipe Culverts

Face rebates or sockets upstream.

Rest the full length of the pipe barrel on the bedding.

Position 'TOP' marking on pipes to within 5 degrees of the vertical axis.

Fill all joints with stiff mortar firmly rammed into openings. Remove excess mortar from barrel of culvert. Apply external rubber bands.

Brace pipes of 1200 mm diameter and greater with toms until the completion of the embankment and pavement.

The toms shall bear against a sill along the invert and a cap against the crown of the pipe. Provide toms opposite every pipe joint.

Cast collars and blocks in one operation. Restrain the culvert prior to constructing the collars or blocks by partially backfilling with bedding around the barrel of the culvert to one-half of the pipe diameter.

#### 10.5.8 Laying Box Culverts

Lay precast box culverts on a cast-in-situ reinforced concrete base slab.

Ensure concrete base slab exceeds external width of box culverts as shown on the typical details.

Butt box culverts firmly together.

Cut away lifting hooks and seal over the affected area with an approved epoxy resin.

Fill all joints with a stiff mortar firmly rammed into the openings. Remove excess mortar from the barrel of the culvert and apply external joint seals, Densopol HT60 or equivalent, 150 mm wide.

#### 10.5.9 Connection to Existing Systems – Witness Point

Repair all cut openings and make watertight.

Demolish existing headwalls to make way for the extension of the culvert.

Clean out new work and existing work affected by the new work.

**Witness Point** – Advise superintendent within two days when clean out is completed

#### 10.5.10 Backfill – Witness Point – Hold Point

**Witness Point** - Notify the Superintendent before backfilling where holes or fissures occur in rock trenches.

**Hold Point** - Do not place backfill against any in-situ concrete structure until the concrete has attained 80% characteristic strength and approval has been given.

Place backfill in layers not exceeding 150 mm compacted thickness.

Ensure the maximum difference in height of backfill on each side of a culvert is 300 mm.

Backfill around the culvert for the full width of the trench, and for a minimum 300 mm above the top of the culvert, or to subgrade surface if less, with select fill.

Backfill the remainder of the trench with standard fill.

Stabilise all backfill with 2 % cement by mass and compact to 95 % relative compaction.

Produce a uniform mix. Complete compaction within one hour of adding mixing water.

Use compaction equipment which will not damage the culvert and in-situ structures.

Carry out conformance testing using the Department's Panel Period Contractors for Testing.

Stabilise top 150 mm of backfill, for a distance of 1 m adjacent to culvert headwalls and wing walls, so as to be erosion resistant.

Remove surplus material from the site.

Reinstate to subgrade level trenches cut through pavements and other construction by backfilling the trench with stabilised select fill compacted to 95% relative compaction.

Construct base/sub-base layers of the pavement in accordance with PAVEMENTS AND SHOULDERS.

#### 10.5.11 Reinstate Surface.

Reinstate trenches cut outside of pavements and other construction by backfilling with standard fill compacted to 90 % relative compaction.

### 10.6 INLET AND OUTLET STRUCTURES AND MAINTENANCE HOLES

Construct in accordance with the Construction Of Culverts And Structures clause.

Compact foundations to 95% relative compaction to a depth of 150 mm minimum.

Replace unsuitable material as specified in the Excavation Clause.

### 10.7 INLET AND OUTLET CHANNELS – WITNESS POINT

Excavate the inlet and outlet of all culverts to facilitate the flow of water.

Conform to the following:

- Bed width: Minimum 150 mm greater than overall width of culvert.
- Side batters: 45 degrees maximum to horizontal.
- Bed grade: 0.5 % in the direction of flow for a minimum distance of 50 m.

Clean out new work and existing work affected by the new work.

**Witness Point** – Advise superintendent within two days when clean out is completed

### 10.8 OPEN UNLINED DRAINS

Excavate and dispose of all excess material as specified in EARTHWORKS AND DRAINAGE.

Trim drains to form neat levees.

Compact levees to 95% relative compaction.



Allow natural surface runoff.

## 10.9 REMOVAL OF EXISTING CULVERTS AND DRAINAGE STRUCTURES

Demolish and remove from the site existing culverts and drainage structures identified for removal by the Superintendent.

Dispose of waste material in accordance with the Standard Specification for Environmental Management and the Request for Tender (RFT).

## 10.10 SUBSOIL DRAINS

### 10.10.1 Excavation

#### Impervious Material

Excavate below the top of the impervious zone to a minimum depth equal to the outside diameter of the pipe plus 75 mm.

Place a bedding layer of 50 mm of filter material in the trench and compact with a vibrating plate or similar.

#### Pervious Material

Excavate and backfill under the pipe with impervious material as specified.

### 10.10.2 Filter Material

Shall be a hard durable stone having a Los Angeles Abrasion Loss not greater than 35%.

Conform to the grading specified by the manufacturer of the subsoil pipe. If manufacturer's grading not supplied, conform to **Table 10.2 – Filter material grading.**

<b>Table 10.2 – Filter material grading</b>	
<b>AS Sieve (mm)</b>	<b>Percentage Passing</b>
37.50	100
19.00	90 – 100
9.50	65 – 85
4.75	45 – 65
0.60	0 – 5

### 10.10.3 Geotextile Fabric

Refer to Geotextile Grades clause in PROTECTION WORKS MAINTENANCE.

Supply and lay an approved non-woven polypropylene or polyester geotextile fabric having an equivalent opening size (EOS) of 120 micrometre and typical geotextile strength rating (G) of 1350 minimum.

Cut or fold the fabric to the required shape. Patch, repair, or replace damaged fabric.

Cover geotextiles in accordance with the following:

- Untreated UV susceptible geotextiles:  
Within 5 days of placing.
- UV treated or low susceptibility geotextiles:  
Within 30 days of placing.

Encase the length of the trench with the fabric placed in such a way as to fully encompass the pipe and filter.

Overlap the fabric 300 mm over the top of the filter material.

### 10.10.4 Subsoil Drain Pipe

Use 100 mm diameter Class 400.

Use compatible couplings and fittings.

Connect solid wall pipe to the subsoil drain pipe for the disposal of collected water.

### 10.10.5 Laying and Backfilling – Hold Point

Fit the upper end of pipelines with inspection openings and caps supported in a concrete collar.

**Hold Point** - Obtain Superintendent's approval of the pipe installation before backfilling.

Place filter material around the barrel of the pipe and to a height of 200 mm above the pipe.

Compact with a vibrating plate compactor or similar.

Place and compact remaining layers of the filter in layers not exceeding 300 mm.

Prevent contamination of the filter.

Place and compact basecourse gravel, as specified in PAVEMENTS AND SHOULDERS in the top 300 mm of trench.

Place the material in two equal layers compacted to 95 % relative compaction.

Where trench excavated through pavement compact upper layer of basecourse gravel to 100% relative compaction and reinstate surface.

Backfill above solid wall pipes as specified in **10.5.10 Backfill** – Witness Point – Hold Point for trench conditions.

### 10.10.6 End Walls – Witness Point

Construct end walls at the outlet of subsoil drains as specified.

Secure 19 mm galvanised wire mesh over the opening.

Mark end walls with guide posts.

Clean out new work and existing work affected by the new work.

**Witness Point** – Advise superintendent within two days when clean out is completed

**10.11 CONFORMANCE**

Conform to **Table 10.3 – Conformance – Drainage Maintenance.**

<b>Table 10.3 – Conformance – Drainage Maintenance</b>	
<b>Application</b>	<b>Requirement/Tolerance</b>
Invert level and grade line:	No ponding of water.
Open unlined drains:	+ or - 50 mm.
Culverts or lined drains:	+ or - 20 mm.
Plan position:	+ or - 200 mm.
Culverts parallel to kerbs:	+ or - 50 mm.
Concrete structure dimension:	+ or - 5 mm.
Concrete thickness:	Not less than specified.
Subsoil drain slope:	25 mm maximum sag in 8 m.

**10.12 OTHER REQUIREMENTS**

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

**Table 10.4 - Minimum Required Cover Thickness in Metres**

Maximum Construction Vehicle Axle Load (tonne)	Type, size and class of culvert							
	Concrete Pipes, By Pipe Class						Corrugated Metal Pipes	Boxes
	Less than 1200 mm Nominal Diameter			1200 mm Nominal Diameter or more			Internal Diameter or Span up to 3600 mm	Less than 1200 mm Span, 1200 mm Height and 1600 mm Final Fill Height
	Concrete Pipe Class						Min. cover (m)	Min. cover (m)
	X(2)	Y(3)	Z(4)	X(2)	Y(3)	Z(4)		
9	0.4	0.4	0.4	0.4	0.4	0.4	0.6	0.1
20	0.8	0.6	0.4	0.5	0.4	0.4	1.2	0.6
35	1.3	0.8	0.6	1.3	0.4	0.4	1.5	0.9
50	1.0	0.8	-	1.0	0.4	-	1.8	1.2

## 11. PROTECTION WORKS MAINTENANCE



### 11.1 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

Refer to Waste Disposal clause in MISCELLANEOUS PROVISIONS section.

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

### 11.2 FOUNDATIONS

Excavate, fill and trim the site to the required shape prior to commencing the protection works.

Compact the top 150 mm of earthworks, on which protection works are to be laid to 90 % relative compaction.

### 11.3 GEOTEXTILE GRADES

Unless specified elsewhere in the contract, use: non-woven, Strength Grade B.

All strength grades, where specified, based on a Characteristic Values (Q), to conform to *Table 11.1 – Geotextile Strength Grade Properties*.

Notes to table:

- (1) % Elongation corresponding to max CBR burst strength as per AS 3706.4. Generally <30% for wovens, >30% for non-wovens.
- (2) Property value is 80<sup>th</sup> percentile characteristic value (mean strength – 0.83 x standard deviation), as per relevant AS test.

Filtration properties relevant to each grade to be certified as part of Product Certification clause requirements.

**Table 11.1 – Geotextile Strength Grade Properties**

Geo textile Strength Grade	Elongation (1)	Grade Strength (N) (2)	Tear (N) (2)	G Rating (2)
<b>A</b>	>30%	500	180	900
	<30%	800	300	1350
<b>B</b>	>30%	700	250	1350
	<30%	1100	400	2000
<b>C</b>	>30%	900	350	2000
	<30%	1400	500	3000
<b>D</b>	>30%	1200	450	3000
	<30%	1900	700	4500
<b>E</b>	>30%	1600	650	4500

### 11.4 CONFORMANCE TESTING

Where project requirement is less than 15,000m<sup>2</sup>, sampling and testing is not required.

Provide samples to independent, NATA accredited testing laboratory when project exceeds 15,000m<sup>2</sup>, to **Table 11.2 – Test Frequencies**

**Table 11.2 – Test Frequencies**

Description	Units	Test Method	Test Frequency
Tensile Strength	kN/m	AS 3706.2	1 per 15,000 m <sup>2</sup>
Tear Strength	N	AS 3706.3	1 per 15,000 m <sup>2</sup>
CBR Burst Strength	N	AS 3706.4	1 per 15,000 m <sup>2</sup>
Grade Tensile Strength	N	AS 2001.2.3.2	1 per 15,000 m <sup>2</sup>
Flow Rate	l/m2/s	AS 3706.9	1 per 90,000 m <sup>2</sup>

Samples to be 15m<sup>2</sup> in size cut across full width of the roll, not within 2m of the end of a roll, to AS 2001.2.3.2.

## 11.5 ROCK PROPERTIES

The rock properties specified in this clause apply to the rock, stone, aggregate and boulders specified in the following clauses in this section;

- Stone Pitching
- Dumped Rock
- Quarter Tonne Dumped Rock
- Rubble
- Gabion Rock
- Reno Mattresses

REQUIREMENTS; Clean, dry, durable crushed stone of uniform quality, free from declared weeds and their seeds, vegetable matter and other deleterious materials.

Particles must have at least 2 crushed faces and conform to AS 1141.25.1, AS 1141.26 and AS 1141.29.

## 11.6 STONE PITCHING

### 11.6.1 Stone Pitching

The stone to be spalls of hard durable rock complying with the Rock Properties clause and with no dimension less than 200 mm.

Hand place the stones so that they are firmly bedded in layers.

The average plane of the exposed face to be within 100 mm of the specified plane and all exposed faces of stones to be within 50 mm of the average plane.

### 11.6.2 Grouted Stone Pitching – Hold Point

Place stones as specified in the Stone Pitching Clause.

**Hold Point** - Obtain Superintendent's approval before grouting.

Grout stone pitching with cement mortar.

Cement mortar to consist of one part cement to three parts of clean sand mixed with potable water to form a workable mixture.

Work the mortar into the interstices of the stone pitching to a depth of at least 100 mm from the surface. Work from the base upwards.

Cure the mortar for at least 48 hours.

Remove defective mortar and re-grout any loose stones.

Provide 75 mm diameter weep holes penetrating the full thickness of the grout at the rate of one every 5 square metres.

## 11.7 DUMPED ROCK PROTECTION

Large spalls or boulders complying with the Rock Properties clause and having a least dimension of

that specified in the PROJECT SPECIFIC REQUIREMENTS section of the RFT.

Dump into the specified area.

Protect adjacent areas from damage due to dumping.

The average plane of the exposed rock face to be within 100 mm of the specified position.

## 11.8 QUARTER TONNE CLASS DUMPED ROCK PROTECTION

Large spalls or boulders complying with the Rock Properties clause and having the following grading.

Table 11.3 – Rock grading	
Rock Size	Minimum % Larger Than
35 kg	90
250 kg	50
500 kg	0

Dump into the specified area.

Protect adjacent areas from damage due to dumping.

The average plane of the exposed rock face to be within 100 mm of the specified position.

## 11.9 RUBBLE

Broken rock complying with the Rock Properties clause.

Maximum size of rubble to be 200 mm.

At least 30 % by mass to have a nominal size of 100 mm or greater.

No more than 20 % by mass to pass the 2.36 mm sieve.

Dump rubble without segregation onto the prepared area.

Compact rubble to a tight finish.

The average plane of the exposed face to be within 100 mm of that specified.

The exposed face to be within 100 mm of the average plane.

## 11.10 GABIONS

### 11.10.1 General

A flexible, hexagonal woven steel wire mesh box, filled with packed stone conforming to the Rock Properties clause, and securely laced with steel wire.

### 11.10.2 Steel Wire Mesh

Use galvanized steel wire, Grade W15Z380 to AS 2423.

Zinc coating; 250 g/m<sup>2</sup> Galvanization to be carried out prior to weaving of the mesh.

Minimum tensile strength of wire: 380 MPa.

Mesh openings to be 80 mm x 100 mm maximum, hexagonal in shape with flexible joints consisting of not less than two full turns.

All wire to be coated with average thickness of 0.55 mm extruded grey PVC firmly attached to the wire. The minimum thickness of coating to be 0.40 mm in accordance with AS 2423.

At the discretion of the Superintendent, the PVC wire coating may be omitted where abrasion of wire is not likely to be of concern or where deleterious effects on the wire of ground water, soil salinity, natural weather exposure and water emersion is not significant. Check PROJECT SPECIFIC REQUIREMENTS section of the RFT.

Conform to wire sizes and galvanizing weights in **Table 11.4 – Wire properties - Gabions.**

<b>Table 11.4 – Wire properties - Gabions</b>	
<b>Wire Type</b>	<b>Minimum Diameter (mm)</b>
Body wire	2.7
Binding and lacing wire	2.2
Selvedge wire	3.4

Selvedge wire shall be woven integrally along all edges of the mesh, in accordance with the manufacturer's instructions, and such that the mesh shall not unravel.

The steel wire mesh shall be sized so that it can be folded into regular boxes, complete with diaphragms, having dimensions specified. Diaphragms to be at 1,000 mm spacing.

#### 11.10.3 Construction

Assemble and erect in accordance with the manufacturer's instructions.

Pretension the wire framework against a firm anchor or adjacent units.

Retain the shape of the wire framework with spreaders.

Fill with hard durable stone, complying with the Rock Properties clause and placed in stages to achieve the tightest packing of stone.

Maximum stone dimension: 250 mm.

Minimum stone dimension: 100 mm.

Overfill the framework by 20 mm to 50 mm to allow for subsequent movement of the stone.

Perform lacing operations using specified lacing wire. Wire to pass round the edges being joined using alternative single and double loops through each mesh in turn. Tightness of the mesh and wiring is essential.

Ensure a tightly packed, neat and uniform construction.

### 11.11 RENO MATTRESSES

#### 11.11.1 General

A flexible, hexagonal woven steel wire mesh box, filled with packed stone conforming to the Rock Properties clause, and securely laced with steel wire.

#### 11.11.2 Steel Wire Mesh

Use galvanized steel wire, Grade W15Z380 to AS 2423.

Zinc coating; 250 g/m<sup>2</sup>. Galvanization to be carried out prior to the weaving of the mesh.

Minimum tensile strength of wire: 380 MPa.

Mesh openings to be 60 mm x 80 mm maximum, hexagonal in shape with flexible joints consisting of not less than two full turns.

All wire to be coated with average thickness of 0.55 mm extruded grey PVC firmly attached to the wire. The minimum thickness of coating to be 0.40 mm in accordance with AS 2423.

At the discretion of the Superintendent, the PVC wire coating may be omitted where abrasion of wire is not likely to be of concern or where deleterious effects on the wire of ground water, soil salinity, natural weather exposure and water emersion is not significant. Check PROJECT SPECIFIC REQUIREMENTS section of the RFT.

Conform to the wire sizes and galvanizing weights shown in **Table 11.5 – Wire properties – Reno Mattresses.**

<b>Table 11.5 – Wire properties – Reno Mattresses</b>	
<b>Wire Type</b>	<b>Minimum Diameter (mm)</b>
Body wire	2.0
Binding and lacing wire	2.2
Selvedge wire	2.4

Selvedge wire to be woven integrally along all edges of the mesh, in accordance with the manufacturer's instructions.

Cut to shape where necessary.

#### Mattress Panels

Bottom panel: Includes both sides and both end panels.

Top panel: Shall have the same dimension as the bottom, without the sides and ends, and be supplied separately.

Diaphragms: Extend over the full width of the mattress from top to bottom at maximum intervals of 1 m.

### 11.11.3 Construction

Assemble and erect in accordance with the manufacturer's instructions.

Align diaphragms perpendicular to the direction of flow unless otherwise specified.

Pretension the wire framework against a firm anchor or adjacent units.

Retain the shape of the wire framework with spreaders.

Fill with hard durable stone complying with the Rock Properties clause in this section and placed in stages to achieve the tightest packing of stone.

Maximum stone dimension:

120 mm when mattress depth 170 mm.

150 mm when mattress depth 230 mm.

200 mm when mattress depth 300 mm or greater.

Minimum least stone dimension 80 mm.

Overfill the framework by 20 to 50 mm to allow for subsequent movement of the stone.

Perform lacing operations using specified lacing wire. Wire to pass round the edges being joined using alternative single and double loops through each mesh in turn. Tightness of the mesh and wiring is essential.

Last panel on downstream side, or at base of slope, shall be a whole unit (i.e. not cut).

Ensure a tightly packed, neat and uniform construction.

## 11.12 REVETMENT MATTRESSES

### 11.12.1 General

A nylon fabric material filled with mortar with filter points for the relief of hydrostatic uplift pressure.

Conform to the manufacturer's instructions.

### 11.12.2 Materials

Mortar mix proportions to **Table 11.6 – Mortar mix proportions.**

<b>Table 11.6 – Mortar mix proportions</b>			
<b>Cement Type GP or GB</b>	<b>Fine Sand</b>	<b>Coarse Sand</b>	<b>Water</b>
1 (500 kg)	1.2 (600 kg)	2.2 (1,100 kg)	450 L/m <sup>3</sup>

Adjust fine sand/coarse sand proportions if required to provide workable mix.

### 11.12.3 Construction

Toe-in to provide cut-off walls minimum 300 mm deep and width not less than maximum thickness of mattress.

Lay, cut and stitch mattress on prepared surface. Make allowance for take up of fabric resulting from filling mattress with mortar.

All stitching and seams to be neat in appearance and strength to withstand filling pressure.

Ensure mattress is anchored prior to mortar pumping to prevent creep during placement of mortar.

Provide openings in fabric at a maximum of one every 50 m<sup>2</sup> for placement of mortar. Opening to match size of pumping hose.

Make good openings on completion of mortar pumping.

All areas of mattress to be hard filled with mortar with smooth surface.

Do not permit any loading on the mattress until one hour after mortar pumping has been completed.

Remove spilt mortar from surface of mattress by hand only. Do not use water to wash spilt mortar.

Make good any defective areas.

## 11.13 EMBANKMENT PROTECTION - CONCRETE

Construct embankment protection from concrete reinforced with a single layer of centrally located SL62 mesh.

Overlap the mesh by 200 mm at joints.

Make construction joints in the vertical plane, at 2 m maximum spacing.

Continue reinforcement mesh across construction joints.

Where margins are required, construct the embankment protection and the margins as an integral unit.

Where there are adjacent protection works, construct the toe of the embankment protection and the protection work as an integral unit.

Drainage holes to be 75 mm diameter penetrating the full thickness of the protection works. Install the drainage holes at 3 m intervals just above the toe.

Install additional rows of drainage holes parallel to the first, and at 3 m intervals and spacings, where the scope of work requires it.

The exposed surface to be within 50 mm of the specified position.

#### **11.14 MARGINS**

Construct margins with reinforced concrete. Conforming to the requirements of the CONCRETE MAINTENANCE Section.

Make construction joints at 3 m maximum spacing.

Form the top 75 mm of the vertical face nearer the pavement, and any exposed outer face, true to line and level.

Wood float and broom finish the upper surface of the margin. Finish flush with the top of the pavement.

Where adjacent pavement is sealed, overlap the bituminous seal on the margins by not less than 100 mm.

#### **Tolerances**

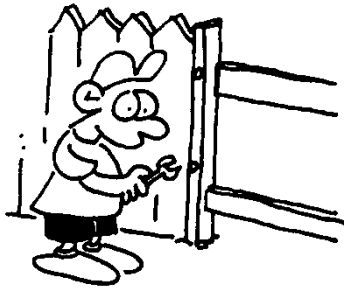
Width: Not less than specified.

Level: + or - 10 mm of top of adjacent pavement.

#### **11.15 OTHER REQUIREMENTS**

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 12. ROAD FURNITURE MAINTENANCE



### 12.1 OUTLINE DESCRIPTION

This section specifies the maintenance requirement for regular maintenance of road furniture.

Maintenance operations are specifically ordered as required by the Superintendent, and includes new installation (where missing), repairs to, removal and replacement of, any of the following:

- Fencing
- Guideposts
- Road Signs
- Raised Retroreflective Pavement Markers (RRPMs)
- Flood Gauge Posts
- Cattle Grids
- Steel Beam Guardrail

### 12.2 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

### 12.3 DEFINITIONS

#### Traffic Control Device

Any sign, signal, pavement marking or other installation placed or erected for the purpose of regulating, warning, guiding or providing for the safety of road users. It does not include temporary warning devices and control measures erected only for the construction period.

### 12.4 STANDARD DRAWINGS

The most recent issue of the following standard drawings form part of the contract as applicable.

**Table 12.1 - Standard Drawings for Road Furniture Maintenance**

Drawing No.	Subject
C(S) 0016	Culvert Crossing Guard Rail Footings
C(S) 1204	Cyclists' Hold Rail
C(S) 1300	Flexible Guide Posts
C(S) 1301	Flood Gauge Posts
C(S) 1302	Log Barrier Fence
C(S) 1303	Standard Security Fence
C(S) 1306	Stock Fence Design and Details
C(S) 1310	Steel Beam Guard Rail
C(S) 1313	Standard Cattle Grid Plan and Sections with Approach Slab
C(S) 1314	Standard Cattle Grid Plan and Sections without Approach Slab
C(S) 1315	Standard Cattle Grid Details
C(S) 1316	Vehicle Movement Barriers

### 12.5 EXTENT OF WORK

#### 12.5.1 Scheduled Work

Undertake scheduled works ordered by Superintendent.

#### 12.5.2 Unscheduled Work

Undertake unscheduled works when directed. Payment will be at scheduled rates if available, or be paid at a fair and reasonable rate negotiated between the Contractor and Superintendent.

Unscheduled works may include new installations or repairs, removal, replacement of items identified whilst undertaking scheduled works.

Be familiar with road furniture installations along the routes under the contract and be vigilant and attentive to any unscheduled works requirements.

Log all unscheduled work in a logbook detailing as a minimum:

- Start date, start time
- Road name, and location measured by distance
- Work performed, i.e.: sign type, guidepost, etc. removed, or replaced
- Completion date, completion time
- Provide electronic copies of before and after digital photos in jpeg format, clearly showing work undertaken.

Refer to each section for lists of materials to be carried on the service vehicle.

The Contractor will inform the Superintendent within 24 hours where unscheduled works cannot be carried out due to lack of particular materials.



**12.6 FENCING****12.6.1 General**

Clearing fence lines includes the removal of trees, shrubs, vegetable matter and debris. Grub out all roots that interfere with the placement of posts. Refer to Clearing and Mulching clauses in Formation Width Clearing in EARTHWORKS AND DRAINAGE.

Erect fences so that the line of the tops of the posts is uniform.

Adjust the position of posts to compensate for the irregularities of the ground.

Provide gates where ordered and across existing access tracks or roads.

**12.6.2 Existing Fences**

Install a post at the intersection of any new fence with the existing fence and fix the wiring of both fences to that post.

Complete the necessary sections of new or replacement fencing before removing existing fencing.

Obtain the owner's agreement to the proposed fence removal and advise the owner or occupier in writing of the date that the fence will be removed.

Erect gates or grids at fence openings as ordered.

**12.6.3 Materials**

Barbed wire: 1.57 mm diameter minimum, high tensile.

Plain wire: 2.50 mm diameter minimum, high tensile.

Wire mesh: Galvanized 3.15 mm diameter x 50 mm chain mesh.

**12.6.4 Stock Fence**

Stock fencing to consist of tubular steel strainer assemblies with star pickets and galvanized wire. Construct as specified on standard drawing CS 1306.

Include the crossing of gullies, watercourses and hollows on the ground.

**12.6.5 Security Fence**

Security fencing to consist of tubular steel posts complete with post caps, cable straining wires, chainwire mesh and three barbed wires. Construct as specified on standard drawing CS 1303.

**12.6.6 Safety Fence**

Safety fence to consist of "HUMEARC" type SWP HRI x 3 m panels or similar.

Erect the fence in accordance with manufacturer's specifications.

**12.7 VEHICLE MOVEMENT BARRIERS/FENCES**

As per Standard Drawing CS 1316.

Supply stock & half stock length pipe barriers.

Erect fences as ordered, so that the line of the tops of the posts is uniform.

Make allowance for excavation and concreting of anchor/footings.

Adjust the position of posts to compensate for the irregularities of the ground.

Minor clearing fence lines may include the removal of trees, shrubs, vegetable matter and debris. Grub out all roots that interfere with the placement of posts.

**12.8 CYCLE HOLDING RAILS**

Supply and erect new cycle grab rails and delineators as per drawing number CS 1204

Or

Remove damaged rail and replace with new rail as per drawing.

Make allowance for excavation and concreting of anchor/footings.

Make allowance for minor clearing of fence lines

**12.9 CULVERT CROSSING GUARD RAIL**

Supply and erect Culvert Crossing Guard Rail rails and delineators as per drawing.

Make allowance for Hot Dip galvanising and masonry chemical anchorage to headwalls.

Make allowance for excavation and concreting of anchor/footings. Refer to drawing CS 0016.

Make allowance for minor clearing of fence lines.

Or

Remove damaged Culvert Crossing Guard Rail and replace with new rail as per drawing.

Make allowance for excavation, removal and rehabilitation of anchor/footings.

**12.10 LOG BARRIER FENCE**

Refer to Recycled Plastic Bollards clause.

Provide log barrier fencing which may either consist of timber posts or recycled plastic posts and rails complete with connections. Construct as shown in the typical details.

**Timber**

Important: Do not use preservative treatments that contain arsenic or chromium for new works or replacements.

Use Stringybark, Woollybutt or pine timber, pressure impregnated with ACQ preservative formulation, copper oxide (CuO) and quaternary ammonium compound (DDAC) to Category H4 of AS 1604.1.

**12.11 RECYCLED PLASTIC BOLLARDS**

Supply round pre-moulded recycled plastic bollards, 1.5 m length x 150 mm dia with built in colours and UV stabilised, resistant to termites, microorganisms and moisture.

Install and ensure security of recycled plastic bollards as per manufacturer's recommendations.

Make allowance for excavation and concreting of anchor/footings.

Make allowance for minor clearing of fence lines.

## 12.12 GUIDE POSTS

### 12.12.1 Posts

Use Thermoplastic guide posts manufactured from plastic alloy ASA/PC or similar.

Refer to standard drawing CS 1300.

#### REQUIREMENTS

Posts to conform to the following:

Colour: Opaque white.

Finish: Smooth, glossy.

Length: 1380 mm.

Width: 95 mm minimum, 105 mm maximum, width to be constant to within 1 mm.

Web thickness: 3 mm minimum, 5 mm maximum.

### 12.12.2 Certification of Guide Posts – Hold Point

**Hold point** - Provide certification that guide posts conform to the following:

- Where installed in normal working conditions, guide posts are capable of self-erecting after 10 impacts head on, from an average sedan travelling at 60 km/h.
- After 2,000 hours of exposure in an Atlas Weatherometer the guide posts do not change colour by more than 10 points on a Delta E colour chart.
- The guide post material has a minimum Vicat softening point of 120°C.
- Physical testing as specified.
- Resistant to termites.

### 12.12.3 Guide Post Characteristics – Hold Point

Provide guide posts which have the following:

- An anti-withdrawal device which will prevent the guide post from being withdrawn without dislodgement of the compacted backfill. Anti-withdrawal devices must be engaged on each and every guide post prior to installation of guide posts.
- Legible and indelible markings similar to those used to mark or uPVC sewer and water pipes, in letters no less than 5 mm high, showing month and year of manufacture and located approximately 400 mm from the top of the post. Stick-on labels are not permitted.
- Legible and indelible marking 380 mm from the bottom of the guide post, to indicate depth for installation. Stick-on labels are not permitted.

**Hold point** - Provide a sample guide post from each batch purchased for this contract for approval before installing any guide posts.

## 12.13 DELINEATORS

### RECTANGULAR RETROREFLECTORS

Class 1 retroreflective material to conform to AS 1743.

Size to be 100 mm x 50 mm for red delineators; 100 mm x 25 mm for white delineators.

### 12.13.1 Installation of Delineators

Attach one red and one white delineator to each guide post, 50 mm from the top of the post.

The red delineator to be attached to the convex side of curved guide posts.

Attach any corner cube delineators required as specified.

Red delineators to be on the left and white delineators to be on the right when viewed in the direction of travel.

### 12.13.2 Unscheduled Guide Post Materials

20 additional guide posts will be carried on the service vehicle when leaving the contractors premises to perform scheduled works, for the purpose of carrying out unscheduled works.

## 12.14 WORK ZONE PRODUCTS AND ACCESSORIES

### 12.14.1 General

Conform to AS 1742.3 unless otherwise specified.

Items required under this section will include, but not limited to the following.

- Traffic Cones 450, 700mm high. reflective
- Traffic Cones (Reflectorised) 700mm high.
- Plastic Barrier Boards (CL1) and Stands.
- Amber Flashing Lights.
- Delineators (CL1), Red/Yellow 200mm x 50mm, White 200mm x 50mm.
- Class 1 Overlays and Sheeting Material in all colours. Colour and sizes will be as ordered.

Various associated items as per the schedule of rates.

## 12.15 ROAD SIGNS – MANUFACTURE, SUPPLY AND DELIVERY

This subsection specifies the manufacture, supply and delivery of road signs.

### 12.15.1 Materials – Hold Point

#### NON-REFLECTIVE MATERIALS

In accordance with AS 1743.

#### REFLECTIVE MATERIAL

Use high intensity Class 1 to AS/NZS 1906.1 for all signs and hazard markers with the exception that all black legends are to be non-reflective.

#### BLANKS

Use aluminium marine grade alloy designation 5052 - H38. Thickness 1.6 mm.

Steel sheets may only be used for temporary signs.

#### ANTI-GRAFFITI COATING

**Hold Point** - Obtain Superintendent's approval for the use of the anti-graffiti films or coating products. Apply anti-graffiti products only to the new road signs specified by the Superintendent.

#### 12.15.2 Manufacture

Chemically clean aluminium blanks before painting or bonding of reflective material.

Stamp the month and year of manufacture and the symbol Dol on the backs of all signs.

#### 12.15.3 Delivery

Supply sign including all brackets, bolts, nuts and bracings. Fix bracings to the signs prior to delivery.

Package and handle all items to ensure delivery in an undamaged condition.

Protect signs with an approved slip sheeting and if required by the retroreflective sheeting manufacturer be padded with microfoam sheeting between the faces. The sheeting is to cover the entire sign.

Store signs on their edge at all times and do not allow to become wet at any stage. Signs are deemed delivered on being received into Sign Stores at Regional Centres.

Signs received in a damaged condition will not be accepted. The Sign Supply Period Contractor is responsible for unloading.

Contact Dol Regional Office to confirm the delivery location and make allowance. Regional Centre Sign Stores are located at the following locations:

#### DARWIN

Dol Road Projects Depot, Yarrowonga Road, Palmerston, and/or Period Contractor for Signage Installation, Darwin.

Note: make allowance for delivery to a single location within a 40-kilometre radius of the Darwin General Post Office.

#### TENNANT CREEK

Dol Road Projects Depot, Leichhardt Street, Tennant Creek.

#### ALICE SPRINGS

Period Contractor for Signage Installation, Alice Springs.

#### EAST ARNHEM

Dol Road Projects Depot, John Flynn Drive, Nhulunbuy.

### 12.16 DELIVERY TIMES – NORMAL REQUIREMENTS

Delivery times are measured from the time of ordering. Requirements are;

**Table 12.2 – Sign delivery times**

Sign Type	Quantity	Delivery Time
Regulatory Signs ('R'-series)	Up to 20 each	1 Week
Warning Signs ('W'-series)	Up to 20 each	1 Week
Guide Signs ('G'-series)	Up to 10 signs	2 Weeks
Temporary Signs ('T'-series)	Up to 10 each	1 Week
Associated Hardware	Any Quantity	1 Week

Where delivery is not achieved within the times listed a penalty of 15% of the value of the order per week or part thereof will be applied at the discretion of the Superintendent.

For orders in excess of the quantities listed, delivery time will be as agreed between the Superintendent and the Contractor.

### 12.17 ROAD SIGNS – INSTALLATION AND MAINTENANCE

#### 12.17.1 General

This subsection specifies the erection or replacement of road signs and posts including supply of posts.

#### 12.17.2 Posts

Post sizes to conform to **Table 12.5 - Roadside Signs - Mounting Selection** unless specified otherwise.

Posts to be medium grade galvanized pipe with plain ends and constructed from a single length of pipe. Cap each post with a galvanized cap.

Do not use "Ingal" posts.

Conform to AS 1074.

#### 12.17.3 Location

Signs to be located clear of vegetation and be clearly visible under headlight illumination.

#### 12.17.4 Lateral Placement

Lateral placement to be measured to the edge of the sign nearest the road.

Lateral placement to be as follows:

Unkerbed roads: 2 to 4 m clear from the edge of the traffic lane, and 600 mm minimum clear from the outer edge of the road shoulder.

Kerbed roads: 500 mm to 1000 mm from the front face of the kerb.

### 12.17.5 Height

Height to be measured as the clearance to the lowest edge of the lowest sign in an assembly.

Heights for signs to be as follows:

<b>Table 12.3 – Sign installation heights</b>	
<b>Unkerbed Roads:</b>	
Fingerboard (G3) and street name signs (G5):	2 m above the near edge of the pavement.
Other signs:	1 to 1.5 m above the near edge of the pavement.
<b>Kerbed Roads:</b>	
Signs overhanging a footway:	2.5 m minimum above footway.
Signs not overhanging a footway:	1 to 1.5 m clearance except for those specific signs on medians and islands given below.

### Specific signs on medians and islands:

The following signs, when used on medians and islands, to have a clearance 150 mm above the kerb:

- D4-1-2 Hazard Marker
- D4-2-2 Hazard Marker
- D4-3 Hazard Marker
- R2-3 (Keep Left) (Keep Right)
- R2-5 (No U Turn)
- R2-6 (No Right Turn) (No Left Turn)
- R2-15 (U Turn Permitted).

### 12.17.6 Installation of Posts and Signs

Conform to **Table 12.5 - Roadside Signs - Mounting Selection.**

Posts to be vertical.

Sleeves, when specified, to be 50 mm longer than the specified ground anchor depth and extend 50 mm above the finished surface level.

Secure the post to the sleeve with a galvanised locking wedge.

Encase the post, or sleeve when used, in a footing of 20 MPa concrete.

Conform to **Table 12.4 - Orientation of signs.**

**Table 12.4 - Orientation of signs**

Face:	Vertical, and turned 3 degrees to 5 degrees horizontally from oncoming traffic on straight sections. On curves, at right angles to centre line of road.
Exception:	Parking signs to be oriented 5 degrees from parallel to the kerb to face oncoming traffic.

### 12.17.7 Remove and Replace Existing Posts and Signs

Dismantle damaged posts and signs.

Backfill the hole left by the post and its footing and compact the fill to the same density as the surrounding area.

Erect replacement posts and signs in newly augered holes in accordance with Installation of Posts and Signs section above.

### 12.17.8 Reinstatement and Relocation of Existing Signs

Dismantle existing post and signs carefully.

Store in a manner to prevent damage.

Backfill the hole left by the post and its footing and compact the fill to the same density as the surrounding area.

Erect posts and signs in newly augered holes in accordance with Installation of Posts and Signs clause above.

Refer to **Table 12.5 - Roadside Signs - Mounting Selection.**

### Refer to Clause 12.30 for Tables

### 12.17.9 General Requirements

Spacing between posts to be:

- 2 post signs - 0.6 times sign width.
- 3 post signs - 0.4 times sign width.
- 4 post signs - 0.3 times sign width.
- Brace spacing to be 380 mm maximum.
- Adopt the nearest size in the list for intermediate sizes.
- Post sizes for galvanized pipe posts are for sign clearance of less than 2 m above the pavement. For sign clearances greater than 2 m, increase the nominal diameter of the pipe size by a percentage equal to the percentage increase in height above 2 m.
- Where signs are erected in groups treat the overall dimensions of the group as one sign size to determine the post requirement from the **Table 12.5 - Roadside Signs - Mounting Selection.**

**12.17.10 Unscheduled Sign Materials**

Carry additional sign materials on the service vehicle for the purpose of carrying out unscheduled repair and replacement works at various sites.

These items are additional to those required for scheduled works.

- 3 x 60 km/h
- 3 x 80 km/h
- 3 x 100 km/h
- 3 x Give Way
- 3 x Stop Signs
- 3 x Keep Left
- 3 x D4-2-2 Hazard Signs
- Ample spare sign posts, caps, brackets, bolts, nuts and bracings
- Concrete materials including cement, sand, and aggregate

**12.17.11 Receipt, Storage, Inventory and Control of Signs**

Make provision for the receipt, storage, inventory and control of existing and replacement stock of Departmental signs, fittings and other associated items for use in the contract works.

Provide a secure and weatherproof storage facility at the Contractors premises. The facility is to be approximately 150 m<sup>2</sup> to accommodate an existing stock of signs, posts and fixtures made available to the Contractor by the Superintendent for use in the contract works. Three large sign racks will also be provided with the signs.

Keep stock records up to date and regularly advise the Superintendent of item usage. The Superintendent will supply replacement items as required. Such replacement items will be at no cost to the Contractor, however costs associated with receipt, storage, inventory and control will be paid at the rate for Establishment as defined in the Schedule of Rates.

**12.17.12 Transportation**

Transport all items with care to ensure installation in an undamaged condition. Signs are to be secured, supported and braced vertically to prevent damage due to scuffing, abrasion or load shifting. Adequately brace large signs to prevent buckling or rivet popping. Signs installed in a damaged condition will not be accepted.

**12.17.13 Daily Log – Hold Point**

Keep a daily log of works which at a minimum identifies road name, chainage, work performed, completion date, equipment down time and unusual happenings. Submit daily log book sheets with each completed Contractor Service Request (CSR).

**Hold Point** - Submit for Superintendent approval a suitably designed format for daily log books prior to commencing works under the Contract.

**12.18 REMOVAL OF GRAFFITI.**

Remove the Graffiti using the nominated graffiti remover in accordance with the manufacturer's instructions. Rinse panel free of remover/graffiti residues with water, wipe dry and assess for clean ability/removal it shall exhibit complete removal of the graffiti and show no discernible effect on the graffiti barrier or retro-reflective or non-reflective sheeting of the sign or other painted surfaces

**12.19 CLEANING OF SIGNS.**

When cleaning a sign a non-abrasive cleaner free of damaging solvents should be applied with a sponge or soft bristle brush. Pressure sprayers may be used if not sprayed so close to the sign that it would damage the sheeting face. Whatever procedure is followed, it is best to first check with the product supplier and test out any chemical cleaner on a sign in the maintenance yard before use in the field.

**12.20 CLEANING OF TOURIST INTERPRETIVE SIGNAGE**

Tourist Interpretive signs in various locations are required to be kept clean at all times and especially during the "tourist season." The signs are to be cleaned in such a manner as to remove all graffiti, dirt and other deleterious material, leaving the signs fit for purpose, clean and readable.

**12.21 ROAD ASSET INFORMATION**

The Superintendent will provide a current Road Information Management System (RIMS) data sheet listing when the Contract is awarded and provide regular updates, as required, throughout the Contract.

The data sheet listing will include the following;

- Each road under the Contract
- The respective identification number
- The respective Permanent Reference Points (PRPs) and chainages.

Work will be located by reference to the information contained on the data sheet listings.

**12.22 MATERIAL SUPPLIED BY THE PRINCIPAL**

On termination of the Contract, undertake a stock inventory of all signs, posts and fixtures and provide the inventory to the Superintendent. All discrepancies deficient from the stock at the onset of the Contract will be charged to the Contractor. Give access to the Superintendent or his Representative in order to remove or relocate the signs at the termination of the contract. The cost of removal or relocation of the signs, posts and fittings will be borne by the Superintendent.

## 12.23 FLOOD GAUGE POSTS

### Posts and Gauges

Use a standard flood gauge refer to standard drawing CS 1301.

Use galvanized posts, single length medium grade 50 mm nominal bore with plain ends and end caps.

### Installation

Erect the post vertically at the outer edge of the road shoulder or margin, on the left hand side when viewed in the direction of travel.

Install a concrete anchor, of 20 MPa concrete, with a depth of 600 mm and a diameter of 300 mm.

Cast a suitable galvanized sleeve, 650 mm in length, in the anchor so that the sleeve extends 50 mm above the finished surface level.

Attach post to sleeve with a galvanized M10 bolt 25 mm from the top of the sleeve.

Secure gauge to post with galvanized bolts and nuts, and galvanized brackets as appropriate.

Position gauge zero to comply with lowest spot on floodway along the centre line.

## 12.24 CATTLE GRIDS

Repair and maintain each required section of the cattle grid or assembly as shown on the Standard Drawings and details below:

- Grid centre line are placed on the centre line of the road pavement.
- Grid grade and levels are to conform to the grade and levels of the adjacent road pavement.
- Place and compact select fill behind the abutments of the grid, up to the base of the pavement.
- Reinstate pavement layers with base material.
- Reinstate surface.
- Tighten all hold down bolts as specified.
- Paint the portion of guardrails above ground with one coat zinc phosphate primer and two coats of white alkyd paint.
- Fix width markers with epoxy adhesive to each guardrail.
- Construct strainer post assemblies.
- Fix the stock fence to the strainer assembly.
- Supply and install a gate in the fencing adjacent to the grid as specified.

Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

### 12.24.1 Grid Maintenance

Refer to Standard Drawings CS 1314, CS 1315 and CS 1316.

This section of work for the repairs and maintenance of grids, include the welding to

damage members of a grid, remove and replacement of damaged parts of a grid and cleaning and painting of parts of a grid

All repairs to grid steel welding will be carried out by a certified tradesman or a person with demonstrated ability to perform the works within the limits of the specification

Carry sufficient spare bolts, nuts, plates and tradesman equipment when carrying out routine maintenance for repairs that were not obvious at the time of original inspection.

## 12.25 STEEL BEAM GUARDRAIL

### 12.25.1 Materials

Repair and maintain each required section of the steel beam guardrails, as shown on the Standard Drawing and details below:

Conform to AS/NZS 3845.

Use W-beam guardrail similar to 'Armco Flex Beam Guardrail' (nominal 300 mm width) or similar formed from HA 350 steel.

Rails to be capable of withstanding a cold bend of 180°. around a diameter 2.5° times its own thickness without cracking.

Metal thickness to be 2.7 mm minimum.

### TERMINAL SECTIONS

Form from HA 350 steel having the same properties and thickness as the rails.

### POSTS

Fabricate posts and block outs from steel channel section in accordance with standard drawing.

### BOLTS AND NUTS

Conform to AS 1111 and AS 1112.

Shape bolt shoulders and holes in rail elements to prevent the bolts from turning.

Length of bolts to be sufficient to extend 6 mm to 12 mm beyond the nuts.

### GALVANIZING

Hot Dip Galvanize all components after fabrication, to AS/NZS 4680.

Repair defective galvanizing by painting with a zinc rich paint of similar colour.

### INSTALLATION

Erect the rail in a manner that produces a smooth, continuous, taut rail closely conforming to the line and grade of the roadway.

Lap rails so that the ends of rails do not face oncoming traffic in the adjacent lane.

Attach reflective delineators to the guardrail in accordance with the manufacturer's specification.

Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

**12.25.2 Steel Beam Guardrail maintenance**

Repairs and maintenance of damage section of steel beam guardrail to include removal and replacement of damaged parts of the rail, post and terminal sections in a manner that produces a smooth, continuous, taut rail closely conforming to the line and grade of the roadway.

Attach reflective delineators to the guardrail in accordance with the manufacturer's specification.

**12.26 ADVERSE CONDITION REPORT**

Submit to the Superintendent a Road Furniture Adverse Condition Report when condition of road furniture is adverse due to factors not covered by this specification.

Carry out the works in accordance with ordered Contractor Service Request (CSR) and as per unscheduled work conditions of this specification, however, submit this report if works are to be interrupted due to external or unforeseen circumstances.

**12.27 LIAISON WITH THE SUPERINTENDENT**

Refer all matters relating to difficulties or problems experienced in carrying out the requirements of the Contract to the Superintendent.

**12.28 CONTRACTOR'S PERSONNEL**

Provide one service vehicle with a minimum of two personnel to undertake the works under the contract.

The Superintendent may at times require the services of additional vehicles and labour to perform Unscheduled Works. Additional vehicles and labour will be paid at the tendered rates defined in the Schedule of Rates.

**12.28.1 Personnel in Crews**

Personnel undertaking contractual works as defined in this specification will be required to work with minimum supervision. Nominate one of the personnel familiar with the requirements of contract to attend all operations in each area of work to ensure full compliance. Nominate an individual or provide a roster of individuals that are contactable and available at all times, 24 hrs a day 7 days a week including Public Holidays.

Refer to **Table 12.6 - Personnel in Crews**.

<b>Refer to Clause 12.30 for Tables</b>
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**12.28.2 Plant and Equipment**

Supply a service vehicle readily available and equipped with all the necessary tools and equipment to perform the works.

Refer to **Table 12.7 - Plant and Equipment**.

<b>Refer to Clause 12.30 for Tables</b>
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**12.29 OTHER REQUIREMENTS**

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 12.30 TABLES

<b>Table 12.5 - Roadside Signs - Mounting Selection</b>					
<b>Sign Size W X D</b>	<b>No. and NB gal. pipe posts</b>	<b>Sign attachment brackets (or M8 bolts) per post</b>	<b>Bracing</b>	<b>Anchor</b>	
				<b>Depth (mm)</b>	<b>Dia. (mm)</b>
300 x 300	1 x 50	2	No	600	300
300 x 450	1 x 50	2	No	600	300
450 x 450	1 x 50	2	No	600	300
450 x 300	1 x 50	2	No	600	300
450 x 600	1 x 50	2	No	600	300
450 x 750	1 x 50	2	No	600	300
450 x 900	1 x 50	2	No	600	300
600 x 450	1 x 50	2	No	600	300
600 x 600	1 x 50	2	No	600	300
600 x 750	1 x 50	2	No	600	300
600 x 900	1 x 50	3	No	600	300
600 x 1050	1 x 50	3	No	600	300
750 x 450	1 x 50	2	No	600	300
750 x 600	1 x 50	2	No	600	300
750 x 750	1 x 50	2	No	600	300
750 x 1200	1 x 50	3	No	1000	300
900 x 300	1 x 50	2	Yes	600	300
900 x 600	1 x 50	2	Yes	600	300
900 x 900	1 x 50	3	Yes	600	300
900 x 1350	1 x 50	4	Yes	1000	300
1050 x 600	1 x 50	2	Yes	1000	300
1050 x 900	1 x 50	3	Yes	1000	300
1200 x 600	2 x 50	2	Yes	600	300
1800 x 600	2 x 50	2	Yes	1000	300
1800 x 1200	2 x 80	4	Yes	1000	300
2400 x 1200	2 x 80	4	Yes	1200	450
2400 x 1800	2 x 100	5	Yes	1200	450
3000 x 600	2 x 50	2	Yes	1000	300
3000 x 1200	2 x 80	4	Yes	1200	450
3000 x 1800	2 x 100	5	Yes	1500	450
3700 x 600	2 x 80	2	Yes	1000	300
3700 x 1200	3 x 80	4	Yes	1200	450
3700 x 1800	3 x 100	5	Yes	1500	450
3700 x 2400	4 x 100	7	Yes	1500	450



<b>Table 12.5 - Roadside Signs - Mounting Selection</b>					
<b>Sign Size W X D</b>	<b>No. and NB gal. pipe posts</b>	<b>Sign attachment brackets (or M8 bolts) per post</b>	<b>Bracing</b>	<b>Anchor</b>	
				<b>Depth (mm)</b>	<b>Dia. (mm)</b>
4300 x 600	2 x 80	2	Yes	1000	300
4300 x 1200	3 x 80	4	Yes	1200	450
4300 x 1800	3 x 100	5	Yes	1500	450
4900 x 600	3 x 80	2	Yes	1000	300
4900 x 1200	3 x 100	4	Yes	1200	450
4900 x 1800	3 x 100	5	Yes	1500	450
5500 x 600	3 x 80	2	Yes	1000	300
5500 x 1200	3 x 100	4	Yes	1200	450
5500 x 1800	4 x 100	5	Yes	1500	450
6100 x 600	3 x 80	2	Yes	1000	300
6100 x 1200	3 x 100	4	Yes	1200	450
6100 x 1800	4 x 100	5	Yes	1500	450

**Table 12.6 - Personnel in Crews**

At least one person shall have the following:

<b>Qualifications:</b>	<p>A current Accreditation Certificate in Work-zone Traffic Control, and prior experience in traffic management.</p> <p>An ability to understand and apply the requirements of AS 1742.3</p> <p>Possess a current NT driver's licence appropriate for the Contractors service vehicle.</p>
<b>Experience:</b>	Relevant experience in the construction industry including safe operation of equipment for welding, cutting, grinding, concreting, and other hand tools.
<b>Attributes:</b>	Good oral and written communication skills, and able to liaise well with Departmental staff.
<b>Knowledge:</b>	Knowledge of the road network.

**Table 12.7 - Plant and Equipment**

The service vehicle will provide effective and efficient service response, and will contain but not be limited to the following items:

<b>Communication:</b>	Hands free mobile phone. Access to a satellite phone for remote locations would be advantageous, however not essential.
<b>Fittings:</b>	Post and sign racks, concrete pre-mix material bins, water tank with potable water supply sufficient to mix concrete as required, and storage boxes for brackets, fitting, bolts and nuts etc.
<b>Equipment:</b>	Mechanical and hand augers, oxy-acetylene set, portable welder/generator set, small electric breaker, ladders, wheelbarrow, lifting equipment, dumpy level and staff.
<b>Hand Tools:</b>	Hand tools for fencing, concreting, digging, shovelling, compacting, fixing, screwing, dismantling, riveting, driving, breaking, and levelling. Electric hand tools and accessories for the grinding, cutting and drilling of steel, aluminium and wood, banding tools.
<b>Camera:</b>	Digital camera to record evidence of damage for unscheduled works and other occurrences.

### 13. PAVEMENT MARKING MAINTENANCE

#### 13.1 OUTLINE DESCRIPTION

This section specifies the materials, testing and standards of workmanship for marking and re-marking of pavements with road marking paint and/or long life material.

#### 13.2 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

#### 13.3 DEFINITIONS

##### CSR

Contractor Service Request. A formal request issued by the Superintendent for works to be undertaken.

##### Longlife Materials

Longlife marking materials generally consist of either thermoplastic, cold applied plastic or pliant polymer materials. These materials have lifespans of between 2 and 5 times that of water-borne paint.

##### Longitudinal Lines

Any line which runs parallel to the road centre line, e.g. broken line, edge line, separation line, barrier line.

##### NTTM

NT Test Methods, found in NT Materials Testing Manual.

##### Other Markings

All diagonal lines, chevron markings and messages on the pavement, including symbols, words, numerals, arrows and kerb markings.

##### PCCP

Painting Contractors Certification Program

##### Retroreflectivity

A term used to indicate the reflectivity provided by glass beads and is expressed as minicandela per lux per square metre ( $\text{mcd/lx/m}^2$ ) as measured by a reflectometer approved by the Superintendent.

##### Traffic Control Device

Any sign, signal, pavement marking or other installation placed or erected for the purpose of regulating, warning, guiding or providing for the safety of road users. It does not include temporary warning devices and control measures erected only for the construction period.

##### Transverse Markings

Any line which is at right angles to the centre line of the road, e.g. stop line, hold line, and pedestrian cross walk.

### 13.4 CONTRACTOR ACCREDITATION

All pavement marking work must be carried out by a contractor accredited to the "Painting Contractor Certification Program" (PCCP) in a class or category applicable to the work. The PCCP is administered by the CSIRO. Information regarding the PCCP can be obtained at <http://www.apas.gov.au/pccp/>

#### 13.5 CONTRACTOR'S MATERIALS AND EQUIPMENT – WITNESS POINT

Provide all general and specialised equipment, tools and materials to carry out and test the work. Be fully equipped on each attendance call.

Equipment used shall produce markings of uniform quality which conform to the requirements of this specification.

**Witness Point** - Produce documented evidence to show that spraying equipment has been calibrated in accordance with NTTM 405.1.

Specifically, provide at least the following:

- One or more self-propelled line marking units with an operating paint capacity of > 600 litres and equipped with appropriate glass bead capacity, a minimum rear wheel track of 1400 mm and a wheel base of 2800 mm with rear operator. These machines are to be equipped with data logging and application monitoring equipment.
- One or more self-propelled line marking units suited to short run urban line marking, intersections and areas requiring greater manoeuvrability. These machines shall have a minimum GVM of 1 tonne and have a paint capacity of not less than 200 litres and have appropriate glass bead capacity. These machines are to be equipped with data logging and application monitoring equipment.
- One or more hand cart line marking units including self-propelled machines with an operating capacity of 20 litres
- Pilot vehicles equipped with required work zone traffic control signage for works on the road network conforming to the requirements of AS 1742. Refer to PROVISION FOR TRAFFIC.
- Skilled labour resources to crew a minimum of one line marking unit. Crews to have gained accreditation from nationally recognised and DoI approved Work Zone Traffic Management courses and obtained the appropriate accreditation cards with photographic identification issued by Motor Vehicle Registry. Crews to also be conversant with Work Health and Safety requirements.
- Schedule of local NT suppliers intended to be utilized for the supply of materials.

### 13.6 PAVEMENT MARKING

#### 13.6.1 General – Witness Point

Pavement Markings at new works to be installed within 3 days of sealing unless otherwise specified by the Superintendent. Paint application will also be at the same rate as specified unless otherwise directed by the Superintendent.

**Witness Point** - Obtain approval from the Superintendent for the type of equipment to be used for applying marking materials.

#### 13.6.2 Road Marking Paint

Australian Paint Approvals Scheme (APAS) Specifications: For paint types identified by an APAS specification code, conform to the specification represented by that code.

Road marking paint to conform to APAS 0041/5 and suitable for application by spray equipment in accordance with Test Method AS/NZS 1580.205.4. Paint to be suitable for asphalt, bituminous seal and concrete road surfaces and for use with Intermix BS 6088 glass beads.

Retain a 'Certificate of Compliance' with the relevant Australian Standards or APAS specification in respect to the paint and glass beads.

#### 13.6.3 Glass Beads

Use Type C glass beads conforming to AS/NZS 2009 with the exception of size. Conform to the size distribution requirements in **Table 13.1 – Glass Beads Size Distribution**.

<b>Table 13.1 – Glass Beads Size Distribution</b>		
<b>Sieve Size (Microns)</b>	<b>% Retained</b>	<b>% Passing</b>
1180	0 – 3	97 – 100
850	5 – 20	80 – 95
425	65 – 95	5 – 35
PAN	0 - 10	

#### 13.6.4 Long Life Marking Materials

Use a product approved and recommended by the manufacturer for the purpose and conforming to the requirements of AS 4049.

Retain a 'Certificate of Compliance' with the relevant Australian Standards in respect to the material.

Intermix glass beads conforming to AS/NZS 2009.

#### 13.6.5 Setting Out

Surface to be marked must be free from dirt, loose detritus, mud and other extraneous matter, and dry before and after painting operations.

The location of all pavement markings on new surfaces, including reflective raised pavement markers, shall be set out by spotting with paint or

other approved method prior to application of the markings.

The location of all pavement markings over existing markings shall match the existing except where directed otherwise.

Setting out will be negotiated with each CSR as an item for new work only. Setting out will be to a level of service satisfactory to the Superintendent.

Set out markings so that they are straight, with smooth even curves where necessary. Remove any marking material beyond the defined marking leaving a neat and smooth marking on the pavement.

**New Work:** Set out line marking in accordance with the standard drawings for line marking, CS 1520 and CS 1521 and in accordance with AS 1742 including the setting out of arrows, letters, numerals and chevrons.

**Remarking:** Remark along the line of the existing line marking and to the tolerances specified for new work.

#### 13.6.6 Application

Apply paint evenly to the road surface at the specified film thicknesses (Tolerance + 0.04 mm) and not more than five seconds after spraying apply Intermix beads

On all work, apply one coat of paint and glass beads to the road. Apply in the direction of traffic flow where possible.

Transverse and Other Marking Applications: Apply paint evenly to the road surface to the specified film thickness and immediately after apply an even application of Intermix glass beads at the specified rates.

Protect all applications from traffic until the binder has hardened sufficiently to retain the glass beads.

Reinstate pavement markings that are damaged by traffic during paint drying time and remove all tyre pickup marks as per Removal Of Markings clause.

Markings must be free from ghosting and raggedness on the sides and ends and parallel with the general alignment of the carriageway. Lines must be level, uniform and free from streaks.

Conform to **Table 13.2 – Line Marking Application Rates**.

**Table 13.2 – Line Marking Application Rates**

Material	Thickness/rate
Waterborne Paint dry film thickness (excluding surface applied beads)	> 0.250 mm
Water borne Paint Wet film thickness (excluding surface applied beads)	> 0.400 mm
Surface applied glass beads (rate retained in the paint surface)	Intermix glass beads > 300 g/m <sup>2</sup>

**13.6.7 Tolerance**

The distance between the centre line of the marking and the centre line of the set out mark is to be less than 30 mm. The apparent line of the markings is to be a smooth continuous alignment when viewed in the direction of the line. Permitted tolerance for the length, width and spacing of all pavement markings: + or - 10 mm.

**13.6.8 Removal of Markings – Hold Point**

**Hold Point** – Obtain approval from the Superintendent on the method used for line marking removal.

Removal of pavement marking must not adversely affect the integrity of the road surface.

When arrows, letters or figures are to be removed or temporarily blacked out, the removal pattern must be in the shape of a rectangle or square to minimise confusion to the motorist, particularly in wet weather or poor lighting conditions.

Remove all materials and debris from removal operations.

The following methods may be considered and will be dependent on the type of surface, extent and application.

**Machine Grinding**

This method may be considered for use on smaller removal jobs where surface finish is not a concern. Can be used on most asphalt and concrete surfaces.

**Sandblasting**

Sandblasting is the preferred method for marking removal on asphalt and concrete surfaces.

Use a skirt or guard around the blaster to minimise the spraying of material away from the immediate work area.

Remove waste material before it can be transported by rain, wind or traffic. This will generally require the use of a vacuum attachment operating concurrently with the blasting operation or alternative method approved by the Superintendent.

**Sealing**

Spray sealing is the preferred method for sprayed seal surfaces. Conform to SPRAY SEALING FOR MAINTENANCE.

**Paint Blackout**

Paint blackout may be considered as a temporary measure only as markings retain a high reflection and possess low skid resistance.

**Other Methods**

Other methods such as water blasting, heat lance or paint stripping may also be considered by the Superintendent.

**13.6.9 Field Testing**

**Wet Film Thickness Comb:** Check the thickness of the wet film applied to the road pavement by the method of procedure for Operation of Wet Film Thickness Comb (NTTM 401.1)

**Glass Bead Application:** Check the application rate of glass beads to the surface of the marked line by the method of Field Procedure for Measurement of the Rate of Application of Spherical Glass Beads (NTTM 402.1)

**Wear assessment:** The degree of wear is defined as the area of pavement marking remaining after a period of time, relative to the initial area of the pavement marking.

**Degree of wear:** At the Superintendent's discretion, determine the degree of wear using Image Analysis in accordance with AS 4049.1 Paints and related materials – Pavement marking materials or by using Image Analysis in accordance with AS 4049.3:2005 Appendix K, Method A, Photographic Method.

**Wear limits for pavement marking:** 95% intact area after six months.

Remark pavement marking that does not conform to the specified limits at the Contractor's expense including the costs of all testing.

**13.7 COLD APPLIED THERMOPLASTIC MATERIALS****13.7.1 Standards**

AS 4049.2 Paints and related materials—Pavement marking materials - Part 2: Thermoplastic pavement marking materials—For use with surface applied glass beads

AS 4049.4 Paints and related materials—Pavement marking materials – Part 4: High performance pavement marking systems

AP-S0041/3 Pavement marking materials – cold applied plastic

AP-S0042 Glass beads for use in pavement marking paints

### 13.7.2 Materials – Witness Point

Generally: A two part Poly Methyl Methacrylate resin based pavement marking material that complies with the requirements for colour, luminance and bead content of AS 4049.2, and which complies with AS 4049.4, sprayed or screeded onto the pavement, containing pre-mixed glass beads conforming to AS/NZS 2009, with additional drop-on beads being added during application, conforming with the following requirements of AS 4049.2: Clause 5.1 – Colour, Clause 5.2 - Luminance and Clause 7 - Field Testing. The material shall have a maximum no-pick-up time of 60 minutes.

**Witness Point** - Provide evidence that all proprietary products such as epoxy or plastic products have demonstrated satisfactory field performance for a period of at least three years.

### 13.7.3 Application – Witness Point

Application is to be in accordance with the Manufacturer's Specification.

**Witness Point** - Provide evidence that it has been applied in accordance with the Manufacturer's instructions.

The area to be marked is to be dry and free of dirt, gravel, oil and other loose or foreign material to ensure the best possible adhesion of new material. Remove existing paint or other material which is flaking or chipped. Cleaning may be carried out by brooming, blowing or washing.

Use a tack coat or primer material for surface or other conditions requiring it in accordance with the Manufacturer's Specification.

Apply by spraying, screeding, trowelling or extrusion methods, including application of glass beads and anti-skid material, in a single uniform layer.

For longitudinal lines and transverse markings, apply material at a rate to achieve a minimum final thickness of 2.5 mm ± 0.5 mm for application by screeding, trowelling or extrusion methods. Glass beads are to be Class C (intermix 20 to 30 % by mass) and Class D (AS/NZS 2009). As well as the "mixed in" glass beads additional Class D beads shall be uniformly applied to the surface of thermoplastic at the rate of 0.40 kg/m<sup>2</sup> as part of the application process and before the material has commenced to set.

The marking produced shall be uniform in texture, width and thickness and the surface substantially free from blisters, streaks, lumps and other defects.

Remove any occurrence of overspray and gun dribble.

### 13.7.4 Setting out

For continuous thermoplastic pavement marking, 50 mm drainage gaps shall be provided, at a maximum spacing of 6m +1m, to allow adequate drainage of the pavement surface. Nominate in the Contract Management Plan the method of identifying the location and spacing for these gaps.

## 13.8 RAISED RETROREFLECTIVE PAVEMENT MARKERS (RRPMS)

### 13.8.1 Materials

Use STIMSONITE 953 markers fixed to the road surface as recommended by the manufacturer of the marker.

Raised Retroreflective Pavement Markers to conform AS 1906.3. Fix to the road surface as recommended by the manufacturer.

Use adhesives as recommended by the manufacturer.

Use adhesives within the time recommended by the adhesive manufacturer.

### 13.8.2 Pavement Preparation

Ensure each RRPM site is free of dirt, oil, grease, paint and any other material which would affect the bond of adhesive to the pavement.

Abrasive blast, chip, or burn pavements that cannot be cleaned by sweeping.

Check the moisture content of the surface immediately before application by the polyethylene film moisture test.

Do not place markers if the film moisture test indicates the presence of moisture.

### 13.8.3 Placing Markers

Place markers in accordance with the manufacturer's recommendations.

Use marker types as follows:

- Centre line: White, two way reflectors,
- Lane line: White, one way reflectors,
- Left edge line: Red, one way reflectors,
- Right edge line adjacent to medians on dual carriageway: Red, one way reflectors,
- Chevron Areas: Yellow one way reflectors, or yellow two way reflectors.

Face reflectors to oncoming traffic.

Do not obscure the reflective faces by adhesive.

Surface finish to be smooth.

Discard markers which are not positioned correctly within the time recommended by the manufacturer for use of the adhesive. Remove adhesive from the road surface.

Do not place markers over joints in concrete pavement.

Where the existing seal has excess binder, or where Gilsabind has recently been used, include the following for adhesion of RRPMS:

- Clean the road surface to expose the aggregate prior to installation,
- Protect the RRPMS from traffic until the adhesive is fully set,
- Locate the RRPMS to the outside of edge lines.

#### 13.8.4 Raised Reflective Pavement Marker Removal

Where required, remove raised pavement markers by breaking the bond between the adhesive, the road surface and the base of the raised pavement marker.

Repair all divots caused by the removal of raised pavement markers with hot melt adhesive or epoxy adhesive to the level of the surrounding pavement.

### 13.9 AUDIO TACTILE LINE MARKING (ATLM)

#### 13.9.1 Site Preparation

Immediately prior to marking application, remove all extraneous or loose material from areas where the thermoplastic material is to be applied. Prepare and prime areas as recommended by the manufacturer to ensure satisfactory adhesion of thermoplastic material.

#### 13.9.2 Application

Apply ATLM directly on to the road surface on existing painted edge lines or centre double barrier lines.

Apply markings within the tolerances specified in **Table 13.3 – Audio Tactile Line Marking Tolerances**. The height of the thermoplastic raised ribs is measured from the planed surface formed by the tops of the aggregate.

#### 13.9.3 Retro-reflectivity

Apply glass beads in accordance with AS/NZS 2009 Type B immediately to the surface of the molten thermoplastic material. The minimum rate to be retained on the thermoplastic material is 200g/m<sup>2</sup>.

Marking must achieve a minimum level of reflectivity of 350 mcd/lux/m<sup>2</sup> at time of application when tested in accordance with AS 4049.2:2005 Appendix K - Field tests for thermoplastic pavement marking material – and Appendix M – Determination of retroreflectivity.

**Table 13.3 – Audio Tactile Line Marking Tolerances**

Aspect	Dimension	Tolerance (mm)
Height of raised rib	8mm	+2mm or -1mm
Spacing of raised rib	250mm	± 10mm
Length of raised rib	50mm	± 2mm
Slope of raised rib	45 degrees	± 10 degrees
Width of raised rib (edge line).	As shown on project drawings. Otherwise 100mm	± 2mm
Width of raised rib (centre barrier line)	80mm	± 2mm

#### 13.9.4 Audio tactile markings

Thermoplastic used for audio tactile pavement markings must comply with AS 4049.2 but modified as follows:

- Softening Point: When determined in accordance with AS/NZS 2341.18 the softening point shall be not less than 95°C.
- Cold Flow: When determined in accordance with AS 4049.2:2005 Appendix I – Determination of flow resistance - the cold flow shall be no more than 5% at 40°C.
- Skid Resistance: When tested in accordance with AS 4049.2:2005 Appendix K – Field tests for thermoplastic pavement marking material – and Appendix L – Field determination of skid resistance (wet pendulum method) - at any time up to 3,000,000 vehicle passes, the skid resistance value of beaded unprofiled base material must be not less than 50.
- Retro-reflectivity: Mix glass beads in accordance with AS 2009 Type C into the thermoplastic material at a rate of not less than 30% by mass prior to application.

#### 13.10 OTHER REQUIREMENTS

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 14. LANDSCAPE MAINTENANCE



### 14.1 OUTLINE DESCRIPTION

This section specifies the maintenance requirement for control of vegetation and litter by use of mechanical means and/or chemicals, and the maintenance requirement for irrigation systems, in an urban road verge environment.

### 14.2 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

Comply with conditions included in any AAPA clearances or approvals applying to the site of the works. Observe the restrictions imposed by any Restricted Works Areas conditions applying to the site of the works.

Refer to Work Involving Chemicals clause in MISCELLANEOUS PROVISIONS section.

Refer to Waste Disposal clause in MISCELLANEOUS PROVISIONS section.

Refer to Vegetation Control in SLASHING AND WEED CONTROL.

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

### 14.3 DEFINITIONS

#### Certified Seed

Seed by record of origin, purity, and strain and conforming in character to the parent stock.

#### Exotic Plants

Any plants not native to Australia.

#### Fine Tilth

The friable soil resulting from cultivation.

#### Germination Percentage

The proportion of pure seed germinating in a fixed time under standard laboratory conditions.

#### Grass

Grass includes clumps or tufts of grass growing on scalded areas, grass species that grow faster than other species and includes the whole of the plant, including leaves, seeds, stems and seed heads.

#### Mulch

Material spread as a surface treatment to reduce soil erosion, water loss, and weed invasion.

#### Native Plants

Plants which are natural to Australia.

#### NPK Ratio

The ratio of Nitrogen (N), Phosphorus (P), and Potassium (K) in a fertiliser compound.

#### Root Ball

The finely bound fibrous root and soil removed intact from the container with the plant.

#### RWA

Restricted Work Area

#### Soil Binding Agent

Material which stabilises and conditions soil and aids moisture retention.

#### Weeding

The removal of unwanted plant or grass species by mechanical, manual or chemical means.

### 14.4 EXTENT OF WORK

Maintain the full extent of the road reserve for each road and length identified in the RFT and/or in the PROJECT SPECIFIC REQUIREMENTS section and the Schedule of Rates.

Identify and undertake the works required to maintain each road within the specified service levels.

Service levels are clearly defined outcomes specified for all the landscape maintenance works specified herein.

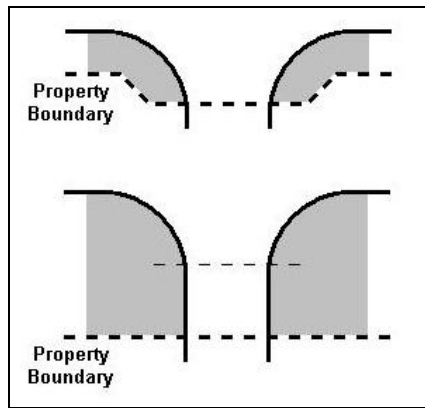
Failure to adhere to the response times for attendance and completion of work, including after hour call-outs, may result in the Superintendent engaging a third party to attend to and complete the work at the Contractor's expense.

At intersections with Local Council Roads, maintain to the end of the curve at the truncation.

Where there is a discernible property boundary or fence line, maintain beyond the end of the curve at the truncation to the extended property boundary line. The relevant Local Councils are responsible for maintenance beyond that point.

Refer to **Figure 14.1 Extent of Work Area at Intersections with Local Council Roads**.





**Figure 14.1 Extent of Work Area at Intersections with Local Council Roads**

Road verges within the road reserve may on occasion be maintained by other land holders or residents, however they are not exempt from the specified service levels.

#### 14.5 INTERSECTION SIGHT LINES

Maintain intersection sight lines to minimum sight distances corresponding to the relevant vehicle speed as per **Figure 14.2 Intersection Sight Lines** and **Table 14.4 - Sight Line Distances**.

**Refer Clause 14.31 for Figure and Table**

### 14.6 CONTRACTOR'S PERSONNEL

#### 14.6.1 Horticulturist

Employ or have access to a qualified Horticulturist for the total period of the Contract. The Horticulturist shall have attained a minimum qualification of Certificate III in Horticulture (Floriculture) or equivalent accredited training course.

The Horticulturist is to continually monitor and advise the Contractor daily on appropriate horticultural requirements with a view to best practices and will play a major part in maintaining the health of all vegetation over the period of the contract.

A Horticulturist's report is to accompany the monthly claim for payment and is to include mention of all observations or occurrences of note related to vegetative issues observed over the period.

Make available the time and expertise of the Horticulturist at no additional cost to the Superintendent in relation to any plant health related query that may arise within the road reserve associated with the contract on an "as and when required" basis.

#### 14.6.2 Certified Irrigation Specialist

Employ or otherwise engage a certified irrigation designer and tradesperson with appropriate qualifications to undertake design, installation and maintenance of irrigation systems. Certification to be recognised by the Irrigation Association of Australia.

Make available the time and expertise of the certified irrigation specialist at no additional cost to the Superintendent in relation to any irrigation related query that may arise regarding issues associated with the contract on an "as and when required" basis.

The certified irrigation specialist is to continually monitor works and advise the Contractor on appropriate irrigation requirements with a view to best practices and will play a major part in maintaining the irrigation systems over the period of the contract.

#### 14.6.3 Arborist

Include at least one qualified arborist in the tree pruning team.

The Arborist shall be a person with a minimum qualification of Certificate III in Horticulture (Arboriculture) RTF30203, from the Amenity Horticulture Training Package RTF03 or equivalent accredited training course.

#### 14.6.4 Supervisors

Employ sufficient supervisors familiar with the requirements of the contract to attend all operations in each area of work to ensure full compliance with specified service levels.

Nominate an individual or provide a roster of individuals including their contact phone numbers who will be available at all times, including nights, weekends and Public Holidays during the period of the Contract.

#### 14.6.5 Personnel Handling Chemicals

Be registered for business as weed control operators, or engage subcontractors registered for business as weed control operators. The Contractor and Sub-contractors must have a Ground Spraying Business Licence and operators must have a Ground Spraying Applicators Licence. Provide copies of these licences.

Nominate one of the personnel familiar with the requirements of contract to supervise all operations to ensure full compliance with statutory requirements.

Do not allow spray drift. Operators must be competent in their understanding of how to prevent spray drift.

Keep a copy of the Safety Data Sheet on site for each type of chemical used

Handle all chemicals as specified in product SDS.

Wear as a minimum the protective clothing as specified in product SDS.

Refer to the Spraying clause in SLASHING AND WEED CONTROL.

### 14.7 PROGRAM OF WORKS

Submit a 12 month Landscape Maintenance Program within 2 weeks of award of contract in the first year, and 2 weeks prior to the commencement of a subsequent 12 month period.

Identify the type, frequency and timing for each service associated with the contract. However, achieve the specified service levels regardless of frequency of treatment.

The Superintendent will use the 12 month landscape maintenance program to measure progress of the works.

There may occasionally be a reduction in the area of service under the contract due to new works being carried out within the road reserve. Negotiate with the Superintendent any variation to the contract should these works result in a changed maintenance requirement both during construction and after completion.

Any reduction in the area of service under the contract as a result of asset transfer to another owner will be varied out of the contract.

## **14.8 PROGRESS REPORTS**

### **14.8.1 Weekly Report**

Submit to the Superintendent via email no later than close of business each Thursday a detailed Weekly Report advising the location and nature of works programmed to be carried out over the following week.

Include information about any chemical spills and the remedial action taken.

Carry out the works in accordance with the Weekly Report, however submit a modified version if works are to be interrupted due to external or unforeseen circumstances.

Irrespective of external or unforeseen circumstances continue to maintain the asset within the service levels specified.

Number each Weekly Report from 1 to 52, and identify as a Revision if that is the case.

### **14.8.2 Monthly Report**

Submit a Monthly Maintenance Report attached to the monthly claim for payment. The report shall provide the following information:

- a summary of the activities carried out during the month of the report
- a Horticulturist's report mentioning all observations or occurrences of note related to vegetative issues observed over the period
- a schedule of trees, plants and shrubs that have died, are dying, or are approaching the end of their expected life in the road reserve during the month of the report.
- a schedule of any vegetation that for any reason is unstable or represents a safety hazard to pedestrians, cyclists, motorists or any other user of the road reserve.
- summary of observations or occurrences of note related to irrigation issues.
- summary of spraying operations for herbicides and pesticides undertaken in the period of the

report. Copies of daily log book sheets for spray treatments shall accompany the monthly report.

- summary of fertilising undertaken in accordance with the Annual Maintenance Plan.
- estimate of quantity, including location, of mulch held in stockpile that is the property of the Principal.
- details of complaints received from members of the public, and actions taken.
- information about any chemical spills and the remedial action taken.
- Details on how compliance with any AAPA conditions or RWAs was achieved.
- a record of details of all dead domestic animals that are disposed of under the contract.

## **14.9 LIAISON WITH THE SUPERINTENDENT**

Refer all matters relating to difficulties or problems experienced in carrying out the requirements of the Contract to the Superintendent.

### **14.10 SAFETY MATERIALS EQUIPMENT AND SIGNAGE**

Carry out all work within the road reserve in accordance with the PROVISION FOR TRAFFIC section and the approved traffic management plan.

Include in the traffic management plan requirements specified herein.

Supply all materials and equipment used under the Contract.

Ensure the safe and proper use and maintenance of all tools, plant, equipment and materials.

Fit appropriate guards on cutting equipment and high mounted orange coloured hazard lights on all plant, equipment and vehicles being utilized under the contract.

Fit all plant, equipment and vehicles with signs or signwriting which identifies the primary contractor and advises users of the road reserve the primary contractor's contact phone number.

Erect chemical spraying advice signs within 200 m of the work zone when spraying chemicals, and relocate as works progresses. Spray only between the signs.

Erect signs and park plant equipment and vehicles within the road reserve so that they do not interfere with or restrict sight lines, particularly at intersections.

## **14.11 MATERIALS**

### **14.11.1 Trees**

Provide trees, shrubs and ground covers with the following characteristics:

- Trunks and stems to be sturdy and well hardened.
- A well-developed vigorous root system.
- A minimum of three months in their container.
- Be sound, healthy, vigorous, and free from insect pests, plant diseases, sun scalds, fresh abrasions of the bark, or other disfigurements.

#### 14.11.2 Fertiliser

Store fertilisers in waterproof sealed bags under shelter away from water and direct sunlight.

Supply fertilisers conforming to **Table 14.2 - Fertilisers**.

**Refer Clause 14.31 for Table**

#### 14.11.3 Imported Soils

Provide imported topsoil conforming to AS 4419 and the following requirements:

- Be free draining.
- Be red-brown or black sandy loam.
- Contains no grass or declared weeds and their seeds.
- Maximum stone size of 6 mm.

#### 14.11.4 Mulch

##### Organic Mulch

- Material free from impurity and sufficiently heavy to prevent dispersal by wind.
- Shredded bark, wood chips, hay or similar.
- Wood chips of a maximum size of 50 mm, inert, and free of resinous toxins and termites.

##### Inorganic Mulch

- Washed and screened lateritic gravel, crushed aggregate or brick chips with particle sizes in the range 6 mm minimum to 25 mm maximum.

### 14.12 GRASS CUTTING

#### 14.12.1 Service Levels

Cut grass on medians, verges and islands within the road reserve to **Table 14.1 – Grass cutting service levels**.

<b>Table 14.1 – Grass cutting service levels</b>	
<b>Maximum cut:</b>	50 mm from the ground.
<b>Height not to exceed:</b>	As specified for the particular road in the PROJECT SPECIFIC REQUIREMENTS section Or Refer to <i>Table 19.1 – Grass Height Specification</i> in ROAD AMENITY MAINTENANCE

#### 14.12.2 Grass cutting operations

Collect litter as part of and prior to grass cutting operations.

Cut grass to between 50 mm and 150 mm of ground level at time of service.

Cut grass from the edge of seal to the extent of the road reserve or to the cleared tree line within the road reserve, including cuttings, batters, inlets and outlets of culverts, protection works, and around road furniture.

Cut grass to clean cut, not broken or ripped, using equipment capable of maintaining the health and appearance of the grass and ground cover.

Do not cut shrubs and trees with a calliper size at base greater than 50 mm diameter, planted vegetation, or vegetation regardless of size that has been pegged and directed by the Superintendent to be retained.

Remove cut material or other detritus from the grass cutting process from gutters, cycle paths, walk tracks and road pavements as the work proceeds. Use this material for mulching if suitable, or remove from site.

Make adjustments to cutting methods and frequency as required to maintain the specified service levels during the wet season.

#### 14.12.3 Plant and Equipment

Anticipated plant requirements are push, front deck and batter mowers and slashers.

Suitable guards are to be in place on all machinery to prevent material being sprayed onto the road surface and endanger vehicles, persons or property.

### 14.13 GRASS TRIMMING

#### 14.13.1 Service Levels

Trim grass using hand held equipment on medians, verges and islands within the road reserve that cannot be addressed by cutting grass by mowing or slashing.

Trim grass at joints on concrete, seal and paving and any other hard surfaces occurring within the road reserve before it reaches 50 mm in height and/or 10 mm in diameter.

Trim grass at top of kerbing before it overhangs the roadside edge.

#### 14.13.2 Grass Trimming Operations

Trim grass in conjunction with grass cutting service.

Use mechanical or manually operated hand held equipment that has no detrimental effect to the landscape or road asset.

Trim grass for the purposes of aesthetics, integrity of asset, functionality, public safety, including vegetation protruding from adjoining properties that interferes with footpath traffic.

Trim grass at back of kerbs, around drainage inlets and outlets, drainage lines and culverts, edges and surfaces of footpaths and cycle paths, access ramps, drive ways, any form of infrastructure, utility, furniture, signs, on in or

around road medians and splitter islands, traffic control devices, fence lines, barriers, trees, concrete or paving.

Trim grass on concrete, paved or bituminous surfaces to ground or surface level. Use of super-heated steam for longer term treatment is permitted here, as is herbicide in accordance with the Herbicide clause.

Fit vehicular trimmer and edge machines with arrow boards and crash attenuators (cushions) to AS 1742.3 Vehicle-mounted signs and devices sub-clause, Truck-mounted crash attenuators sub-sub-clause.

Do not trim grass with vehicular trimmer and edge machines on the carriageways between 6 am and 6 pm Monday to Friday excluding Public Holidays.

#### **14.14 WEEDING**

##### **14.14.1 Service Levels**

Remove unwanted plant and grass species in accordance with the Weeds Management Act.

Do not allow weeds to exceed the allowable grass height on medians, verges and islands within the road reserve.

Remove weeds from joints on concrete, seal and paving and any other hard surfaces occurring within the road reserve before it reaches 50 mm in height and/or 10 mm in diameter.

Remove or treat with herbicide all weeds prior to them seeding.

##### **14.14.2 Weeding Operations**

Weed any areas and at road pavement and kerb junctions, within garden beds and within or around any other structure or feature occurring within the road reserve which cannot be controlled by slashing, mowing or trimming.

Carry out weeding for the purposes of addressing issues related to aesthetics, integrity of asset, functionality or public safety.

Carry out weeding by mechanical, manual or chemical means. Refer to Treatment Of Pest And Weed Species section for clauses regarding the latter.

Do not re-use removed weed matter as mulch within the road reserve.

Dispose of all removed weed matter at a Community or Council Waste Disposal Site. Dispose of declared weeds and their seeds in a manner consistent with the requirements of the Weeds Management Act.

Do not allow weed control activities to impinge on the health of other desirable plant species, or result in damage to any part of the road reserve asset.

#### **14.15 PRUNING**

##### **14.15.1 Service Levels**

Prune trees, shrubs, and other plants so that no part of any plant extends over paved or sealed surfaces up to a height of 3 m over cycle and walk paths or 5.5 m over road pavements.

Prune so that vegetation does not obscure sun light to solar collectors.

Prune so that vegetation does not obscure road signs and sight lines for motorists or other road users.

##### **14.15.2 Pruning Operations – Hold Point**

Carry out tree pruning operations in accordance with AS 4373.

Include at least one qualified arborist in each tree pruning team.

Qualified Arborist: A person with a minimum qualification of Level 3 Horticulture, specialising in Arboriculture, from the National Horticulture Training Package or equivalent accredited course.

Do not carry out tree lopping or heavy pruning practices, except on the written recommendation of the qualified arborist.

Prune plants for the purposes of addressing issues related to plant health, aesthetics, integrity of asset, functionality or public safety.

Prune plants in response to a need arising from vandalism, vehicle accident, age of plant, unwanted growth, damage or death by fire, insect, fungal or other attack, and any form of weather occurrence excluding cyclones, which are referred to in the Cyclone Event Damage clause.

**Hold Point** – Do not prune branches exceeding a calliper size of 75 mm at trunk which overhang the road pavement without the approval of the Superintendent.

Mulch and re-use pruned matter as mulch on previously mulched garden beds within the road reserve. Do not apply freshly mulched material directly onto bare or grassed soils, but allow to age for a minimum of 6 weeks prior to application, stored at an approved location.

Dispose of all removed pruned matter not used as mulch at a Community or Council Waste Disposal Site. Do not leave on site overnight.

#### **14.16 REMOVAL OF VEGETATION**

##### **14.16.1 Service Levels**

Remove dead, fallen or dangerous plants, trees and stumps from within the road reserve within 24 hours of observation or notification.

Remove vegetation as necessary for safety reasons within 1 hour of observation or notice to do so.

#### 14.16.2 Horticulturist Identification of Dead Plants

Engage the Horticulturist to identify any plants that die within the road reserve, including all desirable flora regardless of species or size.

The Horticulturist is to identify dead or sickly vegetation and authorise the removal of any vegetation that is dead or is approaching the end of its expected life.

The Horticulturist may also authorise removal of any vegetation that for any reason is unstable or represents a safety hazard to pedestrians, cyclists, motorists or any other user of the road reserve.

Submit details of the Horticulturists findings and recommendations in the Monthly Report.

#### 14.16.3 Vegetation Removal Operations

Remove trees and shrubs of all species and size that have died or fallen, or may represent a hazard to any person within the road reserve as identified by the horticulturist for whatever reason except in the case of a cyclone.

Grind stumps and roots to a depth of not less than 150 mm below ground level or in the case of smaller species grub, pull and remove roots and stem base.

Do not elevate or reduce ground levels within the immediate area because of vegetation removal.

Refer to Cyclone Event Damage clauses for the removal of vegetation debris necessary as a result of a cyclone event.

### 14.17 REPLACEMENT OF PLANTS

#### 14.17.1 Service Levels

Replace plants which have died within irrigated areas of the road reserve within 7 days of observation.

Replace plants which have died within non-irrigated areas of the road reserve with native species during the month of December each year of the contract.

#### 14.17.2 Horticulturist - Replacement of Plants – Hold Point

The Horticulturist is to identify all dead plants and note the loss in the monthly Horticulturist Report, including all trees, shrubs and ornamental species of flora that occur within the road reserve.

The Horticulturist is to select replacement plants which are healthy and well formed.

**Hold Point** - If the same species of plant is not available the Horticulturist shall recommend a suitable replacement species with similar characteristics that is available, and submit to the Superintendent for approval.

#### 14.17.3 Plant Replacement Operations

Use a water retentive medium such as "Hortex Rain Saver" or similar product with equivalent or better water absorption and release

characteristics in the planting process. Apply according to the manufacturer's recommended rates.

Replace dead plants in irrigated areas with plants of a similar size up to a 45 litre bag size. Exceptions are Eucalyptus, Acacia, Melaleuca, Calytrix, Grevillea or other savanna species. Replace these with tube stock.

Stake all replacement plants within non irrigated areas.

Do not plant vegetation likely to exceed a mature height of 4 m below or within 4 m of power lines.

#### 14.17.4 Planting

Plant trees, shrubs and ground cover only when temperature is below 32 °C.

Maintain the integrity of the plant root zone and the surrounding earth mould.

Place fertiliser in the hole adjacent to, but not in contact with, the root zone of the plant. Use fertiliser in accordance with **Table 14.2 - Fertilisers**, with application rates in accordance with **Table 14.3 – Fertilisers Application Rates**.

#### Refer Clause 14.31 for Tables

### 14.18 LITTER COLLECTION

#### 14.18.1 Service Levels

Maintain the area so that there is no more than ten items of litter within any 100 m section of the full width of the road reserve at any time, and that no litter remains within the road reserve for a period exceeding 72 hours.

#### 14.18.2 Litter Collection Operations

Collect litter and remove from the road reserve to comply with the service level requirements, and prior to grass cutting operations.

Dispose of at a Community or Council Waste Disposal Site, or by acceptable re-cycling methods.

Do not store litter for later retrieval anywhere within the road reserve or adjoining properties.

Litter is defined as any loose unattached inanimate item or any other object that does not form part of the road reserve asset occurring within the road reserve, generally deposited illegally.

Litter includes but is not limited to any forms of:

- goods packaging,
- paper product,
- plastic product,
- rubberised product,
- glass product,
- metal / alloy product,
- stone or masonry product or item including spilt concrete.

Litter also includes but is not limited to:

- any material excluding liquids resultant from a vehicle accident,
- any vegetative item,
- any mechanical item or part that is not related to intact mechanical, electrical or service-related infrastructure occurring within the road reserve,
- any loose, unattached inanimate item that the Superintendent deems is not required, wanted or expected to occur within the road reserve.

Report to the Superintendent any occurrences of concrete, gravel, sand or soil on any trafficable surface. These are not litter under the terms and conditions of the contract and will be removed by other means at the Principal's cost.

Litter does not include illegal signage or abandoned vehicles or equipment

Litter resulting from a significant spill event that cannot reasonably be removed within thirty minutes of commencement of work will be paid at a fair and reasonable rate negotiated between the Contractor and Superintendent.

Any single item of litter with a weight greater than 50 kg will be paid at a fair and reasonable rate negotiated between the Contractor and Superintendent.

#### **14.19 REMOVAL OF DEAD ANIMALS**

Keep a record of details of all dead domestic animals that are disposed of under the contract, noting the following:

- Animal type,
- Breed of animal, if possible,
- Description of size and colour,
- Registration or identification numbers,
- Special identifying features, such as brands, ear tags, collars etc.,
- Submit details to the Superintendent as part of the Monthly Report,
- Collars are to be removed and retained for 30 days before disposal.

##### **14.19.1 Service Levels**

Remove any carcass from within the road reserve within two hours of observation or notice.

Remove any carcass from the road pavement and shoulders within one hour of observation or notice.

##### **14.19.2 Carcass Removal Operations**

Remove and dispose of dead animals from within the road reserve irrespective of reason or event resulting in the demise of the animal.

Dead animals include native and exotic species of vertebrate including but not limited to dogs, cats, kangaroos, wallabies, turtles, fish, birds, lizards, pigs and any other form of mammal, reptile,

macropod, marsupial, amphibian, or aquatic species.

Remove and dispose of multiple or singular carcasses occurring anywhere within the road reserve with a weight per carcass not greater than 50 kg. Removing a carcass with a weight greater than 50 kg will be paid at a fair and reasonable rate negotiated between the Contractor and Superintendent.

The time period for removal of carcasses will commence from time of observation by the Superintendent or the Contractor, whichever is earlier. The Superintendent is under no obligation to advise the Contractor of this observation.

Quantities of carcasses resulting from a significant spillage or killing event that cannot reasonably be removed within 1 hour of commencement of work will be paid at a fair and reasonable rate negotiated between the Contractor and Superintendent. This payment will be for time expended in excess of 1 hour.

#### **14.20 CONTROL OF PEST AND WEED SPECIES**

##### **14.20.1 Service Levels**

Treat any pest species, including weed, fungal, insect and animal occurring within the road reserve within 7 days of observation or notice.

##### **14.20.2 Operations for Control of Weeds**

Control declared weeds in accordance with the requirements of the NT Weeds Management Act. Control other weeds in accordance with this specification. Control methods include mowing, trimming, hand weeding, or by spraying herbicide or other suitable chemicals, or by other manual means.

Treat all declared weeds listed in the NT Weeds Management Act and all other weeds perceived to represent a hazard or impediment to the public, plant growth, the road reserve asset, or which effect the aesthetics of the area.

The chosen methods must not impinge on the health of all desirable species of plants.

Control weeds in the following areas as a minimum:

- along road reserve boundaries,
- along fence lines,
- around the base of trees,
- along pipelines,
- in mulch beds,
- at joints contained within concrete slabs,
- at junctions of road pavement and concrete kerb.

##### **14.20.3 Operations for Treatment of Fungal or other Organic Pests**

Control or eradicate any form of fungal or other organic pest that may be, or is, affecting the

health or integrity of any plant or any other aspect of the road reserve asset, by spraying pest specific fungicides, or by manual means.

#### 14.20.4 Operations for the Treatment of Insect and Animal Pests

Control or eradicate insects including termites, ants, aphids, mealybug or arachnids (invertebrate) and any other form of animal pests (vertebrates) that could be, or are, affecting the health or integrity of any plant or any other aspect of the road reserve asset, by spraying pest specific pesticides, or by manual means.

Relocate protected vertebrate species.

#### 14.20.5 Insecticide

Use insecticide strictly as specified in product SDS.

Use only Fipronil as an insecticide for termite control.

#### 14.20.6 Log Books

Comply with the requirements of the Agricultural and Veterinary Chemicals (Control of Use) Act. Further to any other reporting and log book requirements under the contract, maintain daily log books for spray treatment works undertaken. The following information must be collected and recorded:

- Detailed location of work (place name and GPS coordinates),
- Date and time of spray application,
- Product used (generic label name, active ingredient name and % or proportion of active ingredient),
- Expiry date of product and withholding period (if applicable),
- Chemical mixture (e.g. % or litres per 100 litres of water),
- Rate of application (e.g. litres per ha, or kg per km sprayed),
- Type of spray equipment used (e.g. hand spray, vehicle mounted spray),
- Type of transport equipment used (Mounted spray Ute, Truck, quad, by hand),
- Names of target pest species,
- Weather conditions (e.g. rainfall, temp, wind speed and direction),
- Name of applicator,
- Any unusual happenings on the site,
- Results of application: Include date this information is added.
- Add additional items.

Submit daily log book sheets with monthly invoice for payment. Retain copies as per statutory requirements.

Include a digital copy in MS Excel spread sheet format.

#### 14.20.7 Herbicide - Hold Point

**Hold Point** - Submit a Weeds Management Plan for assessment and approval.

Herbicide treatment of weeds in the urban environment must be controlled and proposed in the Weeds Management Plan for approval by the Superintendent.

Apply herbicide in accordance with manufacturer's specification.

Do not use dyes in the application of herbicides.

For chemical weed control in urban areas use only Glyphosate. Use according to manufacturer's directions for use.

Do not use Glyphosate in the following areas:

- At drainage lines,
- On top of kerbs not associated with concrete slabs or paving,
- Around signage, utilities, roadside furniture, culverts, irrigation systems or any other road related infrastructure,
- Beyond 500mm from the vertical trunk at the base of any tree.

#### 14.20.8 Chemicals

For weed control in areas outside of urban areas submit to the Superintendent the list of chemicals intended for use during the contract. Include information in the Weeds Management Plan.

Use chemicals that are approved by the Australian Pesticides and Veterinary Medicines Authority (APVMA). Find all information pertaining to the use requirements of chemicals on the Authority's web site. Only use the chemicals on plant species listed in the product information.

Use herbicides, fungicides, pesticides that are biodegradable and do not contain lead arsenates or other substance or salts dangerous to humans or animals.

Handle, transport, spray, store and dispose of chemicals and their containers in accordance with the product SDS.

Ensure that personal protective equipment (PPE) including protective clothing is worn by all personnel handling or applying chemicals. Use PPE in accordance with the product SDS.

#### 14.20.9 Spraying

Do not spray on days where wind velocity exceeds 15km/hr or if it poses a risk of spray drift.

Prevent misting in breeze conditions by spraying at a lower pressure or adjusting spray nozzles to increase droplet size.

Do not spray near schools during school hours, or during outdoor activities at the school at any time. Spray only when wind is blowing away from the school.

Refer to Spraying in SLASHING AND WEED CONTROL.

## **14.21 FERTILISING**

### **14.21.1 Service Levels**

Apply fertiliser to promote the development and ongoing health of all vegetation within the road reserve in accordance with the Fertiliser Proposal Document submitted with the tender and approved by the Superintendent.

### **14.21.2 Fertilising Operations**

Apply fertiliser as specified in the approved Fertiliser Proposal Document including:

- proposed method to confirm proof of each treatment,
- description of proposed fertilisers, product name, N:P:K Ratio, and application rate if such rate is not to be applied at manufacturers specifications,
- description of fertiliser locations such as grassed areas, trees, under mulch, under ground covers etc.,
- what is to be fertilised,
- time of fertilising as shown in the Program Of Works, indicating week and month.

## **14.22 DRAINAGE LINES**

### **14.22.1 Service Levels**

Maintain all drainage lines including inlets and outlets to Side Entry Pits (SEPs) and Letterbox Pits in a debris free state.

Re-fit dislodged lids to stormwater pits within 48 hours of observation.

Make safe stormwater pits with missing or broken lids immediately upon observation or within one hour of notification. Notify the Superintendent of any observation.

### **14.22.2 Re-fitting Dislodged Stormwater Pits**

Re-fit dislodged SEP and Letterbox Pit lids. Advise the Superintendent of any damaged lids which cannot simply be re-fitted.

### **14.22.3 Drainage Line Maintenance Operations**

De-silting drainage lines, and the internal cleaning and clearing of SEPs, drainage culverts and Letterbox Pits is not included in the contract.

Remove all litter and/or debris from open drainage lines including inlets and outlets to SEPs and Letterbox Pits to ensure free drainage.

Do not force litter or debris into inlets of SEPs or Letterbox Pits but collect and remove from site.

## **14.23 REPLENISHMENT OF MULCH**

### **14.23.1 Service Levels**

Maintain 75 mm thick consolidated layer of mulch within all mulched areas including garden beds, other plantings or medians within the road reserve.

### **14.23.2 Mulch Replenishment Operations**

The Horticulturist will advise the Contractor on the status of organic mulch.

Replace or replenish mulch with material of similar characteristics to the existing mulch.

Replenish mulch sufficient for the purposes of aesthetics, retaining moisture, insulating the soil and ongoing soil improvement resultant from the decaying matter.

Supply mulch that is free from weeds, seeds, sticks, stones, insects, diseases and other deleterious matter.

Provide organic mulch for a 500 mm radius from the main stem, but ensure a gap of 50 mm is retained between the main stem and the mulch.

## **14.24 DISPOSAL OF CUT MATERIALS**

### **14.24.1 Service Levels**

Remove and dispose of all non-mulched cut or waste materials daily at a Community or Council Waste Disposal Site, do not leave on site overnight.

### **14.24.2 Disposal Operations**

Dispose of any materials in accordance with relevant environmental protection legislation.

Apply mulched material from cuttings suitable for use only on previously mulched areas, not on bare or previously non-mulched areas. Do not use weeds as mulch.

## **14.25 IRRIGATION OPERATION AND MAINTENANCE**

This section outlines the requirements for the repair, operation and maintenance of existing irrigation systems.

### **14.25.1 Service Levels**

Maximise efficiency of landscape irrigation systems.

Manage and maintain irrigation systems to maintain a functional and healthy landscape with the minimum required amount of water for the designated purpose.

Do not allow irrigation water, other than that carried by wind, to flow onto the road pavement.

Repair broken or vandalised sprinkler or spray heads within 12 hours of observation or notification by the Superintendent.

### **14.25.2 Monthly Irrigation Report**

Provide an Irrigation Report attached to the monthly claim for payment. Report all observations or occurrences of note related to irrigation issues over the period being claimed.

### **14.25.3 Telemetric Control (Darwin Region)**

The superintendent will arrange for supply and installation of the telemetry irrigation control base station at the Contractors premises.



This supply will not include basic office requirements such as power sockets, office furniture etc.

Irrigation systems will be periodically upgraded to Telemetric Control. Do not maintain newly upgraded systems until the completion of the defects liability period for that upgrade contract, with the date as advised by the Superintendent.

#### **14.25.4 Irrigation Systems Maintenance Operations**

Maintain and adjust in sound and serviceable condition all controllers, control cables, housings, meters, meter protection, valves, back flow prevention, drippers, sprays or conduits used in the delivery of water to all plant species including grass.

Engage and disengage manually controlled irrigation systems.

Maintain all irrigation supply and main lines in a water tight condition.

Maintain all adjustable sprinkler heads within their adjustment requirements at all times.

Repair or adjust daily as required to prevent over watering of vegetation and grass, and to prevent wastage through overflow of irrigation water onto the road surface.

#### **14.25.5 System Shutdown – Witness Point**

##### **NORTHERN REGIONS**

Shut down irrigation systems at the start of the wet season each year for the duration of the wetter months. Re-activate the irrigation systems towards the end of the wet season.

Time the start of shut down and re-activation operations according to the weather conditions apparent at the time.

**Witness Point** - Advise the Superintendent of the full shut down and re-activation of irrigation systems.

#### **14.25.6 Irrigation Day and Night Cycle Late in Dry Season – Witness Point**

##### **NORTHERN REGIONS**

Ensure areas receive sufficient quantities of water during the hotter part of the dry season, i.e. September to early October. This may be achieved by running selected systems twice a day.

**Witness Point** - Advise the Superintendent of altered irrigation cycle times.

#### **14.25.7 Reset Irrigation Timers During School Holidays – Witness Point**

Reset pop up irrigation systems for day light watering the week preceding school holidays on road reserves that pass through high density residential areas.

Reset back to night watering within seven days of the new school term commencing.

**Witness Point** - Advise the Superintendent of such action taken.

### **14.26 ENVIRONMENTAL PROTECTION**

#### **14.26.1 Duty of Care**

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT. Comply with the following additional requirements included under the contract and allow for any associated costs.

#### **14.26.2 Litter**

Prevent any form of littering by all Contractor's personnel, including sub-contract personnel, during the course of the work.

Remove all debris, surplus material, waste material or any form of spoil related to works from the site.

Prevent materials from falling or being blown from vehicles.

Leave the work site clean and tidy at the completion of each day's work. Do not allow refuse of any type to remain on site overnight.

#### **14.26.3 Noise**

Comply with the relevant sections of the Local Government Act, Waste Management and Pollution Control Act and the Work Health and Safety (NUL) Act and Regulations with regard to noise pollution.

Ensure all plant and equipment complies with statutory regulations, and is designed, installed, operated and maintained to minimise noise disturbance to residents and the general public.

#### **14.26.4 Protection of Waterways**

Comply with all regulatory guidelines and legislation including the Water Act.

Ensure no materials enter any waterways, including stormwater and sewerage systems.

#### **14.26.5 Protection of Flora and Fauna**

Ensure best practice protection to any flora and fauna that may be affected by the works, particularly those which:

- have particular botanical, historical or cultural significance,
- have outstanding aesthetic or ecological significance,
- provide habitat for rare or endangered species,
- have cultural and archaeological heritage.

Refer to Acts, Regulations And Codes Applicable To The Works And Authorities With Jurisdiction Over The Works in REFERENCED DOCUMENTS.

**14.27 DAMAGE TO PROPERTY**

Ensure that the works proceed with all due care in order to avoid damage to property, utility installations, vehicles, or the environment.

Without limiting the Contractor's obligations under the General Conditions of Contract, promptly repair or have repaired any damage to property, utility installations or environment resulting from the implementation of the works associated with the contract.

Immediately notify the Superintendent of any such damage advising proposal for repairs at no cost to the Principal.

Ascertain the owner's wishes as to the timing of the repairs. Engage appropriately qualified tradespersons to carry out repairs to the satisfaction of the property owner and the Superintendent.

After providing seven days notice to the Contractor, the Superintendent reserves the right to settle any claims arising from the damage.

Settlement of damages by the Superintendent will not relieve the Contractor of any responsibility under this clause. The Superintendent will deduct any costs incurred in settling these claims from the Contractor's monthly progress invoice.

**14.28 STORM DAMAGE**

In the event of a tropical or severe storm, immediately mobilise and supply sufficient staff and resources to locate and make safe storm damage which has occurred within the site of works. The Superintendent will assist in identifying immediate safety concerns where and whenever possible.

Make trafficable surfaces i.e. roads, cycle and footpaths, safe as quickly as possible.

Clean up storm damage as part of the contract to the specified service levels within 24 hours of the observation of damage, and where this is not possible, within a time line acceptable to the Superintendent.

Give priority to roadways, cycle and footpaths to make safely trafficable as soon as possible.

Access real time storm and weather information on the Internet at the Weather Bureau website at <http://mirror.bom.gov.au/weather/radar/>

**14.29 CYCLONE EVENT DAMAGE**

A cyclone event does not include severe storms.

A cyclone event will be recognised as commencing when a cyclone has been declared and named and is effecting any location within the contract area. The cyclone will be recognised as remaining current until such time as all warnings associated with the event have been cancelled for the area of the contract.

Immediately following the passing of a cyclone;

- Attend the site of works and identify all works required to clean up and reinstate, that which is attributable to cyclone damage,
- quote a fair and reasonable price for such works in negotiation with the Superintendent,
- quote a time line for implementation and completion of the works,
- Removal of tree or vegetative debris as additional works as a result of a cyclone event will relate to green plant growth only, since removal of dead wood is a requirement of maintaining to specified service levels under the contract prior to the tropical cyclone,
- Increase resources as necessary to ensure a rapid rectification and clean-up of site.

The Superintendent reserves the right to employ the services of additional Contractors when the need to expedite these works becomes necessary due to public health or safety concerns.

In the interests of safety, it is not a requirement under the contract to supply staff or resources beyond stage three of a cyclone. The requirement resumes when cyclone danger has passed and the cyclone alert for the area of the contract has been cancelled.

**14.30 OTHER REQUIREMENTS**

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

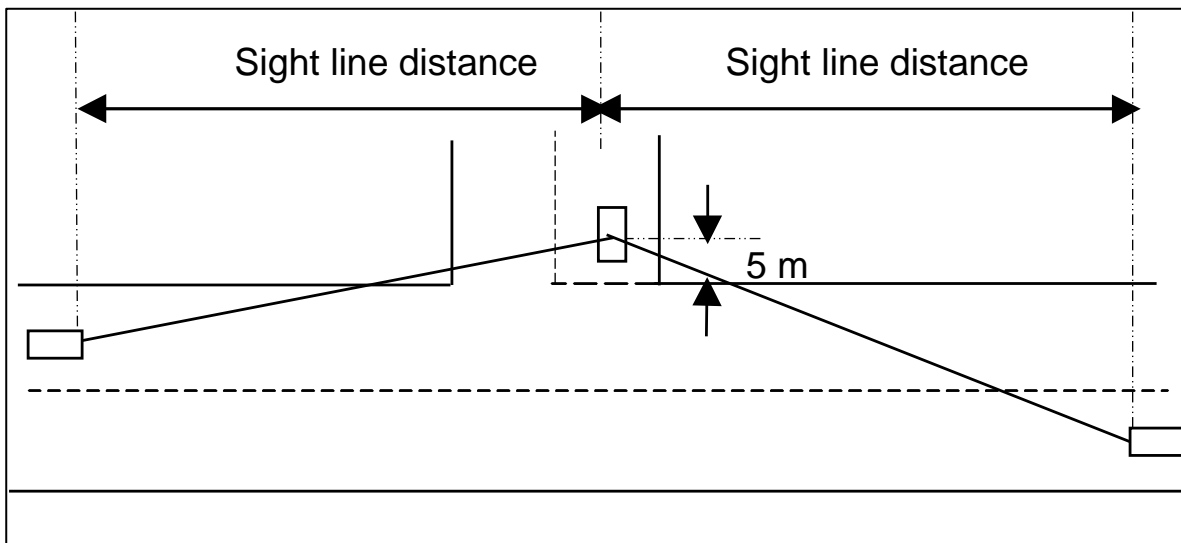
14.31 TABLES

<b>Table 14.2 - Fertilisers</b>			
<b>Use</b>	<b>General Plant Category</b>	<b>Where Used</b>	<b>Component Requirements</b>
Planting	Native	Surface	"TROPIGRO Native Plant Feed Mix"
	Exotic	Surface	"TROPIGRO Exotic Planting and Feeding Mix" or similar
	Native) Exotic)	Hole	Granular or Tablet Slow Release (6 month minimum) 20:10:10 NPK ratio
Feeding	All existing plants	Surface	As for Planting - Surface
Grassing	All seeding, both new and existing	Surface	Fast Release 15:7:7 NPK ratio Trace Elements
Do not apply fertiliser to Grevillia and Banksia plant varieties.			

<b>Table 14.3 – Fertilisers Application Rates</b>			
<b>Fertiliser Type</b>	<b>Application Rate</b>		
Native - Planting - Surface	Tube stock		10 g
	150 mm container		30 g
	200 mm container		80 g
	250 mm container		100 g
	300 mm container		150 g
	20 litre bag		300 g
Exotic - Planting - Surface	Plant height:	0.5 m	100 g
		1.0 m	200 g
		2.0 m	300 g
Native - Planting - Hole (Exotic)	Ground covers and shrubs 10 cm tall		10 g
	Ground covers and shrubs 20 cm tall		20 g
	Plants to 1 m		40 g
	Plants to 2 m		80 g
	Plants to 3 - 4 m		120 g
	Advanced trees and palms 2 m -		200 g
	Advanced trees and palms 3 m -		300 g
	Advanced trees and palms 4 m -		400 g
Native - Feeding	These rates apply to both granular compound and equivalent tables.		
	Ground covers:		
	up to 300 mm wide		30 g
	300 - 600 mm wide		50 g
	600 - 900 mm wide		75 g
	900 - 1000 mm wide		100 g
	Thereafter 100 g per metre		

**Table 14.3 – Fertilisers Application Rates**

Fertiliser Type	Application Rate		
Native - Feeding	Shrubs:		
	up to 300 mm high/wide		50 g
	300 - 600 mm high/wide		75 g
	600 - 900 mm high/wide		100 g
	900 - 1000 mm high/wide		150 g
	Thereafter use 200 g/m of height or width		
Native - Feeding	Trees:		
	200 g/m of height		
Exotic - Feeding	250 g/m of plant height		



**Figure 14.2 Intersection Sight Lines**

**Table 14.4 - Sight Line Distances**

Posted Speed Limit (km/h)	Sight Line Distance (m)
40	73
50	97
60	123
70	151
80	181
90	226
100	262
110	300
120	341
130	383

Sight line distances are based on Safe Intersection Sight Distance parameters defined by AGRD04A-10 Austroads Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections, 2010.

## 15. SLASHING AND WEED CONTROL

### 15.1 OUTLINE DESCRIPTION

This section specifies the maintenance requirement for control of vegetation and litter on road verges, batters and medians, by use of mechanical or manual means and/or chemicals, and for the control of noxious weeds in the road reserve by use of herbicides.

### 15.2 STANDARDS

Comply with the following Acts and Regulations:

- Work Health and Safety (NUL) Act and Regulations
- Weeds Management Act
- Dangerous Goods Act and Regulations
- Poisons and Dangerous Drugs Act and Regulations
- Agricultural and Veterinary Chemicals (Control of Use) Act

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

Refer to Protection Of Culturally And Historically Significant Items in MISCELLANEOUS PROVISIONS.

Refer to Plant And Equipment clause in MISCELLANEOUS PROVISIONS.

Refer to Work Involving Chemicals in MISCELLANEOUS PROVISIONS.

Refer to LANDSCAPE MAINTENANCE.

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

### 15.3 DEFINITIONS

#### APVMA

Australian Pesticides and Veterinary Medicines Authority.

#### Vegetation

Refers to any grasses, shrubs or trees to be controlled.

#### Weeds

Refers to undesirable vegetation in the area to be controlled, including declared and non-declared species.

#### Herbicide

A chemical formulation for control and eradication of vegetation and weeds.

## 15.4 WEED SPREAD PREVENTION

Comply with the requirements of the *Weeds Management Act*. Do not spread declared weeds by slashing. For prevention of weed spread by machinery see the Standard Specification for Environmental Management. While slashing does not kill weeds, if done at the right time it can be an effective measure to reduce seed production especially in infested areas. Slashing must be planned in conjunction with chemical control.

To reduce flowering of grassy weeds, slash at end of rain season as stems are starting to elongate prior to seed maturity.

Slash from clean area to infested area

Clean down slasher after working in infested area with leaf blower, compressed air or high pressure water

It is best practice to control isolated individual plants or clumps in otherwise clean areas with herbicide

Most herbicides are absorbed more effectively through green leaves. Previously slashed weeds may need time to grow green leaves before spraying.

Machinery hygiene practices are detailed in the Department of Land Resource Management Weed Spread Prevention Strategy <http://www.lrm.nt.gov.au/weeds/manage/prevention>.

### 15.5 REFERENCE STANDARD DRAWINGS

Refer to Standard Drawings listed in **Table 15.1 - Civil Standard C(S) for reference for terminology** for typical cross section profiles and terminology used throughout this section.

<b>Table 15.1 - Civil Standard C(S) for reference for terminology</b>	
CS-2100	CS-2105
CS-2101	CS-2106
CS-2102	CS-2107
CS-2103	CS-2108
CS-2104	CS-2109

**Table 15.2 - Road classification and indicative road reserve widths**

Road Class	Reserve Width
National Highway	200m
Arterial - Urban	80m
Arterial - Rural	150m
Sub-arterial/Distributor - Urban Industrial	22m
Sub-arterial/Distributor - Urban Residential	(See Note)
Sub-arterial/Distributor - Rural Industrial	100m
Rural Secondary Road	100m
Pastoral 3	100m
Collector - Urban Industrial	20m
Collector - Urban Residential	(See Note)
Collector - Rural Industrial	40m
Collector - Rural	40m
Local - Urban Industrial	20m
Local - Urban Residential	(See Note)
Local - Rural Industrial	30m
Local - Rural	30m
Pastoral 1 and 2	100m
Do not take dimensions as being correct for all road types and classifications. <b>Note:</b> Road reserve for this and any other roads not in this list refer to the relevant local authority. <b>Excerpt from;</b> Department of Transport Policy, Performance And Design Standards For Northern Territory Government Roads, April 2015 Version 1.0.	

## 15.6 SLASHING

### 15.6.1 Slashing Operations

Slash all grass and vegetation including shrubs and trees with a butt size up to 100 mm diameter.

Trim vegetation to a height of 100 mm or less above the ground.

Collect litter prior to slashing.

Slash steep batters or areas inaccessible to conventional slashers with hydraulically operated boom mounted slashing equipment.

Trim growth that cannot be slashed with tractor mounted slashers with hand held equipment. Include around road furniture, culvert headwalls, bridges, grids, floodways, drains and drainage structures.

Trim overhead vegetation to minimum clearance height of 5.5 m above the carriageway.

At bridges trim vegetation to a minimum of 2 m behind bridge rails.

Re-slash any area which is not slashed to the specified height above the ground.

Remove stones, grass or other debris from the sealed pavement following slashing operations.

### 15.6.2 Plant

Provide sufficient plant to achieve the minimum specified rate of progress, using the following plant configurations to complete all slashing operations simultaneously:

- Tractors and Slashers,
- Tractor and Batter / Reach Mower,
- Hand held equipment including chainsaws and brushcutters.

Suitable guards are to be in place on all machinery to prevent material being “sprayed” onto the road surface and endanger vehicles, persons or property.

### 15.6.3 Opening Slash

Slash both sides of roadway from edge of seal for 3.6 m or as specified Project Specific Requirements, i.e. nominal two cut width.

Slash other areas as directed.

Provide sufficient plant, labour and resources in order for two separate crews to each complete 15 km per day, both sides of the road.

### 15.6.4 Full Slash

DARWIN, EAST ARNHAM AND KATHERINE REGIONS

Normally undertake between November and March depending on the severity of the wet season.

Slash both sides of roadway from the edge of pavement, sealed or unsealed, to the cleared tree line including cuttings, tops of batters at cuttings, fill batters, inlets and outlets of culverts, protection works, and around road furniture.

At intersections slash triangular areas joining points of sight distance lines given in **Figure 14.2 Intersection Sight Lines** and **Table 14.4 - Sight Line Distances**.

Slash other areas as directed.

Provide sufficient plant, labour and resources in order for two separate crews to each complete 20 km per day, both sides of the road.

ALICE SPRINGS AND TENNANT CREEK REGIONS:

Slash both sides of roadway from the edge of pavement to the outer edge of formation including cuttings, fill batters, inlets and outlets of culverts, protection works, and around road furniture.

Slash other areas as directed.

Provide sufficient plant, labour and resources in order for two separate crews to each complete 15 km per day, both sides of the road.

#### **15.6.5 Slash Table Drain Offlets**

##### **Specification Reference**

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

Slash each side of invert of trapezoidal shaped table drain offlet for 1.8 m width, i.e. total width of cut 3.6 m, nominally two cuts.

Slash each side and invert base of trapezoidal shaped table drain, i.e. total width of cut 5.4 m, nominally three cuts.

Table drain offlets are generally at intervals not exceeding 150 m and have a minimum length of 50 m.

#### **15.6.6 Slash Firebreaks**

Slash firebreaks within the road reserve for 3.6 m width, i.e. nominal two cut width, or 7.2 m, i.e. nominal four cut width or as specified or directed otherwise.

#### **15.6.7 Slash and Rake Firebreaks**

Slash firebreaks within the road reserve.

Rake slashed material and windrow to one side.

#### **15.6.8 Litter Collection and Disposal**

Include litter collection and disposal as a part of slashing operations. Undertake collection of litter on area to be slashed prior to slashing.

Litter collection and disposal may also be ordered separately, and shall include full road reserve width.

Collect litter including but not limited to:

- Tyres & tubes,
- Drink or food packages,
- Rocks larger than 100mm,
- Fallen trees, branches or timber,
- Ant beds,
- Any other materials or rubbish which is 100 mm or more higher than natural surface.

Litter collection does not include abandoned vehicles or car bodies, or dead animals. Advise the Superintendent of the location of such items and they shall be collected and disposed of separately.

Dispose of all litter legally, at Community or Council Waste Disposal Site.

#### **15.6.9 Replacement of Damaged Roadside Furniture and Structures**

Repair or replace guide posts, signs, culverts or any roadside furniture or structure damaged by slashing operations at no cost to the Principal.

The Principal reserves the right to affect repairs by any means and recover the costs from the contractor.

## **15.7 BUSHFIRE PREVENTION**

### **15.7.1 Requirement**

Advise Bushfires NT for the region and adjacent property owners of slashing program prior to commencement of slashing in the area.

Adhere to bushfire prevention requirements during slashing operations when there is a fire warning rating of moderate or higher.

### **15.7.2 Plant**

Provide plant and equipment for fire-fighting. The following are minimum requirements:

- 1 x 500 litre water tank with an attached pump,
- 2 x 9 litre air expelled water fire extinguishers, or 1 x 20 litre knapsack spray, as appropriate to the slashing equipment being used.
- Carry the equipment in a 4 wheel drive back up utility travelling behind the tractor slasher operations at all times. Maintain two-way radio communication between the utility and the tractor slasher.

### **15.7.3 Conditions Preventing Slashing**

Avoid roadside slashing when it is dry and windy, or when the bushfire warning is extremely high.

Cease slashing operations if weather conditions indicate an extreme fire danger. If such a day is predicted, then start early and cease operations when the conditions reach a point that would indicate that if a fire started then it would be difficult to contain.

### **15.7.4 Response Procedures to Fire Starting**

Cease slashing operations immediately a slasher starts a fire, and assist with combating the fire. To achieve this, the crew must be working in close proximity to each other at all times and be in radio contact.

Contain any fire which occurs due to slashing operations immediately to avoid the fire spreading. If the crews are unable to contain and extinguish the fire, immediately notify the adjacent station/property owners/managers and Bushfires NT, Department of Land Resource Management.

Remain and provide assistance to the property owners/managers until the fire is contained, or until the owners/managers or Bushfires NT Officers no longer require your assistance.

Do not recommence slashing until the fire is contained and all crew are back on site with all equipment fully operational again, i.e. water tanks refilled, pump motors refuelled, etc. Do not undertake roadside slashing without the support backup.

**15.7.5 Contractor Responsibility**

Accept responsibility for any damages, loss of pasture or stock that is a result of a fire started by slashing operations.

Exercise care in areas where the possibility of ignition is high. An example is rocky outcrops where it may be necessary to raise the blades marginally higher to avoid sparks.

**15.7.6 Fire Fighter Training – Hold Point**

At least one member of each slashing crew is to hold a current qualification of Fire Fighter 1 NT. Training in this course is available from Bushfires NT, DLRM, phone 8922 0844.

**Hold Point** – Provide evidence of qualifications before commencing slashing operations.

**15.8 VEGETATION CONTROL****15.8.1 Vegetation Control Operations**

Control or eradicate vegetation around road structures and furniture to ensure they are visible to motorists and to prevent damage by fire, by spraying herbicides and/or other suitable chemicals.

**15.8.2 Log Books**

Maintain daily log books for works undertaken under the contract. Include the following information:

- Description, i.e. category of work for measurement and payment,
- Start/finish spray locations by PRP chainage and as GPS position,
- Time of spray application,
- Product used,
- Chemical mixture (e.g. kg or litres per 100 litres of water),
- Rate of application (e.g. kg per hectare, or Kg per kilometres sprayed),
- Type of spray equipment used (e.g. hand spray, vehicle mounted spray).
- Type of transport equipment used (Mounted spray Ute, Truck, quad, by hand),
- Target weeds,
- Weather conditions (e.g. rainfall, temperature, wind velocity and direction),
- Name of applicator,
- Any unusual happenings on the site,
- Results of application: Include date this information is added.

Submit daily log book sheets with invoice for payment.

Include a digital copy in MS Excel spread sheet format.

**15.8.3 Chemicals – Witness Point**

**Witness Point** - Submit to the Superintendent the list of herbicides and other chemicals intended for use during the contract, details of vegetation controlled by the herbicide, and duration of control per treatment.

Use chemicals that are approved by the APVMA. Obtain copies of SDS pertaining to the use requirements of chemicals listed on the manufacturers' labels. The APVMA web site <http://services.apvma.gov.au> has information about SDS.

Use herbicides that are biodegradable and do not contain lead arsenates or other substance or salts dangerous to humans or animals.

Use spreading agents if and as recommended on the labels.

Obtain a permit from Parks Australia North for the use of any chemicals within Kakadu and Uluru – Kata Tjuta National Parks and up to 30 km from their boundaries, and from Parks and Wildlife Commission of the Northern Territory for the use of any chemicals within NT National Parks and Reserves and up to 30 km from their boundaries.

**Witness Point** - Provide copies of the permits.

**15.8.4 Personnel Handling of Chemicals**

Be registered for business as weed control operators, or engage subcontractors registered for business as weed control operators.

Personnel carrying out spraying operations must have undertaken and passed a National Farm Chemical User Training Program.

Do not allow spray drift. Operators must be competent in their understanding of how to prevent spray drift.

Keep a copy of the Safety Data Sheet on site for each type of chemical used

Handle all chemicals as specified in product SDS.

Wear as a minimum the protective clothing as specified in product SDS.

**15.8.5 Spraying**

Handle, transport, spray, store and dispose of chemicals and their containers in accordance with the manufacturer's specifications and/or directions as written on the labels which appear on the APVMA web site, to avoid environmental and health risks.

Do not spray on days of wind velocity greater than 15 km/h mean value and gusts do not exceed 19 km/h because of risk of spray drift causing a hazard on adjoining properties.

Do not cause spray drift. Prevent misting in breeze conditions by spraying at a lower pressure or adjusting spray nozzles to increase droplet particles, or other suitable means.

Do not spray near schools during school hours or during outdoor activities at the school at any time. Spray only when wind is blowing away from the school.

Do not spray during rain or when vegetation is saturated.



### 15.8.6 Spray Equipment

Use equipment calibrated to measure volume sprayed.

### 15.8.7 Around Guide Posts

Spray a minimum triangular area around guide posts having as its base the sealed edge of the road. The length of the base to be a minimum 8 m centred on the guide post. The apex of the triangle to be 1 m beside the guide post on an imaginary line perpendicular to the road centreline and through the guide post.

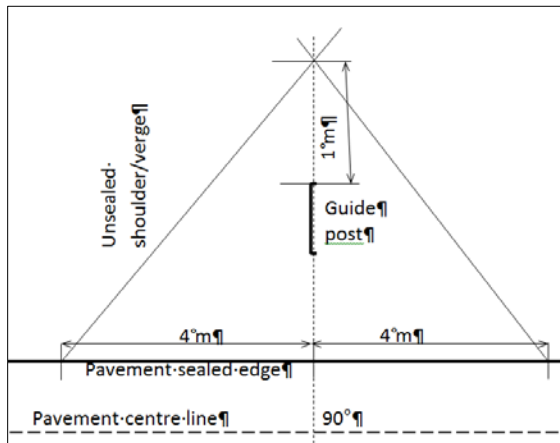


Figure 15.1 Guide Posts Spray Area

### 15.8.8 Around Sign Posts

Spray a minimum triangular area around sign posts having as its base the sealed edge of the road. The length of the base to be a minimum 5 m long and positioned to extend 4 m into the direction of the oncoming traffic and 1 m past the line of the sign post. The apex of the triangle to be 1 m beside the sign post on an imaginary line perpendicular to the road centreline and through the sign post.

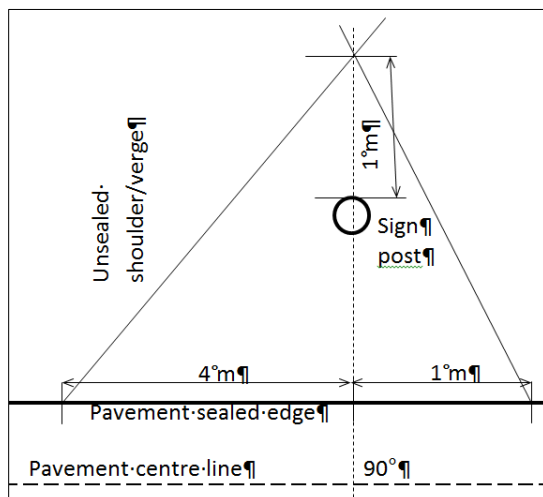


Figure 15.2 Sign Posts Spray Area

### 15.8.9 At Bridges and Guard Rails

Spray area within 1 m of any part of the structure.

Spray area between the edge of the seal and a line 1 m behind any guard rail and extending 10 m beyond the guard rail at both ends.

### 15.8.10 At Flood-ways and Culverts

Spray incorporated rock protection works.

Slash area within 1 m of the structure and protection works.

### 15.8.11 Rest Areas and Truck-bays

Spray areas within 1 m of any part of furniture or structure.

Slash all other areas within the perimeter.

### 15.8.12 Aerodromes

In accordance with the relevant requirements referred to in AERODROME MAINTENANCE, spray areas as follows:

#### Fencelines

1 m either side of fence around aerodrome.

#### Signal Area

Total signal area including 1 m outside of signal area perimeter.

#### Gable Boundary Markers

An area 8 m by 3 m centred on, and oriented the same way, as the marker.

#### Cones, Runway Flares or Lights

An area of 2 m around the structure.

#### Buildings or Other Structures

An area 1 m wide around the edge.

## 15.9 WEED CONTROL

### 15.9.1 Operation

Treat all weeds listed as Declared Weeds under the NT Weeds Management Act, and other nominated weeds and vegetation in the road reserve, by spraying herbicides and/or other suitable chemicals.

Refer to vegetation control clauses for specification requirements for Log Books, Chemicals, Personnel Handling Chemicals and Spraying.

There is a legal obligation to control all declared weeds under the Weeds Management Act (see <http://www.lrm.nt.gov.au/weeds/find> for list). For Class A declared weeds it is necessary to eradicate them; for Class B it is necessary to prevent them from growing and spreading.

### 15.9.2 Treatment Program – Hold Point

Prepare a Weed Management Plan within 4 weeks of commencement of the contract (outlined in the Standard Specification for Environmental Management).

The Weed Management Plan must be signed off by both the Superintendent and Contractor and must refer directly to the Response Schedule and the Request for Tender and this specification.

**Hold Point** - Submit a Weeds Management Plan for assessment and approval.

A Weed Management Plan is to set practical objectives for each road identified in the Response Schedule and/or the RFT and be based on detailed maps of declared weeds present, the scope of their infestations and the likelihood of seeds being spread (e.g. proximity to turn off areas). For example, in a road section with isolated individuals the objective might be that all plants are chemically controlled, whereas in a core infestation slashing alone may be adequate to prevent weed spread and satisfy obligations under the *Weeds Management Act*.

Objectives need to be measurable so that effectiveness of control measures and spread prevention can be assessed. Objectives should be discussed with the Superintendent in conjunction with DLRM.

Address seasonal restrictions to weed reproductive cycles to prevent weed seeding.

#### DARWIN, EAST ARNHEM AND KATHERINE REGIONS

Time the operations to follow the first storms of the wet season and/or before seeds are produced by the target plants.

Timing of seed production is variable depending on rainfall, however some wood species (eg. Neem) flower and produce seed in the dry season.

#### ALICE SPRINGS AND TENNANT CREEK REGION

Rain can fall in both winter and summer in arid Australia. Operations should be timed about 3 weeks after a 25 mm rainfall event for broad leaf or grassy weeds. Woody weeds can be controlled all year round but the herbicide works better after rain.

#### 15.9.3 Herbicide Selection - Hold Point

**Hold Point** - Provide a list of herbicides and chemicals intended for use during the contract to the Superintendent as part of the Weed Management Plan.

Control declared weeds in the road reserve by spraying herbicides and additives as prescribed such as diesel or wetting agents (surfactants). Different herbicides have different modes of action, which needs to be considered in selecting suitable herbicides and their application (e.g. foliar vs. basal bark). Some disrupt the weed's metabolic processes killing the plants, whereas others are residual in the soil and interfere with germinating seeds. See the Department of Land Resource Management Weed Management Handbook ([http://www.lrm.nt.gov.au/\\_data/assets/pdf\\_file/0020/125606/Weed-Management-Handbook-2013\\_web.pdf](http://www.lrm.nt.gov.au/_data/assets/pdf_file/0020/125606/Weed-Management-Handbook-2013_web.pdf)) for appropriate herbicides and application methods for most declared weeds.

For each declared weed species controlled, log book records of chemical use should be kept. Refer to **15.8.2 Log Books** and **14.20.6 Log Books**.

Chemical control should be planned in co-ordination with slashing and burning requirements.

Provide an alternative suitable herbicide if during the course of the contract a chemical is withdrawn from the APVMA approved list.

#### 15.9.4 Effectiveness of Control and Spread Prevention

Effectiveness of control and spread prevention is assessed by:

- a) Permanent Monitoring Sites; these are established by the Superintendent (or his agent) in strategic locations known to contain weeds (point data) and those known to be free of weeds (transects) at the commencement of the contract.

These will:

- identify changes in weed infestations annually and over the entire period of the contract
  - allow for verification against log books
  - evaluate efficacy of the treatment (slashing and chemical control)
  - help inform weed control priorities for the next season (in conjunction with post-season review)
  - include areas of known high density weed infestation and also areas known to be free from weeds at the commencement of the contract period.
  - Provide incentive for the contractor as a result of improved control over the duration of the contract.
- b) Overall visual assessment of road verge for monitoring according to submission of the log books.
  - c) Specific monitoring for gamba grass control and spread management may be conducted in strategic areas.

#### 15.9.5 Determination for Key Performance Indicators

Evaluation of the monitoring points will occur at the conclusion of the treatment period (wet season) annually. Assessment will be consistent with the WMB data collection requirements (<http://www.lrm.nt.gov.au/weeds/mapping>), and will allow determination of a Key Performance Indicator (KPI) based on criteria listed below. The KPI is linked to final payment schedule.

The KPI is calculated as the percentage of sites where values of 1, or 100% alive adult seeding gamba grass were recorded, indicating that weeds were not managed.

Refer to **15.11 KPI Example**, **Table 15.3 - KPI Criteria and KPI Value Codes** and **Table 15.4 – SAMPLE – Field data log - Assessment of sites by KPIs**.

#### **15.9.6 Induction for Declared Weed Management**

The contractor and personnel shall attend a ½ day induction course prior to the commencement of the Contract to confirm;

- Correct weed identification and any new species declarations
- Appropriate herbicides for specific weed situations, and old/new formulations
- Appropriate methods of application, and application techniques
- Understanding of required data collection and logbook guidelines

#### **15.9.7 Post Season Review**

The contractor and/or his agent shall attend an annual post season review to conduct desk-top analysis of weed data and associated road maps and to conduct site visits if necessary.

The primary purpose of the annual post-control review is to determine if contractor has maintained road reserve as per the contract and met objectives in the Weed Management Plan. The focus of the review will be a dialogue between the Superintendent and the contractor to plan for better control in the following year.

Inspections will be undertaken jointly between the Superintendent (or his agent) and the contractor (or his nominated subcontractor) not longer than 4 weeks after the end of annual control operations.

At the conclusion of the post-season review meeting, final payment as a percentage of the scheduled rate will be determined.

#### **15.10 OTHER REQUIREMENTS**

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 15.11 KPI EXAMPLE

**Table 15.3 - KPI Criteria and KPI Value Codes**

Point data codes (KPI value)	Transect data codes (KPI value)	Gamba Age & Status Codes
<b>1</b> = No evidence of effective treatment  <b>2</b> = treated (slashed or sprayed) but not adequately effective  <b>3</b> = effective treatment (>90% total brown-out) or slashed such that plants dead and did not produce seed	<b>1</b> = weed present and not controlled  <b>2</b> = weed present and evidence of effective control  <b>3</b> = no weed present	<b>Age</b> <b>&gt;1yr</b> Perennial plants <b>&lt;1yr</b> Germinated that season <b>Status</b> <b>AS</b> Alive and seeding (post-feathering) + % alive <b>DS</b> Dead but seeded + % dead but seeded <b>D</b> Dead + % dead

**Table 15.4 – SAMPLE – Field data log - Assessment of sites by KPIs**

Name of assessor -					
Date of assessment -					
Site No.	Road Name or Description	Site Type (Point or Transect)	Monitoring Site ID	KPI value	Gamba Age & Status
Total number of sites assessed:				#	
Total number of sites where value = 1				# sites (# points, # transects)	
Average KPI% across ALL sites (average of all KPIs, divided by total number of sites assessed, expressed as a percentage)				#%	

## 16. TRAFFIC SIGNALS AND INTELLIGENT TRANSPORT SYSTEMS MAINTENANCE

### 16.1 DESCRIPTION OF THE WORKS

A general outline of the work to be carried out under the Contract comprises:

Provide a twenty four hours a day, seven days a week service to safely and efficiently meet the requirements of this Request for Tender within specified timeframes for all ITS & related equipment within the area stipulated in the RFT/RFQ, associated with inspection, servicing, repairs and maintenance for:

- Traffic Signal Controller (TSC) assets & associated hardware;
- Advanced Warning Signs (AWS or Wig Wags);
- Variable Speed Limit Signs (VSLS);
- Closed Circuit Television (CCTV);
- Uninterruptible Power Supply (UPS) systems;
- Other Intelligent Transport Systems (ITS); and,
- Associated communication equipment relating to the above items.

The contractor is required to ensure that all infrastructure as listed above and their components remain in good condition and operate as designed.

The majority of the equipment to be maintained includes, but is not limited to traffic signal controllers, detectors, detector loops, signal hardware (including conduits, cables, footings, conduit junction pits, detector pits, signal posts, supports, wiring assemblies, lanterns, pedestrian buttons and traffic signal / pedestrian lanterns). AWS, VSLS, CCTV, UPS and other ITS equipment including all IT and communication equipment, and equipment linking each asset to the Sydney Coordinated Adaptive Traffic System (SCATS) regional computer.

The minimum requirements for the maintenance of traffic signals are specified as three work types, these are;

- Fault Maintenance
- Routine Maintenance
- Specific Maintenance

Other equipment which integrates into the traffic signal controller shall be included within this contract such as the Red Light Camera equipment which is housed within the TSC.

Other equipment which integrates to the TSC such as Emergency Services 'hurry call' equipment, or other equipment which uses the controller for information, power supply, or communications shall also be included.

#### 16.1.1 Fault Maintenance

Fault Maintenance is the response to unscheduled maintenance. Fault Maintenance can be identified by either the Contractor, Superintendent's Representative, Traffic Section staff, or DoI On-Call staff, but attendance on site and works must be authorised by the before mentioned DoI staff (except where the fault is of a nature that poses a significant risk to the public or the worker), and occur within specified response times provided in **Table 16.12 - Response Times** (Refer to clause 16.32).

Fault Maintenance includes the following faults for example: accidents, traffic signals flashing amber and other controller related faults, blacked out, non-operational, communications outages, aspects out of alignment, pedestrian hardware related faults, and all ITS related faults.

#### 16.1.2 Routine Maintenance

Routine Maintenance is carried out to a specified level and within a broad timeframe. Work is scheduled by the Contractor but must be completed within an allocated time as shown in **Table 16.12 - Response Times**. Routine maintenance is generally follow up work to Fault Maintenance i.e. reinstate pedestal and hardware, replace detectors, replace faulty signal component, replace UPS batteries or testing, CCTV repairs, cleaning or inspections.

#### 16.1.3 Specific Maintenance

Specific Maintenance consists primarily of an audit of an individual traffic signal site, inclusive of all ITS related to that traffic signal asset. A report is generated by the contractor identifying the condition and performance of the traffic signals and related ITS, if applicable. The report, inclusive of any recommended repairs identified from the audit are scheduled by the Contractor and submitted to the Superintendent's Representative in a program of works within 5 working days of the audit being completed as a basis for approval. Any recommended repairs considered as urgent at the time of the audit being undertaken, the contractor shall contact the Superintendent's Representative immediately for further direction regarding works to be undertaken. Nominated repairs such as pole top replacements are undertaken in conjunction with the Audit.

## 16.2 STANDARDS

Conform to the following Standards and Publications unless specified otherwise:

AS/NZS 1163	Cold-formed structural steel hollow sections
AS 1231	Aluminium and aluminium alloys - Anodic oxidation coatings
AS/NZS 1477	PVC pipes and fittings for pressure applications
AS/NZS 1554	Structural steel welding - Welding of steel structures
AS/NZS 1594	Hot-rolled steel flat products
AS 1742.3	Manual of uniform traffic control devices - Traffic control for works on roads
AS 1743	Road signs - Specifications
AS/NZS 2053	Conduits and fittings for electrical installations
AS 2144	Traffic Signal Lanterns
AS/NZS 2276	Cables for traffic signal installations
AS 2339	Traffic signal posts and attachments
AS 2353	Pedestrian push-button assemblies
AS 2700	Colour standards for general purposes
AS 2703	Vehicle loop detector sensors
AS 2979	Traffic signal mast arms
AS/NZS 3000	Electrical Installations
AS/NZS 3100	Approval and Test Specification – General Requirements for Electrical Equipment
AS/NZS 3108	Approval and test specification - Particular requirements for isolating transformers and safety isolating transformers
AS/NZS 3191	Electric flexible cords
AS/NZS 3678	Structural steel - Hot-rolled plates, floorplates and slabs
AS/NZS 3679.1	Structural steel - Hot-rolled bars and sections
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS 5000.1	Electric cables - Polymetric insulated - For working voltages up to and including 0.6/1 (1.2) kV

## 16.3 CROSS REFERENCES

MISCELLANEOUS PROVISIONS

PROVISION FOR TRAFFIC

CONCRETE MAINTENANCE

## 16.4 DEFINITIONS

In this contract, unless otherwise specified, the following words and expressions will have the following meanings;

**Table 16.1 – Definitions – Traffic Signals and ITS Maintenance**

<b>Advanced Warning Signs (AWS):</b>	Large yellow and black signs approximately 150m advanced of some signalised intersections displaying alternating flashing yellow lights when the approaching signal group is in either yellow or red. Also known as “Wig wags”.
<b>After Hours:</b>	Any hours not between 0700hrs and 1700hrs Monday to Friday and all weekends and public holidays.
<b>Audio Tactile Driver:</b>	An electronic device to activate the transducer within the associated push button assembly mounted on a traffic signal post.
<b>Auxiliary Cabinet:</b>	An approved housing for ITS components which is often fitted to the top of a controller cabinet. It may house Red Light Camera (RLC) equipment, CCTV equipment, and other ITS equipment and related components including routers, UPS, modems, fibre optic connections etc.
<b>Business Hours:</b>	Between 0700hrs and 1700hrs Monday to Friday.
<b>Closed Circuit Television (CCTV):</b>	CCTV is the use of <a href="#">video cameras</a> to transmit a signal to a specific place, on a set of monitors. The cameras may be fixed, or PTZ (pan, tilt, zoom) and capable of being remotely controlled. The CCTV for use in this contract may monitor traffic flow / congestion, incidents, or to observe events or works.
<b>Control Relay:</b>	An electro-mechanical or solid state assembly within a controller cabinet for the purpose of switching signal lamps.
<b>Controller:</b>	A complete electronic mechanism for controlling the operation of traffic signals and other ITS.
<b>Controller Cabinet:</b>	An approved housing for a controller, control relays, auxiliary equipment, terminal blocks, sockets, flasher units, wiring, and other ITS components etc. which may or may not include vehicle detectors and linking equipment.
<b>CSR:</b>	Contractor Service Request/Report
<b>Day:</b>	Calendar business day unless otherwise stated.
<b>Deficiency:</b>	The visible or measurable evidence of failure or other undesirable condition that is at or exceeding its intervention level or that is likely to become a Hazard (as reasonably determined by the contractor or Superintendent's Rep) before the next scheduled or required inspection.  The deficiency may affect the safety, serviceability, structural capacity or appearance of the asset.
<b>Detector Loop:</b>	An in-pavement wiring configuration (including lead-in wires) to detect or count vehicle movements, or both.
<b>Detector Sensor:</b>	An electronic device, which may be post or controller mounted, used to count, classify, or detect vehicles or pedestrians, or both.
<b>Fault:</b>	Any malfunction of equipment to be rectified within specified response time.

**Table 16.1 – Definitions – Traffic Signals and ITS Maintenance**

<b>Fault Maintenance:</b>	The repair and/or replacement of equipment damaged or defective through any cause and shall require:
	(a) A 24 hour, 7 days/week fault attendance service for the purpose of inspection, identification and repair of reported site malfunctions, with a fully equipped service vehicle and experienced technicians.
	(b) An adequate back-up service to enable permanent repairs and rectification of all site deficiencies.
	(c) A fully equipped workshop facility for the purpose of testing and repairing equipment removed from the maintenance site.
<b>Footing and Post / Pedestal:</b>	A concrete base, including all conduit bends, ragbolt assemblies and reinforcement cages, and a post used primarily for the support of traffic signal lantern/s (including mast arms and joint use poles). Footings and posts maintained by other authorities are not included in this definition.
<b>Intelligent Transportation Systems (ITS):</b>	Intelligent Transportation Systems (ITS) can be defined as the application of advanced information and communications technology to surface transportation in order to achieve enhanced safety and mobility while reducing the environmental impact of transportation. ITS in the NT may include CCTV, Red Light Cameras, UPS, VSLS, Radar or video detection, VMS (mobile or fixed). It may include vehicle to roadside, vehicle to vehicle, or vehicle to infrastructure technology.
<b>Minor Repairs:</b>	The regular adjustment and minor servicing required to keep traffic signals in good, serviceable operating condition.
<b>Pedestrian Detector:</b>	A push button device used to actuate the pedestrian walk phases which may or may not include audio-tactile devices and 'Wait' indicators.
<b>RFT/RFQ</b>	Request for Tender / Request for Quotation. Provisions in this specification applicable to one are equally applicable to the other.
<b>Routine Maintenance:</b>	Repairs identified during fault maintenance or otherwise directed by the Superintendent's Representative or Traffic Section staff. Work to be completed within a specified timeframe.
<b>Sydney Coordinated Adaptive Traffic Management System (SCATS):</b>	SCATS® is an adaptive urban traffic management system that synchronises traffic signals to optimise traffic flow across a whole city, region or corridor. It's highly configurable, dynamically responding to the demands of the network in real time. SCATS is used throughout the NT to control the traffic signals.
<b>Shall</b>	Is indicative of a mandatory requirement unless the context clearly indicates otherwise.
<b>Supports:</b>	All structural components, brackets, post top assemblies, clamps, straps and parts thereof, used to support traffic signal equipment.
<b>Specific Maintenance:</b>	Scheduled inspection of all asset based on-site equipment compiled in report form to identify condition and performance of traffic signal hardware and related ITS. Recommended repairs scheduled in program as provided by contractor and agreed to by Superintendents Representative.



**Table 16.1 – Definitions – Traffic Signals and ITS Maintenance**

<b>TCD</b>	Traffic Control Diagram – TCDs are part of TMP
<b>TMP:</b>	Traffic Management Plan – includes TCDs
<b>Traffic Signal Aspect</b>	A single optical system (circular, arrow or symbolic) on a single face capable of been illuminated at a given time. 2 or more aspects in a common mount and operation are called a Lantern (see Traffic signal lantern)
<b>TSC</b>	Traffic Signal Controller
<b>Traffic Signal Lantern:</b>	A vehicular traffic control signal, pedestrian control signal, flashing signal or internally illuminated sign including all housings, visors, doors, lamp holders, reflectors, gaskets, target boards, lenses, wiring and cables and other related items. The lantern may consist of Incandescent, Halogen, or Light Emitting Diode (LED) lamps to illuminate the traffic signal display.
<b>Uninterruptable Power Supply (UPS):</b>	An uninterruptible power supply, or battery backup, is an electrical apparatus that provides emergency power to a load when the input power source, typically mains power, fails. The UPS continues to power the traffic signals and ITS until mains power can be restored. Also may be termed as ICUPS (Internal Controller UPS), or ECUPS (External Controller UPS).
<b>Variable Message Signs (VMS):</b>	A VMS, is an electronic traffic sign often used on roadways to give travellers information about events related to the road reserve. They warn motorists of road conditions, traffic management, accidents or incidents and may warn of traffic congestion. They may direct vehicles to take alternative routes, limit travel speed, warn of duration and location of the incidents or just inform of the traffic conditions.
<b>Variable Speed Limit Signs (VSLS):</b>	A VSLS is an electronic sign that can display alternate speed/s by time of day remotely either automatically, or manually, for reasons such as school zones, busy areas, areas of high pedestrian numbers etc, where the lower speed limit is not warranted permanently.
<b>Wig wags</b>	See Advanced Warning Signs

## 16.5 SITE OF WORKS

There are various sites for these works. Refer to the RFT. The sites will include all traffic signalised intersections, pedestrian crossings AWS, CCTV, UPS, VSLs, and ITS applications within the areas stipulated in the RFT.

All traffic signals in the stipulated areas are included in this contract. Maintenance for any newly constructed assets will be included within the maintenance list once a handover has been undertaken with the constructing contractor and the Project Manager for the governing agency and accepted by DoI Traffic Section.

All Closed Circuit Television (CCTV) cameras under the control of Department of Infrastructure (DoI) are included in this contract. Other selected NTG CCTV assets or future council CCTV may also be included.

The following points identify locations of these intersections and are shown in:

**Table 16.7 - NT Government Owned Traffic Signals – Darwin Region,**

**Table 16.8 – Darwin City Council Owned Traffic Signals,**

**Table 16.9 – Palmerston City Council Owned Traffic Signals,**

**Table 16.10 – NT Government Owned Traffic Signals – Alice Springs and**

**Table 16.11 – Alice Springs Council Owned Traffic Signals**

(Refer clause 16.30):

- Department of Infrastructure managed traffic signal assets, and all other ITS assets;
- City of Darwin Council owned traffic signal assets &
- City of Palmerston Council owned traffic signal assets &
- Alice Springs Town Council owned traffic signal assets.

Where work is required to be carried out in easements or on land adjacent to the site for the purpose of connecting services or joining up of roads etc. ensure that the appropriate licences and approvals are obtained for work in those particular areas.

Permits – City or Town Council permits are required to be obtained to undertake works for all non-fault maintenance activities. As per Council direction, fees will be waived for all works within Darwin and Palmerston Council jurisdictions for works directly relating to traffic signal or ITS maintenance purposes executed under this contract. Approved permits shall be forwarded on to the Traffic Section prior to proceeding with the works.

## 16.6 RESTRICTED WORKING HOURS

The work to be performed under the Contract shall be subject to execution within certain restricted working hours and the Contractor shall therefore accept that some Routine Maintenance works may not be able to be carried out within normal work hours due to the high risk nature of some environments, for example; where traffic volumes are too high to allow works to be undertaken in accordance with PROVISION FOR TRAFFIC or Australian Standards for traffic management. Therefore these works shall be rescheduled to a time when risk can be better managed i.e. after hours or on weekends at the scheduled rates.

For the purpose of this contract working hours are:

- Business Hours: Within 0700 – 1700 hours,
- After Hours: Outside the above hours, weekends and Public Holidays.

See also PROVISION FOR TRAFFIC.

See also the clause titled 'Working Hours' in the Conditions of Contract.

See also the clause titled 'Routine Maintenance' for further clarification.

## 16.7 ACCESS TO SITE

Prior to entering the site of the Works, the Contractor shall contact the officer-in-charge of the site to explain the nature of the work to be carried out and for permission to enter to carry out the Works.

In the event of either, being unable to contact the officer-in-charge, or being refused permission to enter the premises the Contractor shall notify the Superintendent's Representative.

Work shall not proceed in such areas until further advised by the Superintendent's Representative.

Note: This clause applies where the contractor is required to access a site to undertake traffic signal, or ITS maintenance, that at the time, is under contractual possession of a third party i.e. other contractor.

### 16.8 SCHEDULE OF DRAWINGS INCLUDED IN CONTRACT

The following drawings shall form part of the Contract:

**Table 16.2 – Schedule of Drawings Included in Contract**

DRAWING NO.	AMEND NO.	TITLE
C(S) 1500	4	Signal Details – Ducting
C(S) 1501	3	Signal Details – Pole Foundation
C(S) 1502	2	Signal Details – Mast Arm Foundation
C(S) 1503	3	Signal Details – Controller Foundation
C(S) 1504	3	Signal Details – Communication Isolation Pillar
C(S) 1505	2	Signal Details – Lantern Mounting Details
C(S) 1506	1	Signal Details – Pedestrian Push Button
C(S) 1507	5	Signal Details – Detector Installation
C(S) 1557	2	Traffic Signal Advanced Warning Sign

### 16.9 AVAILABILITY OF CONTRACTOR

The Contractor shall provide twenty-four hours a day, seven days a week telephone contact and availability of labour to deploy to the Works should the Superintendent's Representative, Traffic Section or DoI On-Call staff so direct. The Principal shall have first call on the services of the Contractor.

The contractor shall ensure that there is always an appropriately delegated 'Contractor Representative' available to provide quotes, information on quotes, to make operational decisions and provide technical advice, escalation of works, to be available to resolve

disputed invoices, and for other operational purposes. If the nominated Contractor Representative is on leave, prior notice shall be given of the staff member who will be available for these duties in the Contractor Representative's absence. Alternately, a 2<sup>nd</sup> in charge may be appointed to make the same decisions and provide the same services with equivalent authority.

### 16.10 CONTRACTOR'S ESTABLISHMENT

The Contractor shall provide and maintain an established office workshop facility. The facility shall include the following:

- An approved workshop with equipment and capabilities sufficient to carry out work as requested under the Contract.
- An approved office space with sufficient personnel necessary to take, record or pass on any emergency message that may be received, provide day to day information with regard to prices availability and delivery. Be sufficiently qualified to process and forward invoices for work carried out.
- An approved storage facility that is secure and provides a weatherproof location for the storage of DoI owned assets or hardware that are stored by the contractor under the requirements of this contract.

### 16.11 CONTRACTOR'S EQUIPMENT AND MATERIALS

The Contractor shall provide all general and specialised equipment, tools and materials to carry out and test the Work (except for equipment, tools and materials supplied by the Principal). It shall be the responsibility of the Contractor to be fully equipped on each attendance call.

### 16.12 CO-ORDINATION OF WORK

The Contractor shall confer with any sub-contractors and persons engaged on separate orders in connection with the Works and with the Superintendent's Representative, Traffic Section or DoI On-Call staff for the purpose of co-ordination and execution for the various phases of the Works. The Contractor shall be responsible for arranging that each shall attend upon and assist the other trades.

The Contractor shall ascertain from the sub-contractor and persons engaged on separate contracts the extent of all chasing, cutting and forming of all openings, holes, grooves and the like.

The Contractor shall ascertain the routes of all services and the position of all pits, conduits and

the like in connection with the installation of plant and services and arrange for the construction of work accordingly. The breaking and cutting of complete work must be avoided wherever possible.

### 16.13 MATERIAL AND SOFTWARE TO BE SUPPLIED BY THE PRINCIPAL - DARWIN

The following material and software will be supplied free by the Principal to the Contractor for use only in execution of the Works:

<b>Table 16.3 – Items supplied by Principal – Darwin</b>	
ITEM	QUANTITY
<b>CONTROLLERS</b>	
PSC MK3 Cabinet & Test Controller (with lamp load bank)	1
Keyboard Display Units (KDU)	8
Eclipse Cabinet & Test Controller (with lamp load bank)	1
Eclipse Hand Held Terminal (HHT)	7
PSC Manuals and Eclipse Manuals	1
CCTV Cleaning Pole	1
<b>SOFTWARE / SCATS / USER MANUALS</b>	
Scats Access Program	1
SCATS Log	1
Loop Detector Analyser	1
Tyco Log Viewer	1
EUpdate	1
ATSUI	1
Microconnect LCM Management Tool	1
UPS Manuals	1
<b>SIGNAGE</b>	
'Changed Traffic Conditions Ahead' Signs	4

**Table 16.3 – Items supplied by Principal – Darwin**

ITEM	QUANTITY
'Traffic Signals Under Repair' Signs	8

#### 16.13.1 Collection of Hardware – Hold Point

**Hold Point** - Within 7 days of award of the Contract, the Contractor shall collect such materials and take delivery of the materials at the DoI Yarrowonga shed / storage yard.

Before taking delivery of any material, the Contractor shall check that is in a satisfactory condition and in the quantity described. No claim will be admitted for replacement of material alleged to be found defective or deficient in quantity after delivery.

The quantities stated are not necessarily adequate for the execution of the Works and supply of any additional quantities shall be arranged by the Contractor and at his own expense.

The maintenance and serviceability of all equipment provided by DoI and used for testing by the contractor, such as the KDUs, HHTs, test controller cabinets and associated load banks are the responsibility of the contractor to arrange and shall be at the contractor's expense. The equipment shall always be in a serviceable condition.

On completion of the contract, the contractor shall deliver the Principal supplied material back to the Traffic Section storage yard in serviceable condition.

### 16.14 MATERIAL TO BE SUPPLIED BY THE PRINCIPAL – ALICE SPRINGS

The following material will be supplied free by the Principal to the Contractor for use only in execution of the Works:

<b>Table 16.4 – Items Supplied by Principal – Alice Springs</b>	
MATERIALS	QUANTITY
<b>CONTROLLER:</b>	
Keyboard Display Units (KDU)	3
PSC MK3 Cabinet Test Controller	1

**Table 16.4 – Items Supplied by Principal – Alice Springs**

MATERIALS	QUANTITY
Mother Board	1
PSC Processor Plus card	1
PSC Power Supply card	1
PSC Power Interface card	1
PSC PD212 Detector card	1
PSC PD216 Detector card	1
PSC Lamp Control Board cards (low power)	3
Memory Test Program (from old L0101)	1
PSC Motherboard complete with: PSC Processor Plus Card, PSC Power Supply Card, PSC Power Interface Card, 2 x PSC PD216 Detector cards, 3 x PSC Lamp Control Board cards.	1
PSC Motherboard	1
PSC Processor Plus card	2
PSC Power Supply card	3
PSC Power Interface card	1
PSC PD212 Detector cards	1
PSC PD216 Detector cards	1
PSC Lamp Control Board cards (low power)	6
PSC Flasher Units	1
PSC Manuals	2
Eclipse Controller EC1-69-16	3
Eclipse Controller EC1-69-08	1

**Table 16.4 – Items Supplied by Principal – Alice Springs**

MATERIALS	QUANTITY
Eclipse Hand Held Terminal (HHT)	3
Eclipse Manuals (electronic copy)	1
Eclipse Motherboard LM40-16-16 complete with cards	2
Eclipse Motherboard LM40-08-16 complete with cards	3
Eclipse CPM 1a card	2
Eclipse LDM 416 card	2
Eclipse LCM 8 card	4
Eclipse PSM card	1
Eclipse Flasher Unit	2
Eclipse Mains Filter Unit	2
Eclipse Assembly Site ID	1
PSTN Micro Connect Linking Control Modules for SCATS communication	1
<b>SCATS</b>	
Scats Access Program	1
SCATS Log	1

On award of the Contract, the Contractor shall submit a written request for such materials, and on receiving the Superintendent's written authority, he shall take delivery of the materials at the Traffic Section storage location wherever it may be in Alice Springs (Currently second floor of Greenwell Building)

Before taking delivery of any material, the Contractor shall check that is in a satisfactory condition and in the quantity described. No claim will be admitted for replacement of material alleged to be found defective or deficient in quantity after delivery.

The quantities stated are not necessarily adequate for the execution of the Works and supply of any additional quantities shall be

arranged by the Contractor and at his own expense.

**16.14.1 Documents / items to be Submitted for this contract after award**

**Table 16.5 – Documents / Items Contractor to Provide**

ITEM	TIMEFRAME
Project Control Plan	14 Days
Document / Hardware Control	14 Days
Contact numbers - during and after hours	24 Hours
Site Log Template	7 Days
Traffic Management Plan & TCDs	14 Days
Test Controllers Installed	14 Days
Test Traffic Signal Loop Installed	14 Days
Contractors Nominated PIN Numbers	7 Days
Contractor's Personnel Accreditations / Qualifications	7 Days
Company Workplace Health & Safety Plan	14 Days

**Table 16.6 – Documents / Items DoI to Provide**

ITEM	TIMEFRAME
Material to be supplied to Contractor	Upon Request (within 7 days)
Callout Request Form	24 Hours
Contact numbers - during and after hours	24 Hours
Excel Spreadsheet Quote Sheet	7 days

Note: The items listed above are required to be provided or undertaken within the nominated

timeframes following commencement of the contract, however is not an exhaustive list.

Documents shall be updated and provided to the Superintendent's Representative as soon as possible of any contents within the documents changing.

**16.15 PROCEDURES, CALLS AND PAYMENTS**

**16.15.1 General**

This section specifies the requirements for attending the work and the procedures for reporting and payment of work carried out.

NOTE: The DoI Traffic Section are investigating the feasibility of implementing a maintenance management system for traffic signals and ITS in the NT. It is anticipated that this system be capable of creating and forwarding works order directions, and allow responses for all maintenance tasks, tracking work orders and invoices, recording works completion times, and providing full reports. It may also be able to attach photos to work orders, control stock and location.

If this system is implemented during the term of this contract, the contractor will be required to adopt the use of the system for the purpose of this contract. Licenses, software and equipment (mobile devices) will be provided by the Department if required.

**16.15.2 Abbreviations and Definitions**

The following abbreviations and definitions are used in this specification section:

- SCHEDULED WORK – Work for which a specific rate item is provided in the Schedule of Rates.
- UNSCHEDULED WORK – Work for which no specific rate item is provided in the Schedule of Rates.
- CSR – Contractor Service Report/Request.
- ITPC – Instruction to Period Contractor
- WO – Works Order.
- RCTI – Recipient Created Tax Invoice

**16.15.3 Direction to work**

A direction to work may be issued in the following forms:

- Telephone call or facsimile.

A CSR will subsequently be issued by the Superintendent.

- Instruction to Period Contractor. (ITPC)

A CSR will subsequently be issued by the Superintendent.

- Contractors Service Request/Report (CSR)

Issued in its own right or subsequent to a telephone call or facsimile, an ITPC or an urgent call out.

- Service Order

Issued in respect to a quotation for specific works not included in the Schedule of Rates.

- Urgent call out work outside of normal working hours.
- Urgent call out work outside of normal working hours may be communicated to the Contractor by the Department's answering service contractor or the Superintendent's Representative, Traffic Section or DoI On-Call staff.

In the event of an urgent call out outside of normal working hours the Contractor shall on the first working day thereafter, complete a "Call Out Request Form" and email the same to Traffic Section as a prerequisite to the issue of a CSR or email work order.

If the Superintendent's Representative, Traffic Section or DoI On-Call staff considers any particular work requirement is urgent he shall so advise the Contractor and shall cause the CSR subsequently issued to be stamped "URGENT".

The Contractor shall visit the office of the Superintendent as required to collect any hard copy directions to work.

For traffic signal maintenance works, an automatically generated CSR is issued monthly to the contractor for each traffic signal asset. Traffic Section staff send email work orders to the contractor as a direction to work to initiate maintenance works to be completed at required assets. The contractor then compiles the email work orders and evidence, and then invoices the DoI monthly for each CSR. Where works have not been undertaken at any particular asset for that month, the contractor will enter the words 'nil charges' on the relevant CSR and return with the other monthly invoices for that CSR to be cancelled.

For works where there is a recovery of costs initiated by DoI i.e. where a traffic signal has been knocked over by a motorist, a separate CSR will be forwarded to the contractor to undertake the works in relation to the reinstatement of that asset.

Specific maintenance and other works may be initiated on a separate CSR.

#### 16.15.4 Advance Direction

Notwithstanding the provisions of the Direction To Work clause the Contractor will receive an advance direction to carry out any required Scheduled Work up to a maximum of the monthly pro rata frequency of the respective Schedule of Rate Items.

Any advance direction issued may be revoked at the sole discretion of the Superintendent.

#### 16.15.5 Authority to Undertake Work

The Contractor will not undertake any work unless specifically directed to do so by the Superintendent's Representative, Traffic Section or DoI On-Call staff, with the exception of:

- Hazardous situations. If there is obvious works required due to a hazardous situation that could endanger a worker or member of the public, the contractor shall attempt to contact the Superintendent's Representative for permission to proceed with the work. If the Superintendent's Representative or other Traffic Section staff are not available, the contractor may proceed with the works if the works is of a nature that poses a risk to the public or workers.

In the above situations the contractor shall notify the Superintendent's Representative as soon as practicable during or after the works, and provide supporting evidence (photographic or other) of the works that occurred.

#### 16.15.6 Instruction To Period Contractor - CSR

One copy of an ITPC or CSR will be issued to the Contractor. The document will describe in brief detail, the location and a brief description of the work required.

When the works required by the CSR have been completed the Contractor shall insert, in the appropriate place on the CSR, brief work descriptions, item numbers, quantities, rates, extensions, additions, the total value and any other information required by the Superintendent to approve payment.

The CSR shall have the completion date of the works entered thereon and be signed off by the Contractor.

#### 16.15.7 Time Limit for Attendance

The works must be attended within the time limits specified in **Table 16.12 - Response Times**.

Any inability to undertake the works during the allowable time limit shall be coordinated with the

Superintendent's Representative or Traffic Section staff, prior to the time or date due for completion with sufficient time to arrange a suitable alternative.

#### 16.15.8 Variation Approval

Any variation from the extent of work ordered must be approved by the prior to the varied work being carried out.

Where an item of work is ordered pursuant to a Schedule of Rates item for Scheduled Work and the Contractor considers the item to be outside the scope of the Schedule of Rates item the Contractor shall obtain the approval of the Superintendent prior to carrying out the varied works unless the works is of a nature that poses a risk to the public or workers.

The Contractor shall in the case of any authorised variation insert on the CSR the approving officer's name and the date of such approval.

#### 16.15.9 COMMUNICATIONS

Provide field and after hours communication with the Department by mobile telephones connected either to a cell net system or a satellite system.

Provide the Department with a list of current contact numbers (including mobile phones) for all staff involved in the delivery and works within this contract, including the single after hours contact number within 24 hours of award of the contract.

Ensure that the telephones are switched on every day between the hours of 0700 and 1700 or at any other time when work is being carried out under the Contract.

Ensure that the after hours phone is manned at all times, twenty-four hours a day, seven days a week.

The use of answering machines or message banks as the primary form of communication is not appropriate and should only be used if the phone is engaged (in use) or if the user is unable to get to the phone in time to answer it. The contractor shall ensure that if a call is not answered for any reason, a return phone call will be made within ten minutes from the original missed call.

Replace faulty telephones within 3 working days of the occurrence of the fault, and advise the Superintendent's Representative in writing of any temporary arrangements.

All email work orders that are sent to the contractor with instruction to undertake works, shall be replied to (reply to all) by 1000 hrs

(10am) the following work day with details of the works that were undertaken, the fault/s that were fixed, scheduled and unscheduled items used, and any works outstanding or other non-urgent maintenance observed while on site. Any work order written responses required due to urgent reasons on the day that works occurred will be marked as such on the work order, and shall be received by 1000 hrs that day or earlier, as otherwise directed.

Works will be checked against the time limit for repairs of the fault and SCATS Log.

#### 16.15.10 DAILY LOG BOOKS – APPROVAL – Witness Point

Maintain daily log books for works undertaken under the contract.

**Witness Point** - Approval - Submit to the Superintendent's Representative for approval, a suitably designed format for an individual Site Log template prior to commencing works under the Contract – to be provided within 7 days of award of contract.

A Site Log job sheet shall be filled in for each attendance regardless of the type of works being undertaken, and shall have all details completed including if a field is n/a.

Include in each individual site job sheet the following fields as a minimum:

- The site asset number and location, i.e. road name / intersection,
- Date and time of each attendance - arrival, returns, and departure from site,
- Confirmation that attendance was as per contract time limit for attendance – Yes/No,
- Names of personnel who attended site,
- Details of other site attendees (Police, Power & Water, Worksafe, Sub-Contractors etc),
- Name of DoI officer that ordered the works (business hours and after hours),
- The type of work and details of the works undertaken, including controller faults and codes, test readings and results,
- Scheduled and non-scheduled items, and the quantities used or completed,
- Stock used (whether or not the item used was from DoI stock or provided as new from the contractor),
- Details of significant changes in the operational state of the traffic signals such as disconnection of communications



or power to the site, Flashing Amber, Blackout or similar. Shall include approximate time of the change to operation,

- Evidence of works, including date and time stamped photographic images of any damaged / replaced items, additional or outstanding works.
- Equipment or works down time,
- Work Health & Safety incidents, near misses, or any unusual happenings, and any other requirements specified in the relevant Technical Section,
- Any outstanding maintenance requirements or faults observed onsite but not corrected at the time of attendance, or adverse traffic signal operational observations.

So that the Superintendent's Representative and Traffic Section staff can record the job as completed, all email work orders that are sent to the contractor with instruction to undertake works, shall be replied to (reply to all) by Close of Business the following work day with details of the works that were undertaken, the fault/s that were fixed, scheduled and unscheduled items used, and any works outstanding or other non-urgent maintenance observed while on site. Works will be checked against the time limit for repairs of the fault.

Submit daily log book sheets with each completed CSR with the monthly or separate invoices.

#### **16.15.11 Payments Generally**

On completion of all work described on the CSR, endorse the CSR as required and return to the Superintendent no later than 14 days after completion of work.

When the Superintendent is satisfied the work has been completed in a satisfactory manner, and that the charges are in accordance with the Schedule of Rates, payment will be certified.

All orders for work not invoiced within 14 days of completion may be subject to valuation by the Superintendent and paid accordingly.

Fully detailed particulars, evidence of cost and acceptable reasons as to why the work was not invoiced within the 14 day period may be required as prerequisites to payment.

#### **16.15.12 Tax Invoices**

A GST compliant tax invoice which includes the order number of the work must be attached to the CSR when forwarding to the Superintendent

for payment unless the contractor has entered an agreement with the Principal to receive Recipient Created Tax Invoices (RCTI).

Where the Contractor has a written agreement with the Principal to receive Recipient Created Tax Invoices the Department, after receiving a completed CSR, will create a tax invoice on the Contractors behalf and issue it in parallel with the contract payment.

The Contractor will still be responsible for collecting the GST and remitting it to the Tax Office.

### **16.16 MEASUREMENT AND PAYMENT**

Refer to MEASUREMENT AND PAYMENT

#### **16.16.1 Payment Generally**

Payment for Scheduled Work will be made at the tendered rate.

#### **16.16.2 Rates Generally**

The rates tendered are deemed to represent the full value of the work inclusive of plant, labour, messing, clearances, transportation, fuel, oil, maintenance, tools, material procurement and delivery, all incidentals to complete the work, attendance, supervision and for overheads and profit.

Where a Schedule of Rate item for Scheduled Works is defined as "Labour Only" the rate tendered shall be inclusive of all of the above relating to the labour component.

### **16.17 CLAIMS UNDER THE INDIGENOUS EMPLOYMENT PROVISIONAL SUM**

Claims under the Indigenous Employment Provisional Sum are to be submitted to the Principal within 14 days of the end of each calendar month and must be accompanied by an Indigenous Employment Report as required by the Conditions of Contract.

### **16.18 REVIEW MEETINGS**

The nominated appropriately delegated Contractor Representative shall be available to attend fortnightly meetings at locations to be directed by the Superintendent's Representative and at recurring times that are convenient to both the contractor and the Superintendent's Representative.

The meetings will be held for the following purposes:

- For the contractor to update the Superintendent's Representative of the progress of ongoing and pre-programmed works,

- For the Superintendent's Representative to provide the contractor with future planned works, prioritise works and provide feedback,
- For the Superintendent's Representative and the contractor to confirm previous works have been completed adequately, discuss and resolve disputed invoices, non-conformances and general contractor co-ordination,
- Discuss integration and / or impact of other traffic signal works or contracts on traffic signals not included within this maintenance contract but impacting on traffic signals under NTG control (including other Traffic Section contracts, DoI projects and external clients including councils),
- Current Work Health & Safety concerns by the contractor, Traffic Section, Worksafe or any other stakeholder, and;
- Any other relevant issues or queries that relate to, or impact upon this maintenance contract.

#### 16.19 QUOTING FOR UNSCHEDULED WORKS

The Contractor Representative is required to utilise the Quoting Form which will be supplied to the successful contractor within 7 days of the contract being awarded. The Quoting Form is in an Excel Spreadsheet format. The Quoting Form is required to be completed by the contractor for all unscheduled materials, negotiated rate items and to advise the Superintendent's Representative of what quantities are required for works such as full pole replacements as a result of an accident, or other routine maintenance activities. Quotes may be required for supply only items, labour items, or both.

Completed quote forms should be emailed to the DoI Traffic Section so a CSR or email work order can be raised if the quote is accepted. The email shall be accompanied by a description of what the quote includes, excludes, a breakdown of the negotiated rate items (including personnel and materials), expected duration of works, and the date proposed to commence.

Quotes requested verbally or in writing by the Department shall be provided in detail with all of the required information within the following time limits:

**Standard Quote.** A standard quote shall be provided within 5 business days of the request for quote being issued. A standard quote would include traffic signal and ITS works, repairs or

reinstatement which is of a non-urgent nature as described by DoI Traffic Section, and other non-urgent requirements.

**Urgent Quote.** An urgent quote shall be provided within 24 hours of the request for quote being issued. An urgent quote would include traffic signal and ITS works, repairs or reinstatement which is of an urgent nature or any other urgent requirements as described by DoI Traffic Section.

Also refer to clause 'Availability of Contractor'.

#### 16.20 FAULT MAINTENANCE

Provide a fault attendance service by appropriately qualified technicians on twenty-four hours per day, seven days per week basis for all traffic signal or ITS failures arising from any cause. Typical causes of traffic signal faults include:

- Signal controller or hardware malfunction including power outages,
- Communications outage or malfunction,
- Accident, vandalism or environmental damage. E.g. lightning, moisture, UV exposure, to any traffic signals or ITS hardware.
- Any other issue resulting in a signal controller, or other ITS equipment, to not operate as it is normally intended.

##### 16.20.1 Service Vehicle/s, Equipment and Materials

The vehicle/s used for all works under this contract shall at all times be equipped with sufficient materials to make a site safe, perform fault maintenance activities, and be fully equipped for all after hours call out duties on site.

As an absolute minimum the traffic equipped vehicle shall at all times, be equipped with:

- Manuals, either electronic or hard copy, for:
  - Each type of Traffic Signal Controller (TSC) in use within the region of this contract,
  - Uninterruptible Power Supply (UPS) units currently in use within the region of this contract,
  - Microconnect communication equipment,
  - Variable Speed Limit Sign (VSLS) equipment,

- Manuals for any other equipment worked on within the scope of this contract.
- Necessary fault finding tools, electrical testing equipment including
  - a multi-meter (Low impedance solenoid meter, test lamp, "Wiggy" or similar meters capable of testing and displaying 240V over period of 0.5 sec (flashing amber output cycle)) and
  - a KDU (Keyboard Display Unit),
  - a HHT (Hand Held Terminal) and
  - ladder/s appropriate for accessing a standard traffic signal pole safely,
- Telecommunications / PSTN testing equipment including but not limited to a butt phone, surge protection equipment, data cable / cat 5 cable tester, and a spare microconnect unit,
- A generator, fully fuelled, and serviceable, which is suitable for an immediate connection to a TSC or UPS as required,
- A gatic / pit lid lifter, other common tools including screwdrivers, pliers, side cutters, crimping tools etc.
- Basic replacement and repair hardware such as vehicle and pedestrian cowls, lenses, replacement lamps, pedestrian buttons, fuses, transformers, spare TSC modules and cards, and a green yellow and red roundels and arrows in both 200mm and 300mm.
- The minimum traffic management signage and TMP to carry out fault maintenance tasks in accordance with AS 1742.3 and PROVISION FOR TRAFFIC,
- Flashing beacons or other vehicle mounted warning devices on the highest point of the cabin roof or superstructure of all plant and equipment and in accordance with AS/NZS 1742.3 where these are being used within the road reserve. Fit beacons with a minimum of 75 watt globes. Do not use strobe lights. Ensure that the lights are operational whenever the plant or equipment is working within 9 metres of the road reserve and ensure that the light is visible from all approaches and not obscured by

exhaust stacks, ladders, roof racks or are covered in dust.

#### 16.20.2 Fault Maintenance Procedures

Fault Maintenance is unscheduled maintenance identified by the Contractor, the Superintendent's Representative, DoI Traffic, or DoI On-Call staff. Work must be carried out within a specified time. Refer to **Table 16.12 - Response Times** in clause **16.32 Response Times**.

Attendance on site is to be communicated to and / or approved by the Superintendent's Representative, DoI Traffic, or DoI On-Call staff (except where the fault is of a nature that poses a significant risk to the public or the worker). On receiving confirmation of a fault, the Contractor shall dispatch appropriately qualified technician/s as required to attend the site within the times specified. Upon initial attendance, the Contractor will identify the fault, ascertain the cause and rectify the fault as soon as practical. The cost of the authorised repairs will be paid in accordance with the Contractors tendered schedule of routine maintenance rates.

Where full repairs cannot be implemented immediately, the Contractor shall ensure that the site is made safe and report to the Superintendent's Representative any further works required prior to departure from site. In the event that a site cannot be left with all lanterns functioning (for example where a pedestal has been destroyed) the Contractor shall seek advice from the Superintendent's Representative as to an acceptable temporary arrangement.

For all attendances, prior to leaving the site the Contractor shall ensure that the traffic signals are intact, all functions and displays are as per normal operation, there are communications established from the TSC to SCATS, and that all pits and the controller door are safely secured.

The Superintendent's Representative or Traffic Section staff member's specific authorisation is required for all situations where rectification works will require:

- A site being left in an operational mode other than its normal operational mode,
- Additional scheduled items varied to the original CSR or email work order,
- Any additional equipment other than that specified.

Upon satisfactory completion of repair works the Contractor will advise the Superintendent's Representative or Traffic Section staff member

of the site status and action taken prior to departing the site.

So that the Superintendent's Representative and Traffic Section staff can record the job as completed, all email work orders that are sent to the contractor with instruction to undertake works, shall be replied to [traffic.ntg@nt.gov.au](mailto:traffic.ntg@nt.gov.au) and all other nominated recipients by 1000hrs (10am) the following work day with details of the works that were undertaken, the fault/s that were fixed, scheduled and unscheduled items used, and any works outstanding or other non-urgent maintenance observed while on site. Works will be checked against the time limit for repairs of the fault and SCATS Log.

Submit daily log book sheets with each completed CSR with the monthly or separate invoices.

Initial attendance to any reported faults shall be performed in accordance with the prescribed attendance time criteria on a twenty-four (24) hour 7 day basis. The Contractor shall apply the following priorities for actioning all site faults:

1. Make the site safe
2. Return the traffic signals to operational state
3. Establish communications to all equipment
4. Return any ITS to operational state
5. Optimise the operation and complete remedial works

The Contractor shall ensure that all fault attendance work is performed with the deliberate intention of minimising inconvenience to road users including pedestrians and cyclists, while ensuring the safety of the workers and the public.

In accordance with the 'Provision for Traffic' clause in the standard specification, remedial works shall be performed so as not to interfere with traffic flows during the periods of 07.00 hours to 09.00 hours and from 15.30 hours to 17.30 hours Monday to Friday, excluding public holidays. This exclusion period may be overridden by the Superintendent's Representative, Traffic Section staff or the DoI On-Call Officer in relation to emergency or critical works which require immediate attendance in the interest of public safety.

### 16.20.3 Response Times

Respond to all service calls during normal business hours, and call outs after business hours as per **Table 16.12 - Response Times**.

Maintain a 24 hour / seven (7) days a week service to attend works covered by this contract.

Respond only to service calls or call outs initiated or confirmed by the Superintendent's Representative, DoI Traffic, or DoI On-Call staff.

Confirmation of service calls and call outs will be issued to the Contractor by CSR (Contractor Service Report) or Traffic Section email work order as soon as practicable following the work requested by Superintendent's Representative, or DoI Traffic.

Maximum response times have been applied to various faults or maintenance activities based on their urgency and risk. Considerations such as danger to the public, impact to the road network operation due to a traffic signal or ITS fault, realistic achievability, and other influences have been used to determine these response times. Other variables such as time of day, or critical site/s affected may result in the maximum response times being reduced at the discretion of the Superintendent's Representative, or DoI Traffic Section staff.

Failure to meet the maximum response times listed in **Table 16.12 - Response Times** may expose the contractor to external liabilities. If the contractor fails to attend a site fully equipped to rectify a fault within the given time limit for attendance, and this failure is considered to have caused or contributed to an accident or injury, investigating authorities may consider further action regarding any negligence proven.

Any inability for the contractor to complete the works in accordance with the required maximum response time or other nominated time, shall be coordinated as soon as possible with the Superintendent's Rep or Traffic Section staff, to agree to a suitable alternative time or time extension to complete the works, and shall be followed up in writing.

### 16.20.4 Temporary Repairs

Where it is not practical to immediately repair traffic signal equipment on site, the Contractor shall without delay provide a temporary arrangement as agreed to in consultation with the Superintendent and will maintain the asset including temporary repairs until permanent repairs are authorised and implemented.

In order to allow the installation to operate until permanent repairs can be undertaken, the Contractor may be required, when deemed necessary by the Superintendent's Representative, or DoI, to modify the site, or install or relocate equipment to temporary locations.

Where there is provision for switching the signals from normal to flashing operation, the Contractor may do so while effecting repairs on the controller however the Contractor is advised that flashing operation is an emergency action only and will not be considered as a temporary repair. Also refer to 'switching of traffic signal conditions'.

#### **16.20.5 Switching State of Traffic Signal Conditions or Communications**

Where it is necessary to change the state of the traffic signal operation or the status of controller communications, DoI Darwin Traffic Section shall be consulted and provide approval prior to changing the state of the signals. If its required to occur in the case of urgent works, or it has occurred unintentionally during maintenance activities, DoI Traffic Section shall be informed as soon as practically possible of this need or event.

Change of State is defined as:

- Traffic Signals on to off or flashing amber,
- Traffic Signals off to on or flashing amber,
- Traffic Signals flashing amber to off or on, or;
- Turning communications on or off.

When signals are in flashing yellow mode or switched off during maintenance activities, ensure the attending works vehicle is parked in a prominent position with its high intensity flashing yellow hazard warning lights operating.

Ensure that the location of the works vehicle does not interfere with sight lines for motorists at intersections, and also pedestrian access is to be considered.

Works shall be scheduled so as to minimise disruption to motorists/pedestrians where the planned switching states of traffic signals is considered.

#### **16.20.6 Temporary Shut Down to UPS, CCTV, or Other ITS**

Where it is necessary to shut down a UPS, CCTV, or other ITS, or if this equipment is unintentionally shut down, DoI Traffic Section shall be informed as soon as practically possible prior to this need or as soon as possible after the event.

#### **16.20.7 Connection / Disconnection of a Generator**

Where there is any requirement for the connection of a generator to any traffic signal

controller or UPS, Traffic Section staff shall be consulted and provide approval prior to the connection or disconnection of the generator. If the connection is required to occur in the case of urgent works, or a fault has occurred unintentionally during maintenance activities, DoI Traffic Section shall be informed as soon as practically possible after the connection. If the reason for the generator connection is a power outage, it may be requested that the contractor liaise with the power provider to ascertain when power is restored.

Any third party requests for generator connection to traffic signals or UPS through the maintenance contractor shall be forwarded to Traffic Section for consideration and approvals. Full details including proposed date and timings, the reason for the request, the contact person and business name of the third party shall be provided.

### **16.21 ROUTINE MAINTENANCE**

Routine maintenance repairs are identified by either the Superintendent's Representative, Traffic Section staff or the Contractor. Attendance on site is to be communicated to and approved by the Superintendent's Representative or Traffic Section staff. Routine Maintenance repairs are to be completed within a specified timeframe - Refer **Table 16.12 - Response Times**.

Routine maintenance includes follow up works such as replacing full detector loops, cables and pole tops, conduit junction and detector pit replacements, traffic signal pole and accident repairs, scheduled controller changeovers, and scheduled inspections and works.

Some Routine Maintenance activities may need to be rescheduled due to the high risk nature of the environment (identified by the Contractors written and documented Risk Assessment) so as to reduce risk to the Contractors personnel and so as not to affect the traffic flows in the area. Some examples of situations such as this would be lamp changes or aspect repairs on narrow medians or high speed / high risk areas, or the recutting of traffic signal loops in dense trafficked areas.

The contractor shall endeavour to coordinate all routine maintenance tasks at one asset, at the same time within the time limits for attendance if possible, to reduce the impact on the road network, and reduce traffic management costs. If this is not possible due to time limit for attendance, seek approval for an extension from the Superintendent's Representative who may extend the time limit for attendance subject to the type of routine maintenance required.

These works identified as high risk shall be rescheduled to a time when risk can be better managed i.e. after hours or on weekends at no additional cost to the Principal, unless specific direction to work outside of work hours has been given by Traffic Section staff for other reasons, otherwise whereby works could have been undertaken during normal work hours within the relevant standards and Provision for Traffic section. Where direction to work outside of normal working hours has been made by Traffic Section, additional charges shall be by negotiated rate or hourly rate, as applicable according to the type of works undertaken, and with consideration of the labour component of the item of works involved if it were completed during normal work hours.

When a Routine Maintenance activity is considered 'High Risk' by the contractor, the Superintendent's Representative or Traffic Section staff shall be informed as soon as possible in writing so that the Superintendent's Representative can make an allowance for the contractor's time to complete the works (**Table 16.12 - Response Times**) to a more appropriate time to alleviate the high risk.

Traffic volumes may be available for the contractor to assist to ascertain a more suitable time to undertake the works.

This maintenance will be programmed in accordance with identified performance levels of the traffic signal equipment covered in this contract.

#### 16.21.1 Time Lines for Follow up Works

This requirement of the contract refers to works previously authorised by the Superintendent's Representative and performed after initial reinstatement or repair works have been implemented and the site made safe or other maintenance tasks identified while on site. To support the follow up works, a photo may be required to provide evidence and also to assist with the description of the maintenance works or follow up works identified.

Upon receipt of the Superintendent's Representative or Traffic section staff approval to proceed with additional works the Contractor shall initiate the required works and ensure completion within the timelines identified in clause **16.32 Response Times, Table 16.12 - Response Times**.

Advise the Superintendent's Representative or Traffic section staff of any items temporarily repaired within the prescribed times and provide the Superintendent's Representative or Traffic section staff with an estimate of the time required to complete the works. This information

must be forwarded to the Superintendent's Representative or Traffic section staff as soon as a time line has been determined.

#### 16.22 SPECIFIC MAINTENANCE – TRAFFIC SIGNALS & ITS – HOLD POINT AND WITNESS POINT

Specific maintenance includes the inspection and testing of all on-site equipment to identify its physical condition, operational performance and configuration of hardware. Included in the audit is all components of the traffic signals and any associated ITS situated at the traffic signal intersection, or attached to the traffic signal controller. Details of the inspection are to be recorded in report form.

The following functions are to be undertaken during specific maintenance of traffic signals:

- Site / asset audit
- minor repairs
- Corresponding report & photos

Site audit reports have been categorised to suit the expected work required to be undertaken for each type of audit. Contractors shall appoint appropriate amount of resources in order to be able to complete the audit in one shift. The categorised Site Audits are:

- Site Audit & Report – Vehicle Signalised Intersection.
- Site Audit & Report – Pedestrian Signalised Intersection.
- UPS Maintenance and Report

NT Government traffic signals are to be inspected on an 'as required' basis as directed by the Superintendent's Representative. It is desired that up to eight traffic signalised intersections are audited each year and all UPS in accordance with their maintenance schedule. The Superintendent's Representative reserves the right to include additional sites or assets, or exclude sites at any time if deemed necessary.

City of Darwin Council, City of Palmerston Council and Town of Alice Springs Council traffic signals may be included in the specific maintenance program as required and directed by the Superintendent's Representative.

**Witness Point - Audit Supervision.** Following Traffic Section's direction to undertake a specific maintenance audit, the contractor shall coordinate with Traffic Section to arrange a suitable time to undertake the audit to allow supervision of the works to be scheduled if required by the superintendent's Representative.

Notify the Superintendent's Representative of any variation to the program at least 5 working days prior to any scheduled audit, the commencement of any altered programmed work, or original work program.

**Hold Point** - Audit Report Review. Within 5 days following the physical completion of a specific maintenance audit, the contractor's representative shall arrange a time with a Traffic Section staff member to review the quality and content of the completed report prior to formal submission, and review any recommended follow up works that may be required on site. The meeting may include a site visit and time in the office.

Any changes required to the document shall be undertaken and submitted with the required timeframe.

#### 16.22.1 Site Audit – Traffic Signals & ITS

Inspect, audit and report on each traffic signalised intersection site as directed by the Superintendent's Representative. The contractor should be prepared to undertake approximately eight (8) site audits annually.

A site audit consists of completing all items listed in **Figures and Tables**

**Figure 16.3 - Sample Template Traffic Signal and ITS Audit Report Template**, and marking up all details undertaken on the audit, outstanding works, and discrepancies between the site drawing and the site on a copy of the most current site drawing. Each item in the checklist must be considered a specific maintenance function and all cleaning, adjustment, repair or replacement of such items shall be completed within seven (7) days of the CSR being issued. If issues are considered complicated, by both parties, the completion date can be negotiated.

The contractor shall identify what traffic management is required to undertake the audit completely. The traffic management scheduled items shall be nominated prior to the works commencing; the Superintendent's Representative will subsequently issue a CSR for the audit and traffic management items.

Details of minor repairs carried out during specific maintenance must be recorded in the site audit report. Refer to clause **Figures and Tables**

**Figure 16.3 - Sample Template Traffic Signal and ITS Audit Report Template**. The template shall be modified by the contractor to suit each site requirements.

Where any fault, damage or deficiency is detected during the site audit and cannot be immediately rectified by the Contractor, or where items not required to be carried out during specific maintenance as a minor repair, the details must be included on the site audit report and site drawing. The Superintendent's Representative shall be provided the completed report and corresponding site drawing within 5 working days of completion of the physical audit, inclusive of any quotes for follow up works.

If the Superintendent's Representative issues a direction to work covering authorisation, the works arising from such reports will be considered routine maintenance and itemised as per the schedule of rates.

#### 16.22.2 Minor Repairs – Traffic Signals & ITS

Minor repairs are to be carried out in conjunction with the site audit, and shall be approved by the DoI representative if on site.

Refer to clause **16.33.1 Figures and Tables**

#### **Figure 16.3 - Sample Template Traffic Signal and ITS Audit Report Template.**

All service vehicles engaged in specific maintenance must carry, in addition to standard service equipment, a quantity of materials sufficient to undertake minor repairs suited to the particular site being audited, including but not limited to:

- Replacement Lamps / LED arrays,
- Transformers
- Replacement Lenses,
- Cowls for Vehicle Lanterns,
- Pedestrian Cowls,
- Pedestrian Buttons,
- Complete Pole Top Assemblies,
- Controller module and cards,
- Spare fuses,
- Spare flasher unit,
- Cleaning equipment.

Due to traffic management being implemented for all audits and the site usually being shut down, priorities for minor repairs shall be pole top assembly replacements, followed by other tasks as directed by the DoI site supervisor.

#### 16.22.3 Site Audit Report – Traffic Signals & ITS

Throughout the term of the Contract, keep and maintain accurate records of all replacements, alterations and repairs made to any equipment within the requirements of the Contract. Keep all completed audit reports and make them available to the Superintendent's Representative when requested.

Provide the Superintendent's Representative with a Site Audit Report and corresponding marked up site drawing, no later than 5 working days following an audit being completed. Refer to **Figure 16.3 - Sample Template Traffic Signal and ITS Audit Report Template**.

A site audit report will detail all minor repairs and routine maintenance carried out at that site. It will also include specific maintenance required at the site as follow up works. The purpose of this report is to build a record of maintenance carried out at the site.

### 16.23 SPECIFIC MAINTENANCE – UNINTERRUPTABLE POWER SUPPLY (UPS) SYSTEMS

Specific maintenance for UPS systems includes the inspection and testing of all on-site equipment to identify its physical condition, operational performance and configuration of hardware.

The UPS Maintenance and Battery Condition Report are completed at regular intervals for all UPS installed in the NTG road Network and any future council jurisdiction installations. The intervals required, and brief description of tasks undertaken is:

- At Installation. Requires items 1, 2, 4, 5 & 6 below to be undertaken and recorded.
- Quarterly. Requires items 1 & 2 below to be undertaken and recorded.
- Half Yearly. Requires items 2, 3 & 4 below to be undertaken and recorded.
- Annually. Requires items 2, 3, 4, 5, & 6 below to be undertaken and recorded.

Inspections and tests required to be carried out as a part of the UPS Maintenance and Battery Condition Report are:

- 1) 15 minute discharge test.
- 2) Check battery terminal condition.
- 3) 2 hour discharge test (to be undertaken by Traffic Section).
- 4) Apply battery terminal grease over terminals to prevent corrosion.
- 5) Re-torque battery terminals connections to 12.4 N.m (110 inch/pounds).
- 6) Test internal resistance disconnect - <2Ω.

Included in the UPS Maintenance and Battery Condition Report shall be a general inspection of all components of the UPS including the

housing and connection/s to the traffic signal controller. Details of the inspection shall be recorded in the provided manufacturers report form Refer to **Figure 16.4 – Sample Template UPS Maintenance and Battery Condition Report**.

The following shall be provided upon completion of each UPS maintenance inspection interval, for each UPS (by close of business the following work day):

- Site where UPS maintenance was undertaken,
- Copy of completed UPS Maintenance and Battery Condition Report (see **Figure 16.4**) (photocopy, or clear and legible photograph), in electronic format,
- Any additional information, photos, or follow up works.

Notify the Superintendent's Representative of any variation to the program at least 5 working days prior to any scheduled maintenance inspection, the commencement of any altered programmed work, or original work program.

### 16.24 TRAFFIC SIGNAL & OTHER ITS SPECIFIED EQUIPMENT

The Department of Infrastructure specifies that the contractor shall use equipment provided by the following suppliers:

- Aldridge Traffic Systems – for all asset furniture equipment,
- TYCO Traffic and Transportation – for all traffic controller equipment (unless otherwise specified),
- Aldridge Traffic Controllers (ATC) – for all UPS installations, parts and components.
- Microconnect Linking Control Modules (LCM) for TSC communication equipment,
- Indigovision CCTV cameras and associated equipment and communications equipment.

**Note 1:** DoI Traffic Section is currently preparing for testing of ATC traffic signal controllers and may be incorporated in the above specified equipment. If accepted for use in the NT Government road reserve, the contractor will be required to utilise and maintain this equipment.

**Note 2:** The Superintendent's Representative reserves the right to add or remove use of specified suppliers or equipment within the traffic signals and ITS maintenance contract subject to testing, type approval (local or interstate), or for other reasons at the Superintendent's Representative's discretion.



Whilst the Department of Infrastructure requires that all equipment used in this contract shall be provided by the nominated suppliers, the Department will consider alternate suppliers as proposed by prospective tenderers and / or maintenance contractor. The proposed supplier's equipment shall be provided to the Department of Infrastructure for inspection and testing, any type approvals shall be provided, and evidence that it meets the relevant standards.

On completion of the Department of Infrastructure inspections, testing and assessments of the equipment, the Superintendent's Representative may give approval for the contractor to use the nominated supplier/s equipment throughout the contract subject to any conditions that may be applied. Conditions may include the contractor to maintain minimum stock levels at their cost, and provide full warranty details and conditions.

#### **16.25 MAINTENANCE AT LOCATION UNDER POSSESSION OF OTHER CONTRACTORS**

Where there is traffic signal or ITS maintenance required at an asset which is under the possession of another contractor, Dol staff will coordinate the maintenance between the project contractor and the maintenance contractor regarding timings, access and site contact. When the traffic signal maintenance contractor arrives on site they shall liaise with the site project contractor prior to proceeding with the work.

If there is a fault that occurs on the site of an asset which is under the possession of another contractor, whether directly related to the works that the project contractor are undertaking or not, and the Superintendent's Representative, Traffic Section staff, or the Dol On-Call staff direct the traffic signal maintenance contractor to site, the maintenance contractor shall attend and carry out works as directed in the interest of public safety by returning the site to operational condition as soon as possible. Dol staff shall undertake the coordination role for urgent maintenance between the project contractor and the maintenance contractor regarding timings, access and site contact.

#### **16.26 MAINTENANCE HANDOVER & INSPECTIONS**

Traffic signals and ITS owned by Dol and Councils that are newly constructed, rebuilt or modified, and have not been done so within this traffic signals and ITS maintenance contract, are required to be handed over to Traffic Section in order to identify any defects or faults, and / or

accept the completed condition as acceptable for ongoing maintenance purposes.

The Traffic Signals Maintenance Contractor will be invited to assist Traffic Section staff to attend the maintenance handover with the Project Contractor, and Dol or City Council Project Manager.

The Traffic Signal Maintenance Contractor will be given the opportunity to identify any concerns of their own, and to familiarise themselves with the asset, and / or modified asset. No payment will be made for the attendance of the Contractor Representative to inspect the site at the handover inspection to Dol.

Ultimate acceptance of the site or asset for maintenance purposes under this contract shall be the Superintendent.

### **16.27 SUPPLY & MANAGEMENT OF MATERIALS & EQUIPMENT**

#### **16.27.1 Materials**

Materials to be supplied by the Contractor will be paid at the tendered amount, wholly inclusive of mark up and/or freight charges.

#### **16.27.2 Non Specified Materials / Unscheduled Items**

Non specified materials, or unscheduled items are materials or items which may be required on one or more occasions over the contract period but which the Superintendent's Representative has been unable to predict the requirement for, or quantity of.

Any use of non-specified materials, or unscheduled items shall be approved by the Superintendent's Representative or Traffic Section staff member prior to use of any item.

Non specified materials, or unscheduled items will be new materials or items, hired equipment which is not included in another labour item, or sub-contractor services supplied for use in the performance of this contract and be priced at invoiced cost to contractor inclusive of freight and 10% mark up. Invoices from the supplier or sub-contractor showing cost of the material or service and all freight charges shall be attached to the CSR, before payment will be processed. In the case of a single invoice and multiple assets or CSR's, the invoice shall be copied and marked as a 'copy' and the proportion of the item/s highlighted and allocated to the specific CSR.

**16.27.3 Minimum Stock to be Held by Traffic Signal Maintenance Contractor**

The Contractor is to obtain and maintain the following quantities of stock as a minimum and is to store it at the location approved by the Superintendent. The stock listed below shall be recorded on the Stock Database (see 'Stock Control').

The stock to be held is;

- 5 traffic signal poles complete with base plates,
- 10 complete pole top assemblies,
- 4 complete units of 3 x 200mm LED Aspects including target boards & cowls,
- 4 complete units of 3 x 200mm LED Turn Arrow Aspects including target boards & cowls,
- 4 complete units of 3 x 300mm LED Aspects including target boards & cowls,
- 4 complete units of 3 x 300mm LED Turn Arrow Aspects including target boards & cowls,
- 6 LED pedestrian aspects & cowls complete,
- 5 sets of LED arrays (5 x 300mm & 5 x 200mm)\*,
- 3 sets LED Turn Arrow arrays (3 x 300mm & 3 x 200mm)\*,
- 8 pedestrian buttons complete,
- 6 audio tactile units, including audio tactile cards and housing,
- 5 full brackets and 5 half brackets for mounting aspects,
- 500m Detector Feeder Cable,
- 500m Multicore Traffic Signal Cable,

\*One set consisting of 1 green, 1 yellow and 1 red.

Upon completion of the contract, and if a different contractor has been awarded the contract, the minimum stock to be held by the contractor may be purchased by the Principal from the contractor. Items may be purchased off the contractor in accordance with the 'Negotiated Rate' clause, providing that the item/s or materials are of relevant use to the Department and a reasonable price is offered in consideration to their age and condition.

**16.27.4 Repairs to Electrical Components**

Traffic signal circuit boards that become faulty or require upgrade shall be forwarded to a Superintendent approved service agent for repair. Items shall be clearly marked with 'unserviceable' and details of the specific fault or upgrade required and the asset number from which the component came from and the date removed. The labelling of the circuit boards shall be done immediately when removed from site to ensure it is not mixed with serviceable equipment.

The site / asset number of the controller that the component was removed from, shall be identified for each component repair claimed.

The cost of the repair shall be charged at invoiced cost to contractor inclusive of freight and 10% mark up. Invoices from the repair agent showing cost and details of the material / repairs and all freight charges shall be attached to the CSR before payment will be processed. In the case of a single invoice and multiple CSR's, the invoice shall be copied and marked as a 'copy' and the proportion of the item/s highlighted and allocated to the specific CSR.

Repaired circuit boards returned in full working order from the authorised service agent shall be returned to the stock of specified materials and tracking of the item shall be maintained within the stock list.

Generally, equipment will require forwarding interstate for component repairs. The Contractor will be required to isolate faulty boards by use of the Test Controller provided and will forward on advice of any failure identified to the repairing agent.

If a component is assessed by the contractor or approved repair agent as unrepairable, the Superintendent's Representative shall be contacted and approval be obtained to purchase a replacement component and/or deletion of the component from the stock control database. Any item confirmed unrepairable and approved by the Superintendent's Representative, shall be disposed of following the item being completely destroyed.

**16.27.5 Stock & Equipment Control & Disposal (Stock List)**

The Contractor shall maintain a database list of all DoI owned items, and also stock that the contractor has available for use under the maintenance contract. The Stock Database will be recorded on monthly tabs on an Excel Spreadsheet, which will be available to the contractor on award of the contract (See **Figure 16.5** for template current Stock List for the

Darwin Region). The Stock List may have line items added or removed as required.

The Stock List shall include as a minimum:

- Items that have been recovered from accidents, or removal of other equipment that is to be held in stock for use or re-use under this contract, and marked as 'second hand',
- All DoI owned traffic signal controller cards,
- Items that have been purchased by Traffic DoI (whether through the maintenance contractor or otherwise) but stored by the contractor such as any controllers, UPS, auxiliary cabinets, cable, aspects, comms pillars, Microconnect units, signage etc.
- Principal owned items handed over to the contractor as a condition of this contract as stated in 'Material & Software to be Supplied by the Principal', and;
- All available contractors stock for use within the contract, including the items required as a condition of contract in 'Minimum Stock to be Held by Traffic Signal Maintenance Contractor'.
- Any hardware that has been removed from site in a damaged or inoperable state, or that has been approved or directed by Traffic Section to be disposed of shall be recorded with detail of reasons for disposal.

The Stock List shall be maintained and kept up to date at all times, and shall be available to Traffic Section staff electronically and completely updated within 5 business days of request. The contractor shall supply the Superintendent's Representative with an updated electronic copy of the list in conjunction with the monthly CSR's and will have all previous month's details on other tabs within the spreadsheet. The list shall contain, but not be limited to:

- Type of Item, listed as individual components, both new or second hand,
- Scheduled item number (if applicable),
- Quantity of the item held,
- Serial No of Item (if applicable).
- Date removed from site, and the asset and location of origin,
- Status / Serviceability of Item, and the date tested,

- Date Received / Sent (i.e. to Traffic Section shed, or to nominated repairers),
- Current location (eg: in stock, out for repair)
- Any hardware that has been removed from site in a damaged or inoperable state, or that has been approved or directed by Traffic Section to be disposed of shall be recorded with detail of reasons for disposal

The Contractor shall use the DoI owned stock listed in this stock control list in the first instance unless directed otherwise by the Superintendent's Representative. Any DoI stock used shall also be reported on site logs / job sheets and submitted with any CSR invoices.

#### **16.27.6 Stock List Quarterly Audit**

A Stock List audit will be undertaken on a quarterly basis at the contractor's nominated establishment. The contractor's nominated Contractor Representative shall ensure that they are available to attend and coordinate each audit, and will identify in the workshop all items for inspection that are listed on the most current stock list.

#### **16.27.7 Salvaged Items – Witness Point**

All items or parts thereof that are re-usable shall be salvaged for re-use within the traffic signal maintenance contract, other NTG contract, or as otherwise directed by the Superintendent's Representative or other Traffic Section staff member. Items to be salvaged may be obtained due to any upgrade works, damage to hardware and equipment, or any other maintenance activity.

Within the appropriate scheduled item rates, make allowance for salvage and testing of the equipment and entry into the stock database.

**Witness Point** - Following an incident where traffic signal equipment or ITS such as a signal pole and hardware, signal controller or CCTV camera has been severely damaged, provide adequate notice to allow for Superintendent's Representative to arrange inspection of the equipment prior to dismantling. If this is not possible due to the urgent nature of the situation, take photos of the equipment in its existing location, then relocate back to the contractor's storage yard without causing further damage, for inspection.

**16.27.8 Test Controller – Witness Point**

As per clause 'Material and Software to be supplied by the Principal', The Superintendent will provide the Contractor with 2 test controllers for the purpose of testing control modules and other equipment. It is entirely the Contractors responsibility to ensure that these devices are maintained in a functional and serviceable condition suitable for their purpose at all times. The devices shall be available for use in conjunction with this contract twenty four (24) hours per day.

**Witness Point.** Test Controllers to be displayed in working operation to the Superintendent's Representative within 14 days of the contract being awarded.

Both traffic signal controllers require a suitable load bank for testing purposes. The load banks shall be provided by the contractor and may be purchased by DoI off the contractor at the completion of the contract at a negotiated rate if the contractor wishes for this to occur.

The Test Controllers will not be used for any purpose other than that identified in this document.

**16.27.9 Test Traffic Signal Loop – Witness Point**

**Witness Point.** The Contractor shall provide and install a testing loop at the approved workshop within 14 days of this contract being awarded, for the purpose of testing detector cards. The test loop shall be installed in accordance with the most current relevant standard drawing for detector installation and connected to the test controller and be used for testing the operation of controller detector cards (it is recommended that a switching device be installed to aid in testing detector channels). It is entirely the Contractors responsibility to ensure that this device is maintained in a functional and serviceable condition suitable for its purpose at all times. The device shall be available for use in conjunction with this contract twenty four (24) hours per day.

**16.28 TECHNICAL DIRECTIONS****16.28.1 SCATS Access**

The Superintendent's Representative will provide the Contractor with a copy of the SCATS Access and SCATS Log programs to monitor this system for lamp failures to repair and to advise the Superintendent's Representative of other faults that may require attention if so directed.

This aspect of the contract will require permanently connected internet connection for

continuous day time observation (0700hrs to 1700hrs).

The Contractor will assign an individual Personal Identification Number (PIN) that is between numbers 20 and 40, to each Traffic Signal Technician. These assigned numbers shall then to be provided to the Superintendent's Representative within 7 days of the contract being awarded.

At each site visit, regardless of the type of fault or reason for attendance, the technician shall log in and then at the completion of the job shall log out. This shall be undertaken at every controller where the facility allows. For controllers where there is no log in / log out function such as an Eclipse type controller, the contractor shall open and close the door of the controller at arrival and departure of site, so the opening of the door switch registers attendance on SCATS.

The Superintendent's Representative and Traffic section staff will use the Pin Numbers 1-19 to assist with Identification of personnel working on site.

All fault logs shall be cleared by the contractor following the full completion of works (rather than after initial attendance or if fault is ongoing) with the exception of when the site is not communicating with SCATS. In this instance the contractor is to leave the controller log as it is.

### Fault / Item Identification Procedures

To assist with the identification of asset furniture and lamp faults the contractor will use in their reporting, verbal or written, 1 of 2 methods along with the display colours of Red, Yellow, Green (or R, Y, G).

#### Method 1

Use the pole identification as used on newly released DoI plans.

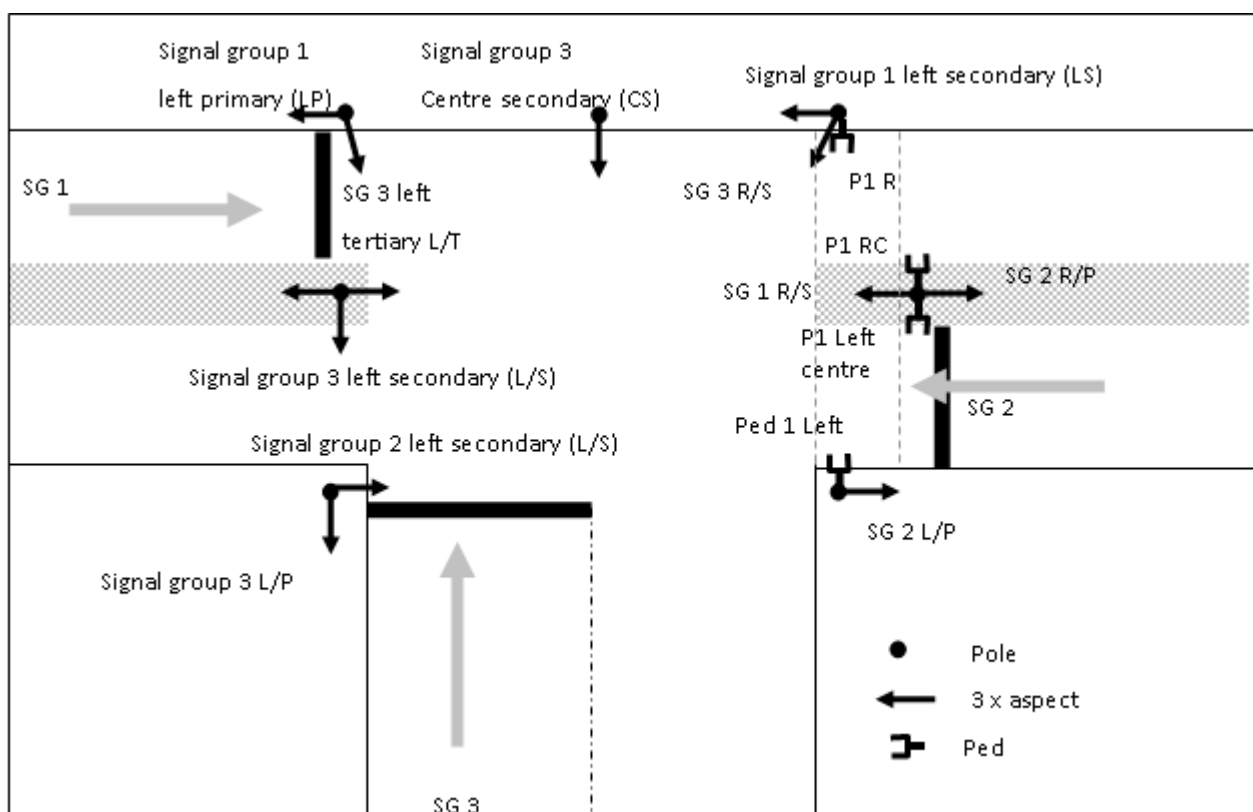


Eg. For a lamp fault on Signal Group 3 red lamp on pole 6 the ID would read SG3, red, pole 6, or SG3 R 6

#### Method 2

Here the pole numbers are not shown on the DoI plan or no plan is available for viewing (ie fault viewed in passing) Use the notation, Right, Left, Centre, Primary, Tertiary, Secondary to identify the position of the furniture.

eg. Signal Group 1 red left secondary or SG 1 R L/S



**Figure 16.1 Item Identification Procedures for Fault Reporting**

### 16.28.2 Lamp Fault Monitoring and Repairs

The Contractor will acknowledge Lamp Faults through the SCATS Access Alarm Management System and will service all non-functional lamps at its own volition, within the relevant time for attendance and at the rates tendered. Lamp faults noted on SCATS will be actioned as per time lines identified in *Table 16.12 - Response Times* at the rates tendered.

All lamp fault times for attendance are measured against the time that the lamp fault has appeared on SCATS, however where the fault has occurred after hours, weekends or

public holidays, the time where the time limit for repairs commences shall be 0900hrs (9am) the following work day.

All faults (including lamp faults) noted by means other than identification by SCATS shall require an authority to proceed from the Superintendent's Representative or Traffic section staff and any such incidence will be noted in the site report.

The contractor shall advise the Superintendent's Representative or Traffic section staff of recurring lamp faults and recommended remedial action with details of the recurring fault.

A recurring lamp fault is considered one that occurs more frequently than others on that site and / or would be considered as the fault occurring once every 2 to 3 weeks.

NOTE: Where a lamp fault is shown on SCATS lamp faults but turns out to be a 'false positive' lamp fault on site (shown on SCATS but not faulty in the field), the contractor shall only attend to repair the fault twice and reset the wattages. The contractor shall advise the Superintendent's Representative or Traffic Section staff of the false positive fault and suggest remedial measures. The contractor will not be paid for attending site to repair a lamp fault which is a false positive beyond the second occurrence.

All other Faults observed are to be reported to Traffic Section for authority to proceed with appropriate remedial action.

### 16.28.3 Pole Top Connections

When performing works associated with pole top installation or repairs, identify:

- Pole tops with an open link, creating an open link in the ring main.

Pole tops with an open link in the ring main shall have the top half of their pole top cover painted BLACK, or a ring (minimum 100mm) painted around the pole top cover in BLACK.

- Pole tops with a junction box or join in an associated pit, creating a join in the ring main.

The pole tops with a junction in an associated pit shall have the bottom half of the pole top cover painted WHITE, or a ring (minimum 100 mm) painted around the pole top cover in WHITE.

### 16.28.4 Detector Loops and Feeder Cables

When performing works associated with suspected failure or partial failure or intermittent problems associated with detector loops and associated feeder cables the following procedures will be implemented:

- Perform normal electrical tests (Continuity, Insulation, and Inductance will be required).

Provide to the Superintendent's Representative or Traffic Section staff separate insulation resistance / resistance and Inductance measurements of:

- Detector loop and feeder cable,
- Loop feeder cable only (disconnected from detector loop),

- Detector loop only (both loops separately).

Detector cables must be disconnected from controller terminal strip before measurements are taken.

Advise the Superintendent's Representative or Traffic Section staff of test findings associated with Detector Loops verbally prior to leaving site and ensure these are written on the site job sheet to be provided to DoI.

Installation of additional or replacement Detector Loops will be performed as indicated in the standard drawing at the rates tendered.

Ensure that Pre-fabricated detector loops are installed where practical, or otherwise instructed by the Superintendent's Representative or Traffic Section staff for all resealing works of asphalt. Coordinate with the pavement contractor in order for the pre-fabricated loops to be installed and to ensure loops are placed in the correct sequence.

Newly installed detector loops shall have their resistance and insulation resistance measured and recorded prior to sealing in the road.

### 16.28.5 Traffic Signal Cabling

#### Multicore Connecting Cable

Cable used shall be 51 core multicore as per AS/NZS 2276.1 and shall have a polyamide jacket termite sheath installed.

Terminate the cabling of signal lanterns and multicore cable in each associated terminal assembly.

#### Loop Detector Feeder Cables

Cable used shall be as per AS/NZS 2276.2 and shall have a polyamide jacket termite sheath installed.

Install and connect feeder cables from detector loops to detector sensors units located in the controller housing.

Feeder cables to be indelibly marked with the loop detector number at each end.

#### Loop Cable for Vehicle Detectors

Cable used shall be as per AS/NZS 2276.3

Cable will be V90 HT, 30/0.25.

Detectors Cut Into Pavement: Supply and install the cable for the loop in a saw cut in the pavement surface.

Clean the saw cut of debris and sharp edges before installing the cable.

Twist loop feeder cable one turn every 200 mm between each loop and junction in the detector pit.

Backfill around the loop cables with emulsion filler. Use Pabkote Emulsion No. 3, Scottech or similar.

House cables in conduits where they pass under kerbs.

Fully test loop following installation, and test operation on SCATS.

Detectors Pre-fabricated: Supply and install the pre-fabricated detector loop allowing for 50mm

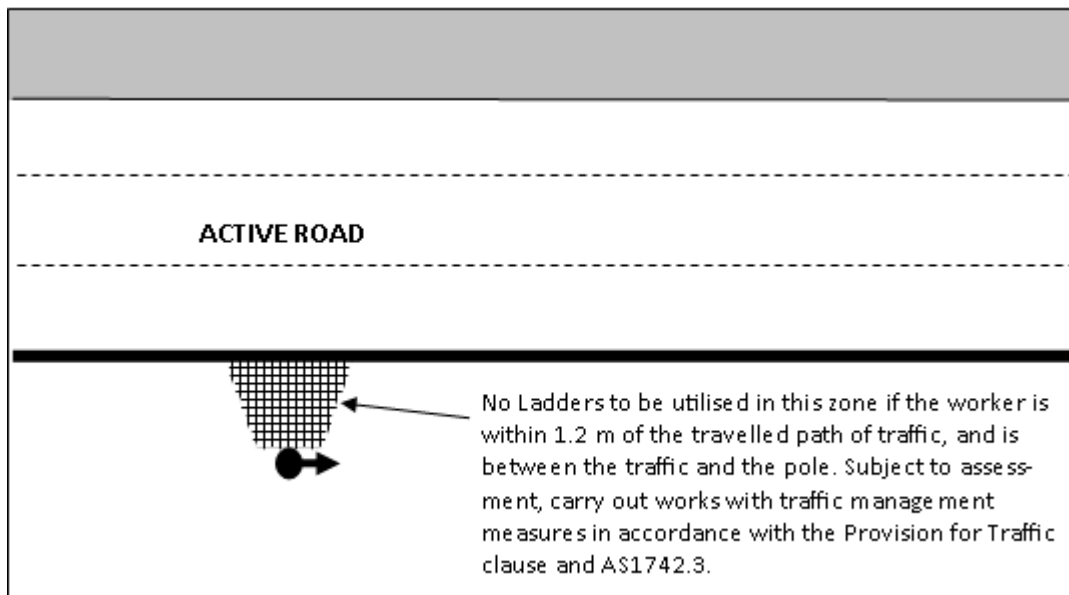
of asphalt cover over the prepared pavement surface.

Clean the surface of loose debris and position the pre-fabricated loop in the correct location, ensuring that the tail of the loop is appropriately placed and protected.

Hand place and compact asphalt over the pre-fabricated loop to ensure the asphalt paving machine does not pick the loop up as it passes over.

Fully test loop following installation, and test operation on SCATS.

### 16.28.6 Workzone Safety



**Figure 16.2 – Work Zone Safety – Ladder Exclusion Zone**

### 16.28.7 Contractor's Personnel

The contractor shall ensure that they utilise qualified trades persons only for technical/electrical works. Australian/New Zealand Wiring Rules apply.

Submit with the tender a list detailing the following for all nominated staff intended for use within the requirements of this contract:

1. Names of all personnel intended for use in the carrying out of works required under the Contract, (mobile phone numbers also to be submitted as soon as the contract is awarded).
2. Detailed work experience and electrical qualifications of all personnel as

provided above, including comprehensive details of:

- Traffic Signal Controller maintenance and fault finding experience, and /or official training,
- Communications equipment fault finding experience and official training which may include PSTN phone lines, 3G / 4G equipment, data cable testing, modems, routers and surge protection devices,
- Uninterruptible Power Supply maintenance and fault finding experience, and / or official training,
- Any other ITS experience, or other relevant training that may be of use in

the traffic signal, communications, or information technology fields,

3. Workplace Health and Safety experience, accreditation and qualifications including the National Occupational Health and Safety Construction Induction card for construction training,
4. Northern Territory accredited Work Zone Traffic Management Qualifications required to undertake any traffic management duties on an NTG road reserve.
5. Northern Territory accredited Construction White Card 'Work Safely in the Construction Industry', required to undertake any construction works / duties in the NT.

Expiration, Withdrawal or Cancellation of Qualification or Accreditations - The contractor shall keep the Superintendent's Representative advised in writing, at least 48 hours in advance of any expiry, or as soon as practical following any cancellation of any qualification or accreditation.

Additionally Nominated Contractor's personnel - Any additions of personnel to be utilised for the purpose of works within this contract shall be requested in writing to the Superintendent's Representative for consideration, at least 48 hours prior to use, and may be accepted for use in the contract at the Superintendent's Representative's discretion.

The Superintendent's Representative reserves the right to remove or suspend any person listed on the nominated staff list at any time, based on any expiration of accreditation, non-conformance or poor work practice, poor WZTM practices, actual or perceived lack of experience in relation to the technical requirements of this specification, or other reason as determined by the Superintendent's Representative.

Any information not available at the time of tender submission shall be provided to Superintendent's Representative within 7 days of the contract commencing.

Traffic Control at Work Sites shall only be performed by accredited Traffic Controller/s. Training associated with this requirement of contract is available through Registered Training Providers at the Contractors expense.

#### **16.28.8 Workplace Health and Safety (WH&S) Action Plan**

A complete company WH&S action plan and accompanying policies and procedures shall be

submitted within 2 weeks of the contract being awarded.

The company WH&S action plan that is traffic signal specific shall be finalised and provided to the Superintendent's Representative within 1 week following initial submission. The WH&S plan is additional to the Traffic Management Plan (TMP) however these documents should reference each other. It shall include, but is not limited to the following traffic signal and ITS maintenance tasks:

- Fault Maintenance activities,
- Routine Maintenance activities,
- Specific Maintenance activities,
- Traffic Accident Situations,
- Working in the road reserve safety procedures,
- Working at heights and appropriate ladder usage and procedures,
- Electrical activities and procedures,
- Heavy Lifting activities and;
- Any other relevant activity for the execution of works in this contract which may also include power tools usage, chemical handling procedures, and heat and exhaustion management.

Worksafe may be consulted in order to create an action plan that is acceptable for use. The plan shall contain references to specific legislation and standards where appropriate.

### **16.29 TRAFFIC MANAGEMENT PLAN**

Refer to PROVISION FOR TRAFFIC.

#### **16.29.1 Submission of Traffic Management Plans/ Diagrams**

Within 2 weeks of the commencement of the contract the contractor shall provide the Superintendent's Representative with a comprehensive Traffic Management Plan (TMP) and full risk assessment to be used as a template throughout this contract for all traffic signals and ITS maintenance works.

The TMP and risk assessment shall be used as a template document which shall be continuously updated throughout the contract. Where site specific issues or concerns have been identified to apply to a particular worksite or location, the TMP should be supplemented with additional or expanded information which shall be provided with the site Specific TCD/s and risk assessment, referencing the TMP in order to address those specific issues or concerns.



The TMP original submission shall as a minimum include the following generic Traffic Control Diagrams (TCD's);

**Type A (Speed Reduction)** Traffic Management setups for implementation including:

- speed reductions for an approach on a divided and undivided road, allowing for various speed zones and reductions, and various clearances to the work site.

**Type B (Lane Closures)** Traffic Management setups for implementation including:

- Lane closure for a left hand and right hand through lane, allowing for various speed zones and reductions,
- A right hand through lane in accordance with the above, allowing access for a right hand turn pocket,
- Management of any side roads affected by the lane closure/s.

**Type D (Short Term Mobile Works)** Traffic Management setup for various implementation including:

- Kerbside works
- Median works
- Right Turn Pocket works

Provide site specific Traffic Control Diagrams (TCDs) per activity as required and/or as specified.

Where a generic TCD is selected for use, an appropriate risk assessment shall be undertaken by staff prior to arrival at site to ensure that the generic TCD is suitable for that specific location. If the site does not allow for the generic TCD to be utilised, subject to consideration by qualified staff at DoI, a separate TCD and associated risk assessment shall be undertaken in order to complete the works.

Where a traffic management situation is not covered by a generic TCD within the TMP, submit the specific TCD and risk assessment to the Superintendent's Representative or Traffic Section staff at least 2 working days prior to undertaking the required works.

For Urgent Works, advise of the generic TCD or submit the specific TCD within the required timeframes in accordance with **Table 16.12 - Response Times**.

The Traffic Management Plan (TMP) is required to be designed by a Northern Territory accredited Traffic Management Plan Designer.

Include the details of the TMP Designer's name, accreditation number and date of expiry of accreditation on the TMP. Produce the plan by electronic means and submit electronically to the Superintendent's Representative.

#### **16.29.2 Implementation of Traffic Management - Hold Point**

**Hold Point** - Do not proceed with implementation of traffic management, or the commencement any works within the relevant road reserve without the TCD and TMP amendments (if necessary) being endorsed by Traffic Section staff or Road Operations staff, and any associated Temporary Speed Limit Authorisations (TSLA) being signed by the delegated person in DoI. In addition to this; if works are on a Council road, do not proceed without the relevant permits being issued, and a copy provided to Traffic Section staff.

**16.30 TRAFFIC SIGNAL & ITS LOCATIONS & OWNERSHIP - DARWIN****16.30.1 NT GOVERNMENT (DEPARTMENT OF INFRASTRUCTURE)**

**Note 1:** The below list is an indication of traffic signal and ITS assets as at October 2015, and is subject to change.

**Note 2:** Red Light Speed Cameras (RLSC) have been noted as ITS onsite so that the Maintenance Contractor is aware of the equipment within the controller and / or auxiliary cabinet. Some ITS equipment utilised for RLSCs are also used for other ITS (such as routers, fibre media converter, UPS etc.) and will be worked on within the contract.

**Table 16.7 - NT Government Owned Traffic Signals – Darwin Region**

Intersection Number	Location	No. of Main Aspect Lamps	No. of Pedestrian Aspect Lamps	No. of Pedestrian Push Buttons	ITS on site
L0002	Stuart Hwy / Daly St / McMinn St	58	4	2	CCTV
L0003	Stuart Hwy / Westralia St	45	20	10	RLSC
L0004	Stuart Hwy / Parap Rd	45	8	3	-
L0005	Stuart Hwy / Ross Smith / Woolner Rd	93	16	8	CCTV / UPS / RLSC x 2
L0006	Stuart Hwy / Bagot Rd / Snell St	70	14	5	-
L0007	Stuart Hwy / Hook Rd	42	-	-	-
L0008	Stuart Hwy / Amy Johnson Ave	89	-	-	-
L0009	Stuart Hwy / Berrimah Rd / Vanderlin Dve	78	8	4	CCTV / UPS / RLSC x 2
L0010	Tiger Brennan Dve / Woolner Rd	77	16	6	-
L0011	Bagot Rd / McMillians Rd	54	8	4	RLSC x 2 CCTV
L0012	Bagot Rd / Trower Rd / Nightcliff Dve	48	12	5	-
L0013	Trower Pelican Xing (Francis St)	24	8	4	-
L0014	Trower Rd / Lakeside Dve	45	12	5	-
L0015	Trower Rd / Parer Dve	45	12	5	-
L0016	Trower Rd / Driestone Rd	54	12	7	-
L0017	Trower Rd / Vanderlin Dve	73	32	13	CCTV
L0018	McMillans Rd / Rothdale Rd	70	24	11	-
L0019	McMillans Rd / Lee Point Rd	66	24	11	CCTV / RLSC
L0020	McMillans Rd / K.O.A Ped Xing	24	16	4	-

<b>Table 16.7 - NT Government Owned Traffic Signals – Darwin Region</b>					
<b>Intersection Number</b>	<b>Location</b>	<b>No. of Main Aspect Lamps</b>	<b>No. of Pedestrian Aspect Lamps</b>	<b>No. of Pedestrian Push Buttons</b>	<b>ITS on site</b>
<b>L0021</b>	McMillans Rd / Amy Johnson Ave	60	8	4	-
<b>L0022</b>	Vanderlin Ped Xing (Hibiscus)	24	8	6	-
<b>L0023</b>	Bagot Rd / Fitzgerald St	51	12	6	-
<b>L0024</b>	McMillans Rd / Matthews Rd	87	32	15	-
<b>L0025</b>	Tiger Brennan Dve / Dinah Beach	67	12	7	-
<b>L0026</b>	Tiger Brennan / Bennett / McMinn St	60	12	7	CCTV
<b>L0029</b>	Bagot Rd / Totem Rd	57	-	-	Lane Lights
<b>L0033</b>	Stuart Hwy / Amaroo St	42	8	3	-
<b>L0034</b>	Vanderlin Dve / Leanyer Dve	45	8	3	UPS
<b>L0035</b>	Casuarina Bus Exchange / Bradshaw	42	16	8	-
<b>L0036</b>	Trower Rd / Rapid Ck Rd	66	16	8	RLSC
<b>L0037</b>	Tiger Brennan Dve / Amy Johnson Av	54	-	-	CCTV / UPS
<b>L0038</b>	Tiger Brennan Dve / Berrimah Rd	32	-	-	-
<b>L0039</b>	Berrimah Rd / Wishart Rd	54	-	-	-
<b>L0040</b>	Vanderlin / Leanyer Waterpark Ent	45	12	6	-
<b>L0056</b>	Tiger Brennan Dve / Gonzales St	66	8	4	Lane Lights
<b>L2002</b>	Stuart Hwy / Tulagi Rd	33	-	-	UPS
<b>L2003</b>	Stuart Hwy / Temple Tce	48	-	-	CCTV / UPS
<b>L2004</b>	Stuart Hwy / McMillans Rd	39	-	-	-
<b>L2005</b>	Roystonea Ave / University Ave	57	-	-	-
<b>L2006</b>	Roystonea Ave / Temple Tce	79	20	9	-
<b>L2008</b>	Stuart Hwy / Howard Springs Rd / Lambrick Ave	84	-	-	CCTV / UPS / RLSC x 2
<b>L2009</b>	University Avenue Ped Xing	18	8	4	-
<b>L2010</b>	Stuart Hwy / Henning Rd	80	12	6	CCTV / RLSC x 2

<b>Table 16.7 - NT Government Owned Traffic Signals – Darwin Region</b>					
<b>Intersection Number</b>	<b>Location</b>	<b>No. of Main Aspect Lamps</b>	<b>No. of Pedestrian Aspect Lamps</b>	<b>No. of Pedestrian Push Buttons</b>	<b>ITS on site</b>
<b>L2011</b>	Stuart Hwy / Arnhem Hwy	36	-	-	UPS
<b>L2012</b>	Elrundie Ped Xing	24	4	2	-
<b>L2013</b>	Temple Tce / Maluka Ave	72	32	14	-
<b>L2014</b>	Stuart Hwy / Deviney Rd	86	8	4	CCTV / RLSC
<b>L2015</b>	Chung Wah Ped Xing	6	4	2	-
<b>L2016</b>	Wishart Rd / Kirkland Rd	23	-	-	CCTV
<b>L2017</b>	Tiger Brennan Dve / Tivendale Rd	32	-	-	-
<b>L2018</b>	Roystonea Ave / Yarrawonga Rd	19	12	6	-
<b>L2019</b>	Chung Wah Tce / University Ave	17	20	9	-
<b>L2020</b>	Stuart Hwy / Jenkins Rd	TBA	TBA	TBA	Radar detection RLSC x 2
<b>L2021</b>	Roystonea Ave / Lambrick Ave	51	16	6	-
<b>L2024</b>	Temple Tce Ped Crossing	24	8	4	-
<b>L2026</b>	Lambrick Ave / Farrar Bld / Zuccoli	74	24	13	-
<b>L0013 VSL</b>	Rapid Ck Variable Speed Limit Signs	-	-	-	VSL x 2
<b>L2010 VSL</b>	Arnhem Hwy Variable Speed Limit Signs	-	-	-	VSL x 2

## 16.30.2 DARWIN CITY COUNCIL

<b>Table 16.8 – Darwin City Council Owned Traffic Signals</b>					
<b>Intersection Number</b>	<b>Location</b>	<b>No. of Main Aspect Lamps</b>	<b>No. of Pedestrian Aspect Lamps</b>	<b>No. of Pedestrian Push Buttons</b>	<b>ITS on site</b>
<b>L0027</b>	Cavenagh St / Bennett St	36	16	8	-
<b>L0030</b>	Mitchell St / Daly St	51	24	10	-
<b>L0031</b>	Daly St / Cavenagh St	53	28	10	-
<b>L0032</b>	Cavenagh St / Knuckey St	36	24	8	-
<b>L0041</b>	Trower Rd / Casuarina Car Park	42	24	6	-
<b>L0042</b>	Trower Ped Xing (Casuarina)	24	8	4	-
<b>L0043</b>	Trower Rd / Bradshaw Tce	39	24	6	-
<b>L0044</b>	Mitchell St / Knuckey St	36	24	8	-
<b>L0046</b>	Gilruth Rd / Gardens Rd	51	8	6	-
<b>L0047</b>	Gilruth Ave / East Point Rd / Goyder Rd	79	16	10	-
<b>L0048</b>	East Point Rd Ped Xing (Parap)	18	4	2	-
<b>L0049</b>	Dick ward Dve Ped Xing (near Tang St)	18	4	2	-
<b>L0050</b>	Ross Smith Ave / Dick Ward Dve	42	16	4	-
<b>L0051</b>	Lee Point Rd / Parer Dve	51	8	3	-
<b>L0052</b>	Knuckey St / Smith St	29	20	6	-
<b>L0053</b>	Lee Point Rd / VRD Drive	45	8	4	-
<b>L0054</b>	Lee Point Rd / Tambling Tce	60	8	4	-

**16.30.3 PALMERSTON CITY COUNCIL**

<b>Table 16.9 – Palmerston City Council Owned Traffic Signals</b>					
<b>Intersection Number</b>	<b>Location</b>	<b>No. of Main Aspect Lamps</b>	<b>No. of Pedestrian Aspect Lamps</b>	<b>No. of Pedestrian Push Buttons</b>	<b>ITS on site</b>
<b>L2007</b>	Temple Terrace Ped Xing	18	8	4	-
<b>L2025</b>	Chung Wah Tce / The Boulevard	57	12	6	-

**16.31 TRAFFIC SIGNAL LOCATIONS AND OWNERSHIP – ALICE SPRINGS  
NT GOVERNMENT  
(MANAGED BY DEPARTMENT OF INFRASTRUCTURE – ROAD PROJECTS)**

<b>Table 16.10 – NT Government Owned Traffic Signals – Alice Springs</b>					
<b>Intersection Number</b>	<b>Location</b>	<b>No. of Main Aspect Lamps</b>	<b>No. of Pedestrian Aspect Lamps</b>	<b>No. of Pedestrian Push Buttons</b>	<b>Type of Site Audit</b>
<b>L0105</b>	Stuart / Wills	45	16	8	Vehicle
<b>L0107</b>	Stuart / Parsons	60	20	12	Vehicle
<b>L0101</b>	Stuart / Larapinta	84	24	14	Vehicle
<b>L0106</b>	Telegraph - Pedestrian Crossing	24	8	4	Pedestrian
<b>L0110</b>	Telegraph - Warning Wig Wags	12	0	0	Fire Truck
<b>L0102</b>	Stott / Bath	48	16	8	Vehicle
<b>L0103</b>	Stott / Hartley	36	16	8	Vehicle
<b>L0104</b>	Stott / Todd	48	16	8	Vehicle
<b>L0111</b>	Larapinta - Pedestrian Crossing	24	8	4	Pedestrian

**ALICE SPRINGS TOWN COUNCIL  
(MANAGED BY DEPARTMENT OF INFRASTRUCTURE – ROAD PROJECTS)**

<b>Table 16.11 – Alice Springs Council Owned Traffic Signals</b>					
<b>Intersection Number</b>	<b>Location</b>	<b>No. of Main Aspect Lamps</b>	<b>No. of Pedestrian Aspect Lamps</b>	<b>No. of Pedestrian Push Buttons</b>	<b>Type of Site Audit</b>
<b>L0108</b>	Wills / Leichhardt	48	14	6	Vehicle

Where work is required to be carried out in easements or on land adjacent to the site for the purpose of connecting services or joining up of roads etc. Ensure that the appropriate licences and approvals are obtained for work in those particular areas.

## 16.32 RESPONSE TIMES

**Table 16.12 - Response Times**

MAINTENANCE OR ACTIVITY	ALARM TYPE	TIME FOR ATTENDANCE / RESPONSE	BRIEF REQUIREMENTS – refer to Maintenance Section & Measurement & Payment for further details
<b>Legend for SCATS related alarms:</b> <b>BO:</b> Black Out <b>DA:</b> Detector Alarm		<b>FY:</b> Flashing Yellow <b>LF:</b> Lamp Fault	<b>NC/DZ/ST:</b> SCATS Communications fault related <b>PB:</b> Pedestrian Button Detector Alarm <b>WD:</b> Watchdog
<b>NOTE:</b> All response times listed are inclusive of after hours, weekends and public holidays – all response times apply <b>NOTE:</b> Maintenance & timeframes identified as 'urgent' is entirely at the discretion of the Superintendent's Rep, DoI Traffic Section, or On Call staff. Maintenance identified as 'urgent' may be based on high risk consideration (danger to the public or workers), maintenance required prior to peak hours, or other urgent requirements.			
<b>Fault Maintenance</b>			
Controller, UPS or Hardware Malfunction	FY / BO / WD	1 Hour	The provision of time for the contractor's technician to be onsite, appropriately equipped to rectify a controller, UPS or hardware malfunction. This may include internal faults, minor accidents, vandalism, storm damage, cable faults, or exposed cables.
Accident Attendance	FY / BO / WD	1 Hour	The provision of time for the contractor's 2 technicians to be onsite, appropriately equipped for an accident attendance which may include the controller, traffic signals pedestals, or any other ITS.
Other Urgent Fault, Malfunction or Maintenance as Directed	-	1 Hour	The provision of time for the contractor's technician to be onsite, appropriately equipped to attend to an urgent issue relating to traffic signals or ITS, as directed by DoI Traffic or DoI On-Call staff.
Supply & Install Generator to Traffic Signal Controller or UPS	BO	1 Hour	The provision of time for the contractor's technician to be onsite, appropriately equipped to connect a generator unit to a traffic signal controller or UPS, as directed by DoI Traffic or DoI On-Call staff. Where a generator connection can be scheduled, as much notice as possible will be provided.
Site Inspection / Routine Maintenance Inspection	-	2 Hours	The provision of time for the contractor's technician to be onsite to undertake a visual inspection of an asset or its operation, provide a photo & respond.
ITS Fault Attendance	-	2 Days	The provision of time for the contractor's technician to be onsite, appropriately equipped to test & repair all components of faulty ITS equipment.



<b>Table 16.12 - Response Times</b>			
<b>MAINTENANCE OR ACTIVITY</b>	<b>ALARM TYPE</b>	<b>TIME FOR ATTENDANCE / RESPONSE</b>	<b>BRIEF REQUIREMENTS – refer to Maintenance Section &amp; Measurement &amp; Payment for further details</b>
<b>Legend for SCATS related alarms:</b> <b>BO:</b> Black Out <b>DA:</b> Detector Alarm		<b>FY:</b> Flashing Yellow <b>LF:</b> Lamp Fault	<b>NC/DZ/ST:</b> SCATS Communications fault related <b>PB:</b> Pedestrian Button Detector Alarm <b>WD:</b> Watchdog
<b>NOTE:</b> All response times listed are inclusive of after hours, weekends and public holidays – all response times apply <b>NOTE:</b> Maintenance & timeframes identified as 'urgent' is entirely at the discretion of the Superintendent's Rep, DoI Traffic Section, or On Call staff. Maintenance identified as 'urgent' may be based on high risk consideration (danger to the public or workers), maintenance required prior to peak hours, or other urgent requirements.			
<b>Routine Maintenance</b>			
Lamp Fault - Critical (Replacement or Reset)	LF	2 Hours (from 09:00hrs if occurring a/hrs)	The provision of time for the contractor's technician to be onsite to replace or reset a traffic signal aspect array or lamp which is considered urgent by Traffic Section, or is a right turn arrow, or if the lamp fault is the second one for that signal group.
Lamp Fault – Standard (Replacement or Reset)	LF	3 Days	The provision of time for the contractor's technician to be onsite to replace or reset a traffic signal aspect array or lamp which has been identified by the contractor on SCATS or by Traffic Section.
Lamp Fault – High Mast (Replacement or Reset)	LF	7 Days (or negotiated) as	The provision of time for the contractor's technician to be onsite to replace or reset a highmast traffic signal aspect array or lamp which has been identified by the contractor on SCATS or by Traffic Section. This maintenance may be negotiated by the contractor or Traffic Section to combine works, or if urgent.
Traffic Signal Aspect – Damaged or Conflicting Display (Aspect out of Alignment)	-	1 Hour	The provision of time for the contractor's technician to be onsite, appropriately equipped to rectify a traffic signal aspect out of alignment or damaged.
Traffic Signal Pedestal Reinstallation	-	7 Days	The provision of time for the contractor to arrange & complete the reinstallation of a complete traffic signal pedestal, cabling, & associated hardware identified as of standard urgency by Traffic Section.
Traffic Signal Pedestal Reinstallation – Urgent	-	2 Days	The provision of time for the contractor to arrange & complete the reinstallation of a complete traffic signal pedestal, cabling, & associated hardware identified as urgent by Traffic Section.

<b>Table 16.12 - Response Times</b>			
<b>MAINTENANCE OR ACTIVITY</b>	<b>ALARM TYPE</b>	<b>TIME FOR ATTENDANCE / RESPONSE</b>	<b>BRIEF REQUIREMENTS – refer to Maintenance Section &amp; Measurement &amp; Payment for further details</b>
<b>Legend for SCATS related alarms:</b> <b>BO:</b> Black Out <b>DA:</b> Detector Alarm		<b>FY:</b> Flashing Yellow <b>LF:</b> Lamp Fault	<b>NC/DZ/ST:</b> SCATS Communications fault related <b>PB:</b> Pedestrian Button Detector Alarm <b>WD:</b> Watchdog
<b>NOTE:</b> All response times listed are inclusive of after hours, weekends and public holidays – all response times apply <b>NOTE:</b> Maintenance & timeframes identified as 'urgent' is entirely at the discretion of the Superintendent's Rep, DoI Traffic Section, or On Call staff. Maintenance identified as 'urgent' may be based on high risk consideration (danger to the public or workers), maintenance required prior to peak hours, or other urgent requirements.			
Detector Fault	DA	2 Hours	The provision of time for the contractor's technician to be onsite, appropriately equipped to test & repair all components of a faulty traffic signal vehicle detector.
Detector Recut / Installation	DA	7 Days	The provision of time for the contractor's technicians to be onsite, appropriately equipped to arrange & install or recut a traffic signal vehicle detector.
Pedestrian Push Button Repair or Replacement (including audio)	DA / PB	2 Hours	The provision of time for the contractor's technician to be onsite, appropriately equipped to test, repair or replace all components of a faulty traffic signal pedestrian push button, including all audio tactile components.
Communications – Test & Restore Traffic Signals or ITS	NC / ST / DZ	TSC - 2 Hours ITS – 24 Hours	The provision of time for the contractor's technician to be onsite, appropriately equipped to test, repair or replace all components of faulty communication equipment for traffic signals or ITS equipment.
<b>Specific Maintenance</b>			
Site Audit – Vehicle Signalised Intersection	-	7 Days	The required time for a physical audit to be fully arranged, completed & recorded.
Site Audit – Pedestrian Signalised Crossing	-	7 Days	The required time for a physical audit to be fully arranged, completed & recorded.
Site Audit Completed Report	-	7 Days	The required time for the final audit report, drawing/s & quotes to be submitted & accepted by DoI Traffic Section.
UPS Maintenance & Report	-	7 Days	The required time for the physical inspection & testing to be completed, & the corresponding report to be completed & submitted to DoI Traffic Section.

<b>Table 16.12 - Response Times</b>			
<b>MAINTENANCE OR ACTIVITY</b>	<b>ALARM TYPE</b>	<b>TIME FOR ATTENDANCE / RESPONSE</b>	<b>BRIEF REQUIREMENTS – refer to Maintenance Section &amp; Measurement &amp; Payment for further details</b>
<b>Legend for SCATS related alarms:</b> <b>BO:</b> Black Out <b>DA:</b> Detector Alarm		<b>FY:</b> Flashing Yellow <b>LF:</b> Lamp Fault	<b>NC/DZ/ST:</b> SCATS Communications fault related <b>PB:</b> Pedestrian Button Detector Alarm <b>WD:</b> Watchdog
<b>NOTE:</b> All response times listed are inclusive of after hours, weekends and public holidays – all response times apply <b>NOTE:</b> Maintenance & timeframes identified as 'urgent' is entirely at the discretion of the Superintendent's Rep, DoI Traffic Section, or On Call staff. Maintenance identified as 'urgent' may be based on high risk consideration (danger to the public or workers), maintenance required prior to peak hours, or other urgent requirements.			
<b>Miscellaneous / Administrative Timeframes</b>			
Provide Lifting Equipment	-	24 Hours (or as negotiated)	The provision of time for the contractor's technicians to be onsite, appropriately equipped with suitable hydraulic lifting equipment to access highmasts, CCTV or as otherwise required by Traffic Section.
Provide Detailed Quote – Standard	-	5 Days	The provision of time for the Contractor's Representative to provide a comprehensive quote inclusive of all labour & materials, following a verbal or written request for traffic signal or ITS works or repairs of a standard nature.
Provide Detailed Quote - Urgent	-	24 Hours	The provision of time for the Contractor's Representative to provide a comprehensive quote inclusive of all labour & materials, following a verbal or written request for traffic signal or ITS works or repairs of an urgent nature.
Work Order Responses	-	10:00hrs - next business day	Provision of time for all Work Order Responses, due fully completed with details of the works undertaken and other particulars as specified.
Salvaged Item Inspection	-	Next business day - AM	Provision of time for the contractor to have damaged items ready for inspection, to agree on salvaged / unrepairable items.
Provide Site Specific TCD/s including Risk Management Plan - Standard	-	5 Days	Provision of time to supply Traffic Control Diagram/s & associated risk management plan in order to undertake works within the road reserve, including the preparation of any permits or authorisations that may be required in order to carry out the works.
Provide Site Specific TCD/s including Risk Management Plan - Urgent	-	24 Hours	Provision of time to supply Traffic Control Diagram/s & associated risk management plan in order to undertake works within the road reserve, including the preparation of any permits or authorisations that may be required in order to carry out the works of an urgent nature – i.e. Traffic Signal Pedestal Reinstallation – Urgent

### **16.33 SPECIFIC MAINTENANCE – TRAFFIC SIGNALS AND ITS AUDIT**

#### **16.33.1 Site Audit – Report Template**

Refer to clause *Figures and Tables*

#### ***Figure 16.3 - Sample Template Traffic Signal and ITS Audit Report Template.***

The Traffic Signals and ITS Audit Template is a required to be comprehensively completed. The current condition of all items shall be described, with any remedial works required to be listed in red.

Diagrams or drawings of the site shall also be submitted with the report, along with photographs to support descriptions of condition of hardware – contact Traffic Section for the most current drawings.

The reports provided shall be typed, with accompanying site drawing provided in a neat, clear format, within 5 working days from completion of the audit.

### **16.34 SPECIFIC MAINTENANCE – UNINTERRUPTABLE POWER SUPPLY (UPS) SYSTEMS**

#### **16.34.1 UPS Maintenance and Battery Condition – Report Sheet**

Refer to ***Figure 16.4 – Sample Template UPS Maintenance and Battery Condition Report***

The UPS Maintenance and Condition report sheet shall be completed for each scheduled UPS maintenance inspection, and left in the door of the UPS housing. A photo of the completed report shall be forwarded to Traffic Section following each specific maintenance activity for recording.

A copy should already be in each UPS unit for completion, however contact Traffic Section if there are any issues relating to this report document.

### **16.35 STOCK LIST & QUANTITIES**

#### **16.35.1 Stock List - Example of Excel Spreadsheet with Current Quantities**

Refer to ***Figure 16.5 – Sample Stock List – Darwin – As at August 2015.***


The Stock List is a current snapshot prior to advertising of this tender, of the items of stock owned by DoI and the Contractor. The stock list will require updating upon award of this contract.

Cells highlighted in Green, indicate that the item has been added to the stock list for the month. Cells highlighted in Red, indicate that the item has been utilised from the stock list within that month.

## 16.36 Figures and Tables

Figure 16.3 - Sample Template Traffic Signal and ITS Audit Report Template

**Sample Traffic Signal and ITS Audit Report Template**



DEPARTMENT OF INFRASTRUCTURE

**TRAFFIC SIGNAL & ITS AUDIT**

**SITE:** .....

**DATE:** ..... **Time Commenced:** ..... **Time Completed:** .....

**Person Responsible for Audit Completion (Contractor)**

**Print name:** ..... **Signature:** .....


**\*Remedial Action in RED**

	ITEM / ASSET	DESCRIPTION / CONDITION (condition of assets, hardware replaced, works undertaken, remedial works required, general notes, and other recommendations or comments)
<b>1</b>	<b>POLES</b>	Check pole condition & base type (direct buried), any rust, pole top cover (painted for open links or junction box), aspect alignment/type/condition. Lenses, cowls, target boards, louvres, seals, connector rack, cable lengths. Pests. Any other infrastructure on the pole?
	Pole 1	
	Pole 2	
<b>2</b>	<b>DETECTORS</b>	Check detector condition (exposed or Scotec missing), direction of loop cut, surrounding pavement condition, operation of loop and testing of cables if required. Also check for half or full loop & advise which half is active.
	NOTE: List detectors as per SCATS image.	
	Detector 1	
	Detector 2	
<b>3</b>	<b>DETECTOR PITS</b>	Note type of pit, condition of pit & lid (pit sinking, or full of dirt), at surface level, feeder cable connections. Also CCTV &/or other ITS pits, advanced warning sign pits.
	NOTE: List which detectors that each pit feeds to.	
	Detector Pit 1	
	Detector Pit 2	
<b>4</b>	<b>CONDUIT JUNCTION PITS</b>	Type of pit & approximate size (brick, asbestos, corrugated plastic), type of lid (steel, concrete), condition of pit, any issues with conduits. Also CCTV &/or RLC pits, advanced warning sign pits.
	Pit A	
	Pit B	
<b>5</b>	<b>PEDESTRIAN GROUPS</b>	Operation of all buttons, arrow facing correct way, audio tactile & speaker, appropriate height of ped aspects (3.0m from ground), line-marking condition, any other issues with crossing. Condition of pedestrian fencing if installed (or missing).
	Walk 1 Across:	
	Walk 2 Across:	


Page 1 of 2 pages

	ITEM / ASSET	DESCRIPTION / CONDITION (condition of assets, hardware replaced, works undertaken, remedial works required, general notes, and other recommendations or comments)
6	<b>TRAFFIC SIGNAL CONTROLLER</b>	Type of controller, site ID sticker, graffiti or damage, site drawings present, footing & fixings, door & locks, internal components wiring, switches & fuses, operation of flasher unit, general cleanliness & cables tidy, signs of pest activity, any safety issues. Excessive heat.
	Controller Type / Model	
	TSC Cabinet Housing Condition	
	Auxiliary Cabinet Housing	
	On/Off/Flash Switch Operation	
	All Wiring Neat & Safe	
	TSC Interior Lighting	
	Paperwork	
	Other	
7	<b>AUXILIARY CABINET ITS COMPONENTS</b>	Check all cabling tidy, any wireless transmitters/receivers, excessive heat, graffiti or damage, door & locks, internal components wiring, switches & fuses, general cleanliness & cables tidy, signs of pest activity, any safety issues. Excessive heat.
	Router / modem	
	Fibre Media converter	
	UPS in Auxiliary Cabinet	
	Surge Protection	
	Fans Installed if Required	
	Cabling tidy	
8	<b>INTELLIGENT TRANSPORT SYSTEMS (ITS)</b>	CCTV – Check pole & footing condition, clean dome. UPS – Check cabinet condition, general inspection, and documentation. VSLS – Check poles and footing conditions, any LEDs not operational. Lane Lights – Check operation of lights, pits.
	CCTV	
	UPS	
	VSLS	
	Lane Lights	
	Other	
8	<b>COMMUNICATIONS &amp; PILLAR</b>	Check comms pillar internal cleanliness & wiring, comms pillar cover condition & type (fibre glass/steel), any pest activity, associated pit's, Linking Control Module (LCM) operation, does LCM have a card inserted, does LCM have surge protection.
	Pillar Type and Condition	
	Cabling	
	LCM	
	Pit's	
9	<b>ADVANCED WARNING SIGNS</b>	Check condition of sign & sign fixings, operation of lights, condition of poles & footings, conduits, associated pits, & cabling to signs.
	Inbound	
	Outbound	
10	<b>Misc. ITEM/S</b>	Additional notes, comments &/or recommendations

Figure 16.4 – Sample Template UPS Maintenance and Battery Condition Report



## UPS MAINTENANCE AND BATTERY CONDITION REPORT SHEET



Site No.: \_\_\_\_\_ Cabinet S/N: \_\_\_\_\_ Date Installed: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

Battery Manufacturer: \_\_\_\_\_ Battery Type: \_\_\_\_\_

INSPECTIONS AND TESTS TO BE CARRIED OUT											
Quarterly Checks				½ Yearly Checks				Install and Annual Checks			
1. 15 minute discharge test.				3. 2 Hour discharge test.				5. Re-torque battery terminals connections to 12.4 N.m (110 inch/pounds).			
2. Check battery terminal condition.				4. Apply battery terminal grease over terminal to prevent corrosion.				6. Test internal resistance disconnect <2W.			

Year 1/4 <sup>1</sup> Install	Date	Initial	Charger <sup>2</sup>		Cell 1 <sup>3</sup>		Cell 2		Cell 3		Cell 4		Cell 5		Cell 6		Cell 7		Cell 8		Inspection and test item <sup>4</sup>					
			Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	1	2	3	4	5	6		
Q1																										
Q2																										
Q3																										
Q4																										
Q1																										
Q2																										
Q3																										
Q4																										

<sup>1</sup> This is the quarter that the inspections and tests are required. Q1 starts three months from installation.

<sup>2</sup> The actual measured voltage and amperes are to be recorded in appropriate columns. This is applicable to both the Charger and Cell Columns.

<sup>3</sup> Cells (batteries) are numbered from left to right and from top shelf to bottom shelf, ie. top left cell is number 1 and bottom right cell is number 8.

<sup>4</sup> The inspection and test columns only need to be ticked to indicate that the process has been performed. The blacked out areas do not need to be checked.

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Page 1 of 2

UPS MAINTENANCE AND BATTERY CONDITION REPORT SHEET

Year 1/4 <sup>1</sup>	Date	Initial	Charger <sup>2</sup>		Cell 1 <sup>3</sup>		Cell 2		Cell 3		Cell 4		Cell 5		Cell 6		Cell 7		Cell 8		Inspection and test item <sup>4</sup>					
			Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	Volt	Amp	1	2	3	4	5	6
Q1																										
Q2																										
Q3																										
Q4																										
Q1																										
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Q4																										





## 17. STREET SWEEPING

### 17.1 OUTLINE DESCRIPTION

This section specifies the sweeping of sealed, concrete and paved surfaces of roads, car parks, kerbs, traffic islands, cycleways and footpaths.

### 17.2 STANDARDS

Comply with the following Acts and Regulations:

- Workplace Health Act and Regulations
- Traffic Act and Regulations
- Control of Roads Act
- Environmental Offences and Penalties Act
- Environment Protection and Biodiversity Conservation Act

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

Refer to Plant And Equipment clause in MISCELLANEOUS PROVISIONS section.

Refer to Work Involving Chemicals clause in MISCELLANEOUS PROVISIONS section.

### 17.3 DEFINITIONS

#### Road

Sealed carriageways utilised by motor vehicles, which consist of one or more traffic lanes in each direction, and may be edged by a concrete kerb.

#### Kerb

Concrete edging to a sealed carriageway, which may include a concrete gutter. Kerbs are generally associated with verges, medians, roundabouts or splitter islands.

#### Verges

Areas of the road reserve between the carriageway and the property boundary. Cycleways and footpaths are constructed on the road verges. Verges may or may not be kerbed.

#### Medians

Areas between divided portions of the carriageway, bounded by traffic lanes carrying traffic in opposite directions. Medians may or may not be kerbed.

#### Roundabouts

Circular centre islands at an intersection, usually having a kerbed perimeter.

#### Splitter Islands

Kerbed islands in varying shapes and sizes used to control the route vehicles take at intersections and other locations.

#### Intersections

Junction points of at least two roads, and may include roundabouts, splitter islands and medians.

### Median Breaks

Trafficable gaps in a road centre median which allow vehicles to gain access to the opposite side of the road. Median breaks are not located at intersections.

### Cycleways/Footpaths

Sealed or concreted carriageways provided for the shared use of pedestrians and/or cyclists, but exclude motorised vehicles.

### 17.4 FREQUENCY OF WORKS

The frequency of sweeping is determined by the number of cycles to be performed during the period of the contract, i.e.: 12 cycles per year equates to monthly sweeping, 26 cycles per year equates to fortnightly sweeping, 52 cycles per year equates to weekly sweeping.

Nominated major intersections, median breaks, kerbed sections of roads, cycleways and footpaths will be swept at the frequency nominated in the Response Schedules.

Other areas will be called up for sweeping at the discretion of the Superintendent.

### 17.5 SCHEDULED SWEEPING PROGRAM

Submit to the Superintendent at least 7 days in advance of the works, the scheduled sweeping program for the following calendar month. The program is to include the scheduled sweeping of all roadways, intersections, median breaks, cycleways and footpaths.

### 17.6 REQUIREMENTS

#### 17.6.1 General

Ensure that all loose or foreign material such as stone, sand, gravel, and vegetative waste deposited against kerbs and on roadways cycleways and footpaths is picked up by the sweeping plant and removed at the time of service.

Where objects such as palm fronds or any other form of obstruction with a weight of less than 40 kg is encountered and found to be obstructing progress of the street sweeping machine, relocate the object out of the path of the machine in order to permit works to proceed. Any such material may be deposited a safe distance back from kerb for later retrieval by others.

#### 17.6.2 Contractor to Inform themselves

The Contractor shall be deemed to have to have examined all sites as nominated in the Response Schedule, and satisfied themselves as to the correctness of all areas of the individual roads and cycle/footpaths under the Contract irrespective of lengths and widths.

#### 17.6.3 Manual sweeping

The hand sweeping of surfaces of medians and splitter islands may be required on occasion, and

this will be undertaken by the Contractor on a tendered hourly rate. Traffic management associated with the hand sweeping work will be supplied by Contractor.

#### 17.6.4 Sweeping of Intersections

The sweeping of intersections includes the sweeping of all road surfaces and all kerbs associated with medians, splitter islands and roundabouts. Sweeping includes all turning, stopping, crossing, and acceleration or deceleration areas including line marked areas across the whole of the road pavement within the area of the intersection.

Sweeping must be undertaken in the direction of the normal traffic flow.

An intersection will commence from the diversion point of any associated slip lane, or from the start of any painted chevron associated with line marking for diverging traffic, whichever is the most distant from the intersection. Where no slip lanes or painted chevrons exist, works will commence at a point fifty metres from the centre point of the intersecting roads.

The manual sweeping of surfaces of medians and splitter islands may be required on occasion, and this will be undertaken by the Contractor on a tendered hourly rate. Traffic management associated with the hand sweeping work is to be supplied by the Contractor.

#### 17.6.5 Sweeping of Median Breaks

The sweeping of median breaks includes the sweeping of all road surfaces and all associated kerbs. Sweeping will include all turning, stopping, crossing, and acceleration or deceleration areas including line marked areas across the whole of the road pavement within the area of the median break.

Sweeping must be undertaken in the direction of the normal traffic flow.

A median break will commence from the diversion point of any associated slip lane, or from the start of any painted chevron associated with line marking for diverging traffic, whichever is the most distant from the median break. Where no slip lanes or painted chevrons exist, works will commence at a point twenty metres from the centre point of the median break.

#### 17.6.6 Sweeping of Cycleways and Footpaths

The sweeping of cycleways and footpaths includes the sweeping of all associated surfaces. Loose or foreign material deposited as a result of heavy rain or flooding is also to be removed.

#### 17.6.7 Sweeping of Kerbs, Roads and Car Parks

Sweeping of kerbed areas of nominated roads includes all kerbs associated with medians and verges and must be undertaken in the direction of the normal traffic flow.

Sweeping of other roads and car parks will be as directed by the Superintendent. Sweeping of car parks includes all car park surfaces and associated kerbs.

Cleaning and sweeping of road surfaces associated with spillages of concrete, oil, paint and other liquids will be required on occasion as directed by the Superintendent.

#### 17.7 ROAD SWEEPING EQUIPMENT

The Contractor will possess sufficient plant to ensure continuity of service and conformance with contract requirements. This will include the provision for continuity of service when machinery is unavailable through service or mechanical breakdown.

The following characteristics are required as a minimum on road sweeping equipment:

- “suction” or “regenerated air” type.
- dual cab controls, enabling the sweeper to be operated from either the right or left side.
- fitted with dual gutter brushes and suction nozzles, enabling sweeping to be carried out on either side of the carriageway while maintaining the direction of traffic flow.
- minimum useable hopper capacity of 5.0 m<sup>3</sup>.
- fitted with noise and dust suppression features in accordance with manufacturers and regulatory requirements.
- fitted with a suction litter hose for the removal of lightweight litter.
- fitted with street washers for the cleaning of road surfaces. The machine must be capable of injecting detergent into the street washer facility. Refer to **17.9 Detergent**.
- fitted with a high pressure hand washer, with reel hose and lance for remote cleaning. The machine must be capable of injecting detergent into the hand washer facility. Refer to **17.9 Detergent**.
- minimum water tank capacity of 1200 litres.
- fitted with a dual rotating beacon positioned on the cabin of the vehicle, and two single yellow rotating beacons positioned at the rear of the vehicle. Refer to **17.12.1 Vehicle-Mounted Warning Device**.
- fitted with an illuminated flashing arrow sign, or an approved flashing bar light. Refer to **17.12.2 Illuminated Flashing Arrow Sign**.
- fitted with audio-visual reversing equipment.

- maintained in good order and condition throughout the Contract.

### **17.8 CYCLEWAY AND FOOTPATH SWEEPING EQUIPMENT**

The following characteristics are required as a minimum on cyclepath and footpath sweeping equipment:

- “suction” or “regenerated air” type.
- minimum hopper capacity of 375 litres.
- capable of removal of all material up to half a kilo (500 g) in weight.
- fitted with noise and dust suppression features in accordance with manufacturers and regulatory requirements.
- fitted with a vehicle-mounted warning device. Refer to **178 Vehicle-Mounted Warning Device**.
- fitted with audio-visual reversing equipment.
- maintained in good order and condition throughout the Contract.

### **17.9 DETERGENT – HOLD POINT**

Detergent utilised for either street washing or remote high pressure washing with the lance is to be supplied by the Contractor.

Detergent is to meet the following requirements:

- heavy duty general purpose cleaner/degreaser concentrate
- diluted in accordance with manufacturer's recommendation
- water soluble and biodegradable
- low foam, quick break product
- be non-toxic,
- not contain; caustic material, phosphate builders or glycol ether solvents
- temperature stable to a minimum temperature of 42 °C.

**Hold Point** - Provide product information details and SDS to Superintendent for approval of the detergent intended for use in the performance of the Contract prior to the commencement of the works.

### **17.10 DISPOSAL OF RECOVERED WASTE**

All recovered waste associated with the sweeping operation will be disposed of at an appropriate waste management facility. Waste is not to be abandoned on site, deposited on adjoining properties, or hidden on areas of vacant land.

### **17.11 PERSONNEL**

Ensure that all works are identified and undertaken in conformance with the requirements of the Contract.

Adequately train machinery operators in the correct operation of all equipment used in the performance of the contract. All operators will hold current licences as required under law.

All supervisors and operators will wear reflective fluorescent safety vests whenever working off

machinery or out of vehicles during the performance of the Contract.

### **17.12 TRAFFIC CONTROL**

Provide traffic control associated with the works in accordance with AS 1742.3.

The following requirements are intended to supplement or clarify the requirements of AS 1742.3.

#### **17.12.1 Vehicle-Mounted Warning Device**

Fit road sweeping equipment with one amber rotating dual beacon (Britax Aerobar 420-00 or similar) mounted over the cabin and fitted with minimum 55 watt globes. The beacon is to be visible from the front and both sides. Fit cycleway and footpath sweeping equipment with a single beacon device visible from all directions.

For road sweeping equipment, additionally provide two single rotating beacons, mounted one on each side at the upper rear of the vehicle, and visible to traffic approaching from the rear.

Ensure that all lights are operational and maintained in a clean state whenever the plant or equipment is working on roadways, cycleways or footpaths.

#### **17.12.2 Illuminated Flashing Arrow Sign**

Road sweeping equipment will be fitted with either an illuminated flashing arrow sign, or an approved flashing bar light mounted horizontally and centrally on the upper portion of the rear of the equipment.

The flashing pattern required for an illuminated flashing arrow sign while sweeping roadside kerbs is for the central bar only to be flashed.

#### **17.12.3 Very Short-Term and Low Impact Works**

Scheduled work will be undertaken as “Work Taking 5 Minutes Maximum”. As there will not be any workers on foot associated with the undertaking of these Contract works, a lookout person will not be required.

Works undertaken under the Contract will not be considered as “Mobile Works”.

#### **17.12.4 Urgent Works Request**

An Urgent Works Request may be made by the Superintendent for reasons of safety, and may be the result of a motor vehicle accident, material or debris spillage, or other incident. Such requests are to be attended to on site within one hour of the request.

In such circumstances, the Superintendent will make alternative arrangements for the management of traffic.

### **17.13 OTHER REQUIREMENTS**

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 18. AERODROME MAINTENANCE

### 18.1 OUTLINE DESCRIPTION

This section specifies the general maintenance of sealed and unsealed, aerodromes and/or aerodrome landing area (ALA), ancillary works to comply with the requirements of the Civil Aviation Safety Authority (CASA).

More information on site rules available at Specification Service webpage (link to CASA and link to manuals):

<http://www.nt.gov.au/infrastructure/techspecs/rules/index.shtml>

### 18.2 REFERENCED DOCUMENTS

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

For ALA, carry out inspections and maintenance works in accordance with the Civil Aviation advisory publication CAAP 92 – 1 (1), Civil Aviation Orders, Part 82, Section 82.3, Issue 3, Appendix 3, where applicable and all CASA Directives.

For registered aerodromes, carry out inspections and maintenance works in accordance with the CASA publication Manual of Standards (MOS) Part 139.

Precedence; Where conflict arises between this specification and CASA requirements, the CASA requirements prevail.

### 18.3 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

Refer to Plant And Equipment clause in MISCELLANEOUS PROVISIONS.

Refer to Work Involving Chemicals clause in MISCELLANEOUS PROVISIONS.

Refer to Site Rules: Civil Aviation Safety Authority (CASA) Manual of Standards (MOS) Part 139 Chapter 12.1.7 'Aerodrome works' for registered aerodromes

For unregistered Aeroplane Landing Areas (ALA) adapt CASA MOS Part 139 Chapter 10.10 'Aerodrome Works Safety' as a guideline.

### 18.4 MAINTENANCE WORKS

Carry out the maintenance works to include all works to meet the specified performance criteria.

This includes inspection, monitoring and reporting on the condition of the aerodrome to ensure its

continual compliance with the requirements of the MOS Part 139 Section 10.

Maintain the aerodrome in a condition that complies with the requirements of the Civil Aviation Regulations (CAR) and all CASA Directives.

### 18.5 UNFORSEEN MAINTENANCE

Unforeseen maintenance works includes all works other than routine maintenance works required to the aerodrome to maintain it in a condition that complies with the CAR.

Contractor to advise Superintendent of any deficiencies.

### 18.6 SLASHING

Slash the grassed areas to maintain grass and other vegetation below the following maximum heights;

- 15 mm on the runway, taxiways and apron
- 150 mm in all other areas within the aerodrome fence line
- 150 mm around the outside perimeter of the fence line
- As part of the slashing operation remove any litter, rubbish or debris from these areas.

### 18.7 WEED CONTROL

For weed control by the chemical spraying method refer to the Aerodromes sub-clause in the Vegetation Control clause in SLASHING AND WEED CONTROL.

### 18.8 CUTTING OF RE-GROWTH

Cut the re-growth on the approaches and side transitions to maintain the longitudinal and traverse clearway and slope requirements, as detailed in the Guidelines for ALA of the CASA.

Remove the cut re-growth from the site to an approved location.

### 18.9 DRAGGING OF AERODROME

Drag the aerodrome with a sufficiently heavy metal beam to fill minor depressions, cracks and wheel ruts and to spread any build up of loose material.

Break up and dispose of ant hills and backfill, if necessary with suitable material. Compact backfilled areas where ant hills were removed.

Maintain the surfaces to limit cracks to the following dimensions;

- Runways, taxiways and aprons; 40 mm.
- Runway strips adjacent to the runway; 70 mm

### 18.10 ROLLING OF RUNWAYS

#### UNSEALED RUNWAYS

Roll gravel runways and taxiways when there is moisture in the pavement, but not saturated, to incorporate loose material and to compact the surface.

Roll with a rubber multi tyred roller with a minimum mass of 15 tonnes and a minimum of 3 passes at approximately 10 km/h.

#### SEALED RUNWAYS

Roll bitumen sealed runways and taxiways to invigorate the bitumen and rebind loose aggregate.

Carry out the rolling work during dry weather and at the hottest part of the day.

Roll with a rubber multi tyred roller with a minimum mass of 15 tonnes and a minimum of 3 passes at approximately 10 km/h.

#### 18.11 MAINTENANCE GRADE – RUNWAY

Grade the full width of the runway surface to remove corrugations and fill in ruts, holes and depressions.

Win and recover material from the edge of the runway.

Spread the trimmed and windrow material evenly across the full width of the runway to fill depressions and to obtain the required cross section.

#### 18.12 GRAVEL SHEETING

Where gravel sheeting is required refer to the Gravel Sheeting clauses of MAINTENANCE GRADING AND GRAVEL SHEETING.

#### 18.13 FENCE AND GATE MAINTENANCE

Maintain aerodrome fences and gates to ensure the fence provides a continuous and taut barrier that prohibits the entry of livestock and similarly sized feral animals to the same level as when originally constructed.

When replacing fencing components conform to the standards of materials and workmanship on the appropriate standard fencing drawings.

#### 18.14 AERODROME FURNITURE

##### WINDSOCK

Repair or replace the windsock when it is not working effectively or when it has reduced visibility such that it is not clearly visible to all aerodrome users.

Maintain the windsock and signal areas in a blackened state to provide sufficient contrast that the windsock signals would be visible to all aerodrome users.

Maintain white markers to clearly define the boundaries of these areas.

##### MARKER CONES

Eradicate grass around marker cones such that no grass or vegetation reduces the visibility of the complete cone or marker.

#### SAFETY EQUIPMENT

Maintain flares in working order to the number required by CASA.

Ensure that the following safety equipment is available, is stored safely and is repaired, painted or replaced as necessary;

- un-serviceability cross
- orange safety cones
- displaced threshold markers
- red and white un serviceability cones

#### AERODROME LIGHTING

Inspect and maintain the runway lighting including the supply and installation of batteries and globes as required.

#### REPLACEMENT FURNITURE

The supply of replacement safety equipment and furniture as necessary will be provided by the Principal.

##### 18.14.1 Aerodrome Products

##### General

Comply with Civil Aviation Safety Authority (CASA) legislations and regulations unless otherwise specified.

Items required under this section will include:

- Gable Boundary Markers
- Cone Markers
- Unserviceability Marker Cones
- Windsocks
- Threshold Lights (battery operated)
- Battery Powered Solar Charged Photo Cell (LED) Lights

Colour and sizes will be as ordered.

##### Gable Boundary Markers

Manufactured of fibreglass, with provision for securing to the ground with steel pegs.

Size: Length 3000mm, Width 1000mm, Height 500mm.

Colour: White.

##### Cone Markers

Manufactured either of rubber or lightweight frangible materials such as fibreglass, with provision for securing to the ground with steel pegs.

Size: Either:

- Base diameter 750mm, Height 500mm, or
- Base diameter 500mm, Height 260mm.
- Colour: White or yellow, as ordered:
- White for 750x500, or
- White or yellow for 500x260.

### **Unserviceability Marker Cones**

Manufactured either of rubber or lightweight frangible materials such as fibreglass, with provision for securing to the ground with steel pegs.

Size: Base diameter 750mm, Height 500mm.

Colour: White, with a midway horizontal red band 230mm high.

### **Windsocks**

Manufactured using unlaminated poly fabric complete with a 19mm rod support around the 900mm opening together with eyelets for attachment.

Size: Length 3650mm, Diameter: 900mm tapering evenly to 230mm.

### **Threshold Lights**

Manufactured using high-impact plastic.

- Battery Powered Solar Charged Photo Cell (LED) Lights

Lens Colour: Either red blue green or half and half, as ordered.

Battery Powered Solar Charged Photo Cell Lights must meet the requirements of the CASA.

### **18.15 OTHER REQUIREMENTS**

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 19. ROAD AND MARINE AMENITY MAINTENANCE

### 19.1 ROAD AND MARINE AMENITIES

The road and marine amenities referred to in this section include rest areas, tourist features, boat ramp amenity areas, roadside stopping places, information bays and car, boat and truck parking bays. General descriptions of these areas are provided in the Definitions clause of AS 1742.6.

Marine amenity specific requirements appear at the end of this work section.

### 19.2 OUTLINE DESCRIPTION

This section specifies the maintenance requirements for routine, periodic and specific maintenance of road and marine amenity areas identified in the PROJECT SPECIFIC REQUIREMENTS section of the RFT.

The maintenance operations in this section are performance based to specified service levels.

Some operations are specifically ordered as required by the Superintendent.

Maintenance operations generally include:

- Rubbish removal
- Maintenance of toilets, shelters and furniture
- Grass cutting, trimming, weeding
- Supplying water and maintaining irrigation systems
- Maintenance of water tanks and water quality
- Maintenance of barbecues and provision of firewood
- Roadside rubbish collection
- Removal of dead animals and abandoned vehicles.

### 19.3 STANDARDS

Comply with the Acts, Regulations, Guidelines and Codes applicable to the works. Comply with the requirements of Authorities with jurisdiction over the works. Conform to the Standards and Publications quoted throughout this document unless specified otherwise. Refer to REFERENCED DOCUMENTS.

Refer to Plant and Equipment clause in MISCELLANEOUS PROVISIONS.

Refer to Work Involving Chemicals clause in MISCELLANEOUS PROVISIONS.

Refer to Waste Disposal clause in MISCELLANEOUS PROVISIONS.

#### Specification Reference

Refer to the Northern Territory Government Standard Specification for Environmental Management and to the RFT.

## 19.4 DEFINITIONS

### Routine Maintenance

Ongoing maintenance carried out in accordance with the program of works to achieve the service levels required.

### Periodic Maintenance

Items of maintenance to be carried out at a particular time in accordance with the program of works.

### Specific Maintenance

Items of maintenance to be carried out as and when required and ordered with the issue of a works order by the Superintendent.

### Vegetation

Refers to any plant growth, grasses, shrubs and trees in the area to be treated.

### Weeds

Refers to undesirable vegetation in the area to be treated.

### Herbicide

A chemical formulation for control and eradication of vegetation and weeds.

## 19.5 REFERENCE STANDARD DRAWING

Refer to PROJECT SPECIFIC REQUIREMENTS section of the RFT for locality map and list of Road Amenity areas included in the contract.

## 19.6 PROGRAM OF WORKS

Submit a 12 month Maintenance Program for routine and periodic maintenance of all Road and Marine Amenity areas within 2 weeks of award of contract in the first year, and 2 weeks prior to the commencement of a subsequent 12 month period.

Identify the type, frequency and timing for each service associated with the contract, however, achieve the specified service levels regardless of frequency of treatment.

The Superintendent will measure the progress of the work against the Contractor's submitted Maintenance Program.

## 19.7 EXTENT OF WORK

Maintain the full extent of all Road and Marine Amenity areas identified in the PROJECT SPECIFIC REQUIREMENTS section of the RFT.

Identify and undertake the works required to maintain all amenity areas to comply with the specified service levels, which are clearly defined outcomes specified for all the maintenance works specified herein.

Undertake specific scheduled works issued by the Superintendent.

Undertake specific unscheduled works requested by the Superintendent, to be paid at a fair and reasonable rate negotiated between the Contractor and Superintendent.

Replacement items of a major nature and not covered under routine or periodic maintenance



will be paid for at the invoiced price plus the Contractor's scheduled mark-up percentage.

Comply with the specified response times for attendance and completion of work to be carried out for safety or other reasons, including afterhours call-outs. The Superintendent will engage a third party to attend to and complete the work at the Contractor's expense if specified response times are not met.

### 19.8 INFORMATION SIGN

Erect an information sign at each rest area with details of the:

- Name and telephone number of Period Contractor for Maintenance of Road and Marine Amenity Areas.

Erect the sign to be clearly visible and securely attached to the shelter shed, and where there is no shelter shed, at a location approved by the Superintendent.

Ensure that the information on the sign is kept current for the duration of the contract.

Fabricate the sign from 0.6 mm off white pre-painted sheet steel, size 600 mm x 400 mm, with 50 mm high Helvetica medium black lettering. Fix to the metal framework of the shelter with 4 mm pop rivets at 200 mm centres.

### 19.9 RUBBISH COLLECTION

#### 19.9.1 Service Levels for Rubbish Collection

Maintain Road and Marine Amenity areas;

- Clear the site of all rubbish that is visible from the site and ensure that,
- There are no more than ten items of rubbish within the site or visible from within the site at any time.

#### 19.9.2 Rubbish Collection Operations - Witness Point

Collect rubbish and remove from Road and Marine Amenity areas to comply with the service level requirements, and prior to grass cutting operations.

Dispose of all rubbish at a Community or Council Waste Disposal Site and pay all dump fees where applicable.

Do not store rubbish for later retrieval anywhere within the amenity areas.

Rubbish is defined as any loose unattached inanimate item or any other object that does not form part of the Road Amenity areas.

Rubbish includes, but is not limited to:

- food scraps
- goods packaging,
- paper products,
- plastic products,
- rubberized products, including tyres and batteries.

- glass products,
- metal / alloy products,
- stone or masonry products or items including concrete chunks,
- any material excluding liquids resultant from a vehicle accident,
- any vegetative item,
- any mechanical item or part that is not related to intact mechanical, electrical or service-related infrastructure occurring within the amenity areas,
- any loose, unattached inanimate item that the Superintendent deems is not required, wanted or expected to occur within the amenity areas.

**Witness Point** - Normal rubbish collection does not include illegal signage or abandoned vehicles or equipment, however, report these items to the Superintendent.

**Witness Point** - Report to the Superintendent any occurrences of concrete spills, gravel, sand or soil on any trafficable surface. These materials are not rubbish under the terms and conditions of the contract and may be removed by others. If not removed by others, remove upon issue of direction to work from the Superintendent at a fair and reasonable negotiated rate.

Remove rubbish resulting from a significant spill event that cannot reasonably be removed within one hour of commencement of work at a fair and reasonable negotiated rate for time expended in excess of one hour.

Remove any single item of rubbish with a weight greater than 50 kg at a fair and reasonable rate negotiated with the Superintendent.

#### 19.9.3 Roadside Rubbish Collection

Roadside rubbish collection is a specific maintenance item and is only to be carried out after a works order is issued by the Superintendent.

Collect all rubbish and remove from the roadside verge, within 10 km of towns, communities, commercial areas, and roadhouses.

Collect rubbish and remove from the roadside between the outside of the outer batters on each side of the road formation, and in fill areas 4 m from the toe of the batter, only upon issue of a direction to work from the Superintendent.

### 19.10 RUBBISH REMOVAL

#### 19.10.1 Service Levels for Rubbish Removal and Bin Placement and Replacement

Maintain amenity areas so that;

- bins do not overflow and have a build-up of rubbish on the ground around the base of the bin,
- bins are not unpleasant for users to deposit rubbish into, due to decomposing rubbish.

**19.10.2 Rubbish Removal Operations**

Empty bins and remove rubbish from the amenity areas to comply with the service level requirements.

Install new plastic rubbish bin liners in all rubbish bins when rubbish is removed. Fold the plastic bin liners over the lip of the bins and secure with packaging tape.

Respond to any direction given by the Superintendent to empty bins and/or remove rubbish within 48 hours.

Dispose of rubbish at a community or council waste disposal site and pay all fees and charges.

Do not store rubbish for later retrieval anywhere within the amenity areas.

Modify the frequency of rubbish removal as necessary to allow for seasonal variances.

**19.10.3 Deodorising Rubbish Bins – Witness Point**

After emptying rubbish bins wash out as necessary and place deodorising granules in the bottom of the bins to comply with the service level requirements.

**Witness Point** - Use Nilodew granules as manufactured by Nilodor Inc. or equivalent as approved by the Superintendent.

Spread approximately 30 grams of the deodorant granules across the bottom of each rubbish bin.

**19.10.4 Bin Placement and Replacement Operations**

Provide rubbish bins, replace or repair missing, damaged or rusted rubbish bins, at amenity areas to comply with the service level requirements.

Provide suitable metal or plastic 200 litre capacity rubbish bins, painted off white. These become the property of the Principal once on site.

Provide sufficient drain holes to prevent bins holding water.

Provide new plastic bin liners in all rubbish bins.

Modify the number of bins as necessary to allow for seasonal variances.

**19.10.5 Rubbish Bin Lids**

At the commencement of the contract ensure that all rubbish bins have lids to prevent animals and birds removing the contents.

Where necessary fabricate new lids from 25 mm x 25 mm welded mesh with a wire diameter of 3.15 mm (Smorgon WG311) and welded to a 10 mm diameter rod frame hinged to a mild steel frame on the top of the bin, fabricated from 50 mm x 3 mm mild steel flat.

Refer to Standard Drawing RU3A (B95-2284).

Ensure that lids are maintained at all times. If a bin loses its lid replace it within 7 days.

**19.10.6 Illegal Rubbish Collection – Witness Point**

Normal rubbish collection does not include illegal dumping of household refuse, signage or abandoned vehicles or equipment; however, report these items to the Superintendent.

**Witness Point** - Report to the Superintendent any occurrences of illegal rubbish dumping, vegetation dumping, concrete spills, gravel, sand or soil on any trafficable surface. These materials are not rubbish under the terms and conditions of the contract and may be removed by others. If not removed by others, remove upon issue of direction to work from the Superintendent, to be paid for at unit rates nominated in scheduled rates, or at negotiated rate.

**19.11 CLEANING OF ROAD AND MARINE AMENITY AREA FURNITURE****19.11.1 Service Levels for Cleaning of Road and Marine Amenity Area Furniture**

Maintain tables and seating at rest areas so that they are clean, free of rubbish and suitable to use at all times.

**19.11.2 Cleaning of Road and Marine Amenity Area Furniture Operations**

Clean tables and seating at rest areas to comply with the service level requirements.

Respond to any direction given by the Superintendent to clean tables and seating within 48 hours.

Remove rubbish from the surface of tables and seating, scrub clean with a scrubbing brush, water and detergent, rinse off with water.

Leave in a clean hygienic condition and suitable for use.

Modify the frequency of cleaning tables and seating as necessary to allow for seasonal variances.

**19.12 CLEANING OF AMENITY AREA TOILET BLOCKS****19.12.1 Service Levels for Cleaning of Amenity Area Toilet Blocks**

Maintain toilet blocks at amenity areas so that;

- they are clean, free of rubbish and suitable to use at all times.
- the 500 litre water tanks are not less than 30 % full at all times.
- the jumbo toilet rolls have sufficient paper to last to the next service by the Contractor.
- the liquid soap dispensers are filled at each service by the Contractor with liquid soap as recommended by the dispenser manufacturer.
- the solar powered exhaust fans, where fitted, are in working order.

### 19.12.2 Cleaning of Amenity Area Toilet Block Operations

Clean the toilet block at amenity areas where installed to comply with the service level requirements.

Respond to any direction given by the Superintendent to clean the toilet block within 48 hours.

Keep all surfaces free from dirt, grime and cobwebs.

Mop the floors with a disinfecting agent and disinfect all handled surfaces, i.e. hand rails, door knobs taps, etc.

Take care when cleaning the toilet bowl not to allow disinfectant to be added to the storage chamber.

Ensure that the toilet roll holders and soap dispensers are clean and work efficiently.

Leave in condition that is suitable for use.

Modify the frequency of cleaning toilet block as necessary to allow for seasonal variances.

### 19.13 MAINTENANCE OF ROAD AND MARINE AMENITY AREA TOILETS

#### 19.13.1 Toilet Systems

The particular toilet system at a road amenity area is identified in the PROJECT SPECIFIC REQUIREMENTS section of the RFT.

#### 19.13.2 Composter Type Systems

Inspect the composting chamber at monthly intervals and rake over the compost using the special compost rake.

After raking, cover the compost with a layer of wood shavings to the manufacturer's specifications.

Ensure that the drain is free flowing and unobstructed.

Advise the Superintendent when the composting chamber is to the level requiring the compost to be removed and the chamber to be re-started.

#### 19.13.3 Clean Out of Toilet Compost systems

When instructed by the Superintendent, clean out and re-start the toilet compost chambers as follows;

Clean out the compost chamber and dispose of the compost by burying at a community or council waste disposal site and pay all fees and charges.

Cover the floor of the compost chamber with wood shavings and treat with chemical composting bacteria in accordance with the manufacturer's instructions.

Spray the area lightly with a water mist.

Ensure that the drain is free flowing and unobstructed.

### 19.13.4 Collection Well Type Toilet Systems

Treat the collection wells with a deodorising organic based chemical at weekly intervals.

Only use chemicals recommended by the toilet manufacturer and in accordance with the application instructions.

#### 19.13.5 Emptying Collection Wells

When the collection well is at a maximum of 75 % capacity arrange for the well to be pumped out and the system restarted with seed water in accordance with the manufacturer's instructions.

For liquid waste removal only use operators that are accredited in waste management and approved to dispose of waste at a Power Water sewerage treatment site.

Ensure that all health requirements are met when pumping out collection wells and transporting waste.

### 19.14 GRAFFITI

#### 19.14.1 Graffiti Removal

Clean off or paint over any graffiti at road and marine amenity sites so that;

- the contained area of graffiti on signs, furniture or other surfaces does exceed 10 % of the total readily visible surface area for the particular item.
- offensive graffiti is removed as soon as it is observed and before leaving the particular site.

Clean graffiti off signs with an approved graffiti cleaning agent.

Respond to any direction given by the Superintendent to remove graffiti within 48 hours.

### 19.15 GRASS CUTTING

#### 19.15.1 Service Levels for Grass Cutting

Maintain verges within the established confines of road amenity areas so that;

- Grass maximum cut from the ground is as per **Table 19.1 – Grass Height Specification.**
- Grass height for more than 10% of any one area at any time does not exceed the heights in the table below.
- Grassed verges are neat and tidy.

<b>Table 19.1 – Grass Height Specification</b>		
<b>Amenity</b>	<b>Maximum grass cut</b>	<b>Grass height does not exceed</b>
Special Areas as nominated in the Project Specific Req.	100 mm	200 mm
Rest Areas within townships	100 mm	200 mm
Rest Areas on National Highways	100 mm	200 mm
Rest Areas on other roads within 10 km of a township	100 mm	300 mm
Rest Areas - Other	100 mm	300 mm
Truck Parking Bays within townships	100 mm	200 mm
Truck Parking Bays – Other roads within 10 km of township	100 mm	300 mm
Truck Parking Bays – Others	100 mm	300 mm
Aerodromes	100 mm	200 mm
Irrigated verges within townships	50 mm	200 mm
Non-irrigated verges within townships	100 mm	200 mm
Parks	50 mm	200 mm

### 19.15.2 Grass Cutting Operations

Cut grass at road and marine amenity areas to comply with the service level requirements.

Respond to any direction given by the Superintendent for grass cutting within 7 days.

Collect rubbish prior to grass cutting operations.

Definition: grass includes clumps or tufts of grass growing on scalded areas, grass species that grow at faster rates than other species, and includes the whole of the plant including leaves, seed stems and seed heads.

Cut grass from the edge of pavement and seal to the extent of the rest areas, truck parking bays and boat ramp areas or to the cleared tree line.

Cut grass to clean cut, not broken or ripped, using equipment capable of maintaining the health and appearance of the grass and ground cover.

Cut grass around established trees and shrubs, and around road furniture.

Do not cut shrubs and trees with a calliper size at base greater than 50 mm diameter, planted vegetation, or vegetation regardless of size that has been pegged and directed by the Superintendent to be retained.

Remove cut material or other detritus matter from the grass cutting, trimming or weeding processes

from the site and dispose of at a community or council waste disposal site and pay all fees and charges.

Modify cutting methods and frequency as necessary to allow for seasonal variances.

Immediately replace and/or repair furniture damaged by grass cutting operations.

### 19.15.3 Grass Cutting Plant and Equipment

Anticipated plant requirements are ride on mowers or push motor mowers.

Use suitable guards on all machinery to prevent material being sprayed onto the road surface and endangering vehicles, persons or property.

Keep 2 x 9 kg water fire extinguishers on site to extinguish fires that may be started by mowing operations.

### 19.16 GRASS TRIMMING

#### 19.16.1 Service Levels for Grass Trimming

Maintain verges within the established confines of road and marine amenity areas to service levels for grass cutting using trimmers where they cannot be addressed by grass cutting operations.

Maintain joints on concrete, seal and paving and any other hard surfaces occurring within the road amenity areas so that;

- Grass does not reach 50 mm in height and/or 100 mm in diameter.

#### 19.16.2 Grass Trimming Operations

Trim grass at road and marine amenity areas to comply with the service level requirements, in conjunction with grass cutting service.

Respond to any direction given by the Superintendent for grass trimming within 7 days.

Trim grass for the purposes of aesthetics, integrity of asset, functionality, public safety, including vegetation protruding from adjoining properties.

Trim grass at back of kerbs, around drainage inlets and outlets, drainage lines and culverts, edges and surfaces of footpaths and cycle paths, access ramps, drive ways, any form of infrastructure, utility, furniture, signs, on in or around verges, traffic control devices, fence lines, barriers, trees, concrete or paving.

Trim grass on concrete, paved or bituminous surfaces to ground or surface level. Use of super-heated steam for longer term treatment is permitted here, as is herbicide in accordance with the Herbicide clause.

#### 19.16.3 Grass Trimming Plant and Equipment

Use mechanical or manually operated hand held equipment that has no detrimental effect to the landscape or road asset.

Fit suitable guards on all machinery to prevent material being sprayed onto the road surface and endangering vehicles, persons or property.

## 19.17 WEEDING

### 19.17.1 Service Levels for Weeding

Maintain verges within the established confines of road amenity areas to service levels for grass cutting and trimming, but where they cannot be addressed by grass cutting or trimming operations.

Remove unwanted plant and grass species.

### 19.17.2 Weeding Operations

Weed any areas and at road pavement and kerb junctions, within garden beds and within or around any other structure or feature occurring within the road amenity areas which cannot be controlled by grass cutting or trimming, to comply with the service level requirements.

Respond to any direction given by the Superintendent for weeding within 7 days.

Carry out weeding for the purposes of addressing issues related to aesthetics, integrity of asset, functionality or public safety.

Dispose of all removed weed matter at a community or council waste disposal site and pay all fees and charges.

Do not allow weeding treatment to impinge on the health of other desirable species, or result in damage to any part of the road amenity area asset.

Carry out weeding by mechanical, manual or chemical means.

Remove or treat with herbicide all weeds prior to them seeding.

### 19.17.3 Chemicals – Witness Point

**Witness Point** - Submit to the Superintendent the list of chemicals intended for use during the contract, if herbicide is intended for use, details of pest species controlled by the chemicals, and life expectancy of control.

Use chemicals that are approved by the APVMA. Find all information pertaining to the use requirements of chemicals on the Authority's web site <http://services.apvma.gov.au/>.

Use herbicides that are biodegradable and do not contain lead arsenates or other substance or salts dangerous to humans or animals.

Use spreading agents if and as recommended on the labels.

### 19.17.4 Herbicide

Glyphosate is the only herbicide permitted for use for weed control. Use according to manufacturer's directions for use.

Do not use herbicide for the treatment of weeds at the following areas:

- at drainage lines
- beyond 500 mm of road amenity area or roadside furniture
- beyond 500 mm from the vertical trunk at the base of any tree.

Minimise the use of herbicide.

Apply herbicide at killing strength and not to retard growth.

Do not use dyes in the application of herbicides.

### 19.17.5 Chemical Spraying

Handle, transport, spray, store and dispose of chemicals and their containers as specified in product SDS.

Do not spray on days of wind velocity greater than 15 km/h mean value and gusts exceeding 19 km/h because of the risk of spray drift causing a hazard on adjoining properties.

Do not cause or allow spray drift. Prevent misting in breeze conditions by spraying at a lower pressure or adjusting spray nozzles to increase droplet particles size, or other suitable means.

Do not spray near schools during school hours or during outdoor activities at the school at any time. Spray only when wind is blowing away from the school.

Do not spray during rain or when vegetation is saturated.

### 19.17.6 Personnel Handling of Chemicals

Be registered for business as weed control operators, or engage subcontractors registered for business as weed control operators.

Personnel carrying out spraying operations must have undertaken and passed a National Farm Chemical User Training Program.

Do not allow spray drift. Operators must be competent in their understanding of how to prevent spray drift.

Keep a copy of the Safety Data Sheet on site for each type of chemical used

Handle all chemicals as specified in product SDS.

Wear as a minimum the protective clothing as specified in product SDS.

## 19.18 IRRIGATION SYSTEMS

### 19.18.1 Top Up Systems

Where irrigation water storage systems are installed, top up the system with water at each visit to the particular site.

Check the system for correct operation and maintain as required.

## 19.19 AMENITY TREES

### 19.19.1 Replacement Trees

Replace any amenity trees in the particular road amenity site that have died or have been badly damaged.

Replace with healthy trees of the same species and of a minimum height of 2 m.

Dispose of dead trees and waste at a community or council waste disposal site and pay all fees and charges.

## **19.20 WATER TANKS AND WATER MAINTENANCE**

### **19.20.1 Service Levels for Water Tank and Water Maintenance**

Maintain water tanks and water in water tanks at road and marine amenity areas so that;

- tanks are never less than 30% capacity,
- water in tanks is at all times uncontaminated and potable,
- taps cannot be left on, are well maintained and are simple to use.

### **19.20.2 Water Tank and Water Maintenance Operations**

Maintain water tanks and water in water tanks at road amenity areas to comply with the service level requirements.

Respond to any direction given by the Superintendent for water tank and water maintenance within 48 hours.

Refill water tanks with potable water from a town water supply.

Monitor quality of water in tanks as follows:

- Supply and maintain chlorine level testing equipment.
- Test free chlorine levels after filling of tank with a Hach 46700-00 or equivalent Digital Chlorimeter.
- Ensure chlorine levels are within 1 to 1.25 ppm (or mg/L) prior to leaving rest area.
- Record free chlorine levels on report form Road Amenity Adverse Condition Report, and submit with monthly CSR / tax invoice.

Empty, clean out, disinfect and refill water tanks when water becomes contaminated in accordance with the Water Tank De-Contamination clause.

Replace taps that are damaged or missing.

Repair leaks in water tanks as required.

Modify frequency of service as necessary to allow for seasonal variances in use.

### **19.20.3 Water Tank Inspection**

Inspect the water tank at each visit for damage or vandalism.

Fit locks to tank lids and keep locked at all times.

If the tank lid has been forced open or the tank is damaged to allow the importation of foreign material the water contained in the tank is deemed to be contaminated.

### **19.20.4 Water Tank De-contamination**

Where a water tank is deemed to be contaminated, carry out the following procedure;

- Drain the tank,
- Repair the damage, if applicable, by a suitable method to ensure the integrity of the tank,
- Thoroughly clean the insides of the tank using a high pressure water jet and super

chlorinated water containing 40 ppm of free chlorine.

- In some cases the contamination may need to be removed by scrubbing the internal surfaces. Ensure worker safety by complying with Work Health and Safety (NUL) Act and Regulations and with Codes of Practice applicable to work in confined spaces and with AS 2865. Finally flush the tank out as per the preceding paragraph.
- Refill the tank with fresh potable water and add chlorine to the correct level and test.

### **19.20.5 Prevent Cross Contamination**

Protect the potable water supply from cross contamination from equipment used in the maintenance of the toilet systems or other areas.

Do not use tanks, pumps, hoses or other equipment associated with the maintenance of toilet systems in the servicing of potable water tanks.

## **19.21 MAINTENANCE OF BARBECUES**

### **19.21.1 Service Levels for maintenance of Barbecues**

Maintain the barbecues at road and marine amenity areas so that they are clean and suitable for use at all times.

Respond to any direction given by the Superintendent for barbecue maintenance within 72 hours.

### **19.21.2 Disposal of Ash**

Remove the ash and burnt wood fragments from the barbecues and dispose of at a community or council waste disposal site and pay all dump fees and charges.

The removed ash may be used as mulch on garden beds provided it is not visually distracting.

## **19.22 PROVISION OF FIREWOOD**

### **19.22.1 Firewood Bins**

Provide firewood bins at each roadside and marine amenity site where barbecues are provided.

Use upturned concrete culverts at least 1.2 m wide, 2.4 m long and 0.9 m deep. Place the firewood bins a minimum of 4 m from the barbecues and bed them solidly to prevent rocking.

### **19.22.2 Service Levels for Provision of Firewood**

Provide firewood at road and marine amenity areas so that;

- firewood log diameter does not exceed 150 mm,
- firewood should be of reasonable burning quality suitable for use in public barbecues and with a minimum density of 1000 kg/m<sup>3</sup>,

Do not provide any treated timber as firewood.

Fill the firewood bins at the following frequencies;

<b>Table 19.2 - Firewood Bin Refilling Frequencies</b>	
<b>Location</b>	<b>Frequency</b>
Special areas as nominated in the Project Specific Req.	Stockpiles never fall below 200 kg
Rest Areas on National Highways	Once a week
Other areas	Once a week

### 19.22.3 Provision of Firewood Operations

Provide adequate stockpiles of firewood at road and marine amenity areas where there are barbecues to comply with the service level requirements.

Store the firewood in the firewood bins.

Respond to any direction given by the Superintendent for provision of firewood within 72 hours.

Modify frequency of service as necessary to allow for seasonal variances in use.

## 19.23 PAINTING OF FURNITURE AND EQUIPMENT

Carry out all painting in accordance with AS/NZS 2311.

Prepare new surfaces for painting in accordance with Section 3 of AS/NZS 2311.

For repainting of existing surfaces conform to Sections 7 and 8 of AS/NZS 2311. This includes cleaning down with sugar soap, treatment of mould growth, rubbing back existing painted surfaces with abrasive paper and patching and priming of damaged surfaces.

Refer to PROTECTIVE COATINGS for marine locations and steel protection.

### 19.23.1 Paint Materials

Use only 100% acrylic low-gloss paint complying with the APAS specification 0280/3

Use only premium paints from approved manufacturers which include the following;

- Dulux Weathershield
- Taubmans Sunproof / Endure
- Wattyl Solagard.

The colours for painting of furniture and equipment are standard colours from the AS 2700 colour range and are as follows;

- Water tanks, tables and seating, shelter shed;
- Northern Region – Darwin to Dunmarra. G 11 Bottle Green. Similar to Mid Brunswick Green on Manufacturer's colour charts.
- Southern Region – Dunmarra to the South Australian border. G 54 Mist Green. Similar to Mist Green on Manufacturer's colour charts.
- Rubbish bins, water tank protection rails - Y 35 off White.

Ensure that the manufacturer's tinting is suitable for external use.

Use paint from the same manufacturer to ensure consistency of finish, particularly when touching up existing paintwork.

### 19.23.2 Initial Painting

Repaint all existing furniture at road amenity areas at commencement of the contract.

Paint new rubbish bins prior to placing on site.

### 19.23.3 Touch Up Painting

Carry out touch up painting on all existing furniture at road amenity areas once every 12 months.

### 19.23.4 Service Levels for Subsequent Painting

Maintain the appearance on all existing furniture at road amenity areas so that graffiti is removed or painted over and other blemishes are painted over to leave the furniture in pristine condition and suitable for use.

### 19.23.5 Painting Existing Furniture

Carry out painting on existing furniture at road amenity areas to comply with the service level requirements.

Respond to any direction given by the Superintendent for painting existing furniture within 14 days.

Paint the following items of existing furniture:

Water Tank: External walls of tanks only.  
Tank protection rails.

Table and

Seating: Tops of seating and tables and associated edges only.

Shelter Shed: All exposed surfaces except the upper surface of the roof.

Rubbish Bins: External surfaces.

Modify frequency of service as necessary to allow for seasonal variances in use.

### 19.23.6 Painting new furniture and equipment

When installing replacement furniture or equipment initially paint the new surfaces in accordance with the Painting Existing Furniture clause. For new work apply a minimum of 2 coats of paint.

## 19.24 REPAIR AND REPLACEMENT OF ROAD AND MARINE AMENITY AREA FURNITURE

### 19.24.1 Service Levels for Repair and Replacement of Road and Marine Amenity Area Furniture

Maintain barbecues, tables and seating at road amenity areas so that they are in good condition and suitable for use at all times.

### 19.24.2 Repair and Replacement of Road And Marine Amenity Area Furniture Operations

Repair or replace barbecues, tables and seating at road and marine amenity areas to comply with the service level requirements.

Respond to any direction given by the Superintendent to repair or replace damaged or missing barbecues, tables and seating within 14 days.

Repair barbecues, tables and seating where necessary, including repainting if required, to a standard of suitable functionality, appearance and safety. Obtain the advice of the Superintendent on the extent of repairs.

Provide replacement barbecues, tables and seating of equivalent standard to existing. Obtain Superintendent's approval of suitable replacement prior to purchase. These items become the property of the Principal, once installed on site.

Remove and dispose of existing barbecues, tables and seating damaged beyond reasonable repair to a community or council waste disposal site.

Secure barbecues, barbecue plates, tables and seating to deter theft.

Modify frequency of service as necessary to allow for seasonal variances.

### 19.25 REMOVAL OF DEAD ANIMALS

#### 19.25.1 Service Levels for Carcass Removal

Remove any carcass as per the following table;

Table 19.3 - Carcass Removal Service Levels	
Area	Response time from observation or notification
Within 50 km of the contract base	1 hour
Within 150 km of the contract base	2 hours
All other areas	24 hours

Ensure that vehicles, while working on the roadway, comply with the Rotating Beacons On Plant clause in the PROVISION FOR TRAFFIC section.

#### 19.25.2 Carcass Removal Operations

Remove multiple or singular carcasses of dead animals from within the road reserve irrespective of reason or event resulting in the demise of the animal.

Dispose of animal carcasses located within 10 km of towns, communities, commercial areas and roadhouses by taking to a dedicated council or community "dead on arrival" pit and pay all fees and charges. In other areas move the carcass to the outside of the outer batter and out of motorists' vision.

There are 2 categories of animal carcasses;

Carcass weight greater than 50 kg. These include: Larger animals including but not limited to cattle, buffalo, camels, horses and donkeys.

Carcass weight not greater than 50 kg. These include:

All other native and exotic species, including but not limited to dogs, cats, kangaroos, wallabies, birds, lizards and pigs.

Remove any carcass that is attracting scavengers, no matter how small the remains of the carcass may be.

The time period for removal of carcasses will commence from time of notification by the Superintendent or observation by the Contractor, whichever is earlier.

Quantities of carcasses resulting from a significant spillage or killing event that cannot reasonably be removed within 2 hours of commencement of work will be paid at a fair and reasonable rate negotiated between the Contractor and Superintendent. This payment will be for time expended in excess of 2 hours.

### 19.26 REMOVAL OF ABANDONED VEHICLES

#### 19.26.1 Service Levels for Vehicle Removal – Witness Point

**Witness Point** - Report any vehicle suspected of being abandoned to the Superintendent within 24 hours of observation.

When instructed by the Superintendent remove any vehicle that has been abandoned in compliance with NT Traffic Regulations Part 5 - Abandoned Vehicles.

#### 19.26.2 Vehicle Removal Operations

Remove abandoned vehicle only upon issue of a direction to work from the Superintendent.

Remove and transport vehicle to a community or council waste disposal site and pay all fees and charges.

### 19.27 ADVERSE CONDITION REPORT

Submit to the Superintendent a Road Amenity Adverse Condition Report when condition of rest areas, truck parking bays and boat ramp areas is adverse due to factors not covered by this specification.

Carry out the works in accordance with the program or issued CSRs, however, submit a modified version of the work program if works are to be interrupted due to external or unforeseen circumstances.

Irrespective of external or unforeseen circumstances continue to maintain the assets within the service levels specified.



**19.28 LIAISON WITH THE SUPERINTENDENT**

Refer all matters relating to difficulties or problems experienced in carrying out the requirements of the Contract to the Superintendent.

**19.29 CONTRACTOR'S PERSONNEL****19.29.1 Supervisors**

Employ sufficient supervisors familiar with the requirements of contract to attend all operations in each area of work to ensure full compliance with specified service levels.

Nominate an individual or provide a roster of individuals including their contact phone numbers who will be available at all times, including nights, weekends and Public Holidays during the Contract.

**19.29.2 Personnel in Crews**

Provide appropriate crew size and numbers for the operations to achieve the specified service levels.

Provide adequate training in the correct operation of all powered equipment, hand tools, trimming techniques, use of chemicals, and first aid.

Where applicable ensure that staff holds current licences as required under law.

All personnel, supervisors, staff and operators on or off the machines are required to wear reflective safety vests to day or night in compliance with Work Health and Safety (N.U.L) Act and Regulations when working within the road reserve.

**19.29.3 Personnel Working in Water Tanks**

Be suitably trained for working in confined spaces in compliance with AS 2865 and WHS (N.U.L) Act. Comply with NT WorkSafe Code of Practice Confined Spaces.

**19.30 MARINE AMENITIES MAINTENANCE****19.30.1 Cleaning and maintenance of Boat Ramps****Service levels for maintenance cleaning of Boat Ramp**

Boat ramp clear of algae growth and debris that compromises user safety. No loose rocks or hazards at base of ramp

**Maintenance Cleaning of Boat Ramp**

Maintain the boat ramp concrete deck and surrounds, so that they are clean and free from algae, sand/mud build up and any other detritus materials. Use high-pressure water blasting methods and a nozzle pressure sufficient to remove all marine growth, algae and slippery surfaces that become a hazard to the public use of boat ramps.

Maintain the surface at the base of the boat ramp to enable the launching of boats at low tide. Reposition loose rocks or hazard, to enable and assist with a smooth path for boats and trailers into or out of the water.

This operation is to be undertaken on a receding tide for boat ramps, the contractor to program works for the most effective tide, in order to maximise the extent of the cleaning of the ramps' lengths. Ensure that ramps are available to users at all times. If necessary, the Contractor may have to demobilise from the ramp to enable users to launch or retrieve boats.

High-pressure water blasting operations are not to pose a danger to or any inconvenience to the public and nor damage their vehicles or boats or trailers.

**19.30.2 Cleaning and maintenance for Jetty, Pontoon, Fishing Platforms and Filleting Tables****Service levels for Jetty, Pontoon, Fishing Platforms and Filleting Tables Maintenance**

Maintain the Jetty, pontoon structure, platforms and tables so that they are clean, free of all undesirable substances, algae and hazardous surfaces that compromise user safety.

**Maintenance for Jetty, Pontoon, Fishing Platforms and Filleting Tables:**

Maintain the Jetty, pontoon structure, platforms and tables so that it is clean, free of all undesirable substances, algae and hazardous surfaces.

Use high-pressure water blasting methods using a nozzle pressure sufficient to remove all fish carcasses, offal, blood stains, scales and or any undesirable substances that may produce an offending sight or odours on the jetty and pontoon deck, its railings, the jetty shelter and surrounds.

Areas which still produce obnoxious odours following water blasting and or scraping, are to be further treated by the use of an approved environmentally friendly disinfectant to neutralise the possibility for flies, maggots to breed, and to reduce obnoxious odours.

Use high-pressure water blasting methods and a nozzle pressure sufficient to remove all marine growth, algae and slippery surfaces that become a hazard to the public use.

Care is to be taken to avoid causing any damage to concrete, steel coating, and other surfaces during high-pressure water blasting operations.

Program works for the most effective time frames in order to maximise the extent of the high-pressure water blasting operation. Ensure that the amenities are available to public use at all times. If necessary, cease the works to enable the immediate use of the amenity by the public at any time.

**19.30.3 Maintenance for Marine Growth/ Shellfish Encrustations on Structures****Service levels for Marine Growth/ Shellfish Encrustations on Structures Maintenance**

Maintain the jetty structure piles landing decks, walkways, and the associated steel grating

railings and posts so that they are clean, free of hazardous surfaces, and suitable to use at all times.

**Maintenance for Marine Growth/ Shellfish Encrustations on Structures:**

Remove, or make smooth, all sharp edges of shellfish encrustations from the structure. Use a small tomahawk and a hammer or other approved tools to scrape and knock the shellfish encrustations off without damage to the underlying protective coatings. Run a curved sharpened blade over all cleaned areas to remove any remaining shellfish encrustations.

Remove or smooth all sharp edges of shellfish encrustations projecting above the top surface of the landing deck grating.

Where ever shellfish encrustation is threatening to fill the gaps between any grating bars by more than 30%, carefully rod through the gap with an approved object to open up the gap and knock off the growth. It is important to maintain the openings in the decking so that wave action is free to move through the openings. If this is not done then the decking will act like a solid plank. The force of the waves can then exert pressure and dislodge the decking units which are only fixed by clips to the structure.

Otherwise use high-pressure water blasting methods and a nozzle pressure sufficient to remove all marine growth, algae and slippery surfaces that are hazardous to the public users.

Touch-up any paint damaged during the cleaning process with an approved protective coating. Take particular care to not damage the paint coating of grating since "touch-up" painting of the grid is not feasible.

Clean any damaged protective coating back to bare metal or clean sound paint work.

Feather edges and lightly abrade areas of existing paintwork that are to be touched up.

Prime the area to be painted as soon as possible after surface preparation and prior to any deterioration or submergence of the surface.

Use WattyI Sigma EP Universal Primer and WattyI Sigmacover TCP Coating Glassflak or other approved system that is impact resistant, extremely tolerant of surface moisture, is high build, and will reliably adhere to the existing paint system.

Mix, handle and apply the paint strictly in accordance with the manufacturer's instructions.

Refer to PROTECTIVE COATINGS.

**19.31 OTHER REQUIREMENTS**

(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.

## 20. PROTECTIVE COATINGS

### 20.1 CODES, STANDARDS AND LEGISLATION

All materials and work shall comply with the latest issue of the relevant codes and standards. Some standards and codes are listed in the REFERENCED DOCUMENTS sections.

When conflict arises between the requirements in the manufacturer's data sheets or recommendations and the specification, the highest standard shall be adopted as directed by the Superintendent.

#### Standards

AS 1580 Paints and related materials  
Methods of test.

AS/NZS 1580.108.1 Determination of dry film thickness on metallic substrates - Non-destructive methods.

AS 1627 Metal finishing — Preparation and pretreatment of surfaces. (Code of Practice for Preparation and Pretreatment of Metal Surfaces prior to Protective Coating).

AS 1627.1 Removal of oil, grease and related contamination.

AS 1627.2 Power tool cleaning.

AS 1627.4 Abrasive blast cleaning of steel.

AS 1627.9 Pictorial surface preparation standards for painting steel surfaces.

AS 1678 Emergency Procedures Guide – Transport.

AS 1678.3A1 Group Text EPGs for Class 3 substances – Flammable Liquids.

AS 1940 The Storage and Handling of Flammable and Combustible Liquids.

AS/NZS 2312 Guide to the Protection of Structural Steel against atmospheric corrosion by the use of protective coatings.

AS/NZS 2312.1 Paint coatings.

AS 2700 Colours for General Purpose.

AS 3894 Site Testing of Protective Coatings.

AS 3894.3 Determination of dry film thickness.

AS 3894.5 Determination of surface profile.

AS 3894.10 Inspection Report – Daily surface and ambient conditions.

AS 3894.11 Equipment Report.

AS 3894.12 Inspection Report – Coating.

AS 3894.13 Inspection Report – Daily blast and paint.

AS 3894.14 Inspection Report – Daily painting  
AS/NZS ISO 9000 Quality management systems - Fundamentals and vocabulary.

AS 1940 The Storage and Handling of Flammable and Combustible Liquids.

AS/NZS 2311 Guide to the Painting of Building.

AS 2865 Confined Space.

ASTM D5064 Standard Practice for Conducting a Patch Test to Assess Coating Compatibility.

Work Health and Safety (NUL) Act.

Work Health and Safety (NUL) Regulations.

Code of Practice, Abrasive Blasting, Safe Work Australia.

Code of Practice, Managing the Risk of Falls at Workplaces, NT WorkSafe.

### 20.2 PROTECTIVE COATING SPECIFICATIONS - SYSTEMS AND APPROVED PRODUCTS – HOLD POINT

Refer to *Clause 20.17 TABLES - PROTECTIVE COATING SPECIFICATIONS - SYSTEMS AND APPROVED PRODUCTS*.

#### Protective coating

**Hold Point** - Surface Preparation: To AS 1627.

Remove loose millscale, rust, oil, grease, dirt, globules of weld metal, weld slag and other foreign matter.

Priming: Apply the primer coat to the structural steel before delivery to the site and protect from damage during handling and transport.

**Hold Point** - Complete and submit Site testing of protective coatings: To AS 3894.10 and AS 3894.11 and AS 3894.12

Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender document.

#### Single pack zinc phosphate

Thoroughly wire brush steelwork to AS 1627.2 and prime with one coat of single pack zinc phosphate to APAS specification 0162/1 with a dry film thickness of 40 microns.

#### Epoxy zinc phosphate

Blast clean to the recommendations of AS 1627.4 to grade Sa of AS 1627.9 and prime with one coat of epoxy zinc phosphate to APAS specification 2971 with a dry film thickness of 45 microns.

#### Inorganic zinc silicate

Blast clean to recommendations of AS 1627.4 to grade Sa of AS 1627.9 and prime with one coat of inorganic zinc silicate to APAS specification 2908 with a dry film thickness of 75 microns.

Site work: After erection, repair any damage to the shop coating and apply the coating, if any, omitted at site connections.

Time delay: Prime the steel surface as soon as possible after surface preparation and prior to any deterioration of the surface. If the surface is contaminated or rust bloomed, repeat the surface preparation before applying the primer.

### 20.3 CONTRACTOR'S RESPONSIBILITIES

Provide all protective coating materials, abrasives, labour, supervision, equipment and materials required to complete all work as specified.

Submit:

- written details of plant and equipment to be used for the work,
- written details of experience in similar projects,
- ITPs (Inspection & Test Plans) detailing all procedures and test plans to be undertaken to complete the project.
- Details of Environmental Policy. Contractor must present details of procedures to protect the environment.
- Details of warranties outlining the responsibilities of the Coating Manufacturer and the Contractors period of warranty.

#### 20.3.1 Pre Job Meeting

Attend a pre job meeting with the Superintendent and the coating applicator, to review this specification and the coating contractors ITPs. Any variation proposed shall be discussed at this meeting. No variation shall be allowed unless agreed at this meeting and formally signed off.

#### 20.3.2 Standard Of Workmanship

Follow the protective coating manufacturer's instructions pertaining to mixing, application, drying time etc. Produce a satisfactory end result acceptable to the superintendent.

Compliance with the protective coating manufacturer's instructions shall not absolve the Contractor of responsibility to rectify unacceptable work. Perform all work in a safe and workmanlike manner.

All phases of the work shall be available for observation by a representative of the coatings manufacturer as well as by the Superintendent or their appointed Inspector.

Use personnel experienced in their particular field to carry out all work on surface preparation, protective coatings application and inspection.

The Superintendent may require the Contractor to produce proof of the tradesmen's qualifications.

#### 20.3.3 Abbreviations

**ACA** Australasian Corrosion Association

**DFT** Dry Film Thickness

**EPA** Environment Protection Authority

**EPG** Emergency Procedure Guide to AS 1678

**ICorr** Institute of Corrosion, UK

**ITPs** Inspection Test Plans

**JSA** Job Safety Analysis

**NACE** National Association of Corrosion Engineers, USA

**NCR** Non-Conformance Report

**ppm** Parts per million

**QA** Quality Assurance

**SDS** Safety Data Sheets – formerly known as Material Safety Data Sheets

**SWMS** Safe Work Method Statement

**TDS** Total Dissolved Solids

### 20.4 SAFETY

Comply with Work Health and Safety (NUL) Act, Regulations, Codes of Practice, Policies and Procedures applicable to the works at all times during the execution of the works.

Abrasive blasting and protective coatings application must include safety precautions necessitated by the presence of air-hydrocarbon mixtures or other flammable materials.

#### Thinners, Solvents And Coating Material Safety

All thinners, solvents, primers and coating materials shall be regarded as hazardous materials and their use and storage shall comply with AS 1940, the coating manufacturer's recommendations and Dangerous Goods Regulations. All caution notices on the product containers and material labels shall be strictly observed.

The SDS for all chemicals, including paints and solvents, used and stored on site must be registered with the site manager prior to the product arriving on site.

A copy of the SDS and the applicable Emergency Procedure Guide (EPG) as per AS 1678 must accompany all chemicals during transport.

Keep SDS for all paints as reference.

### 20.5 TRAFFIC MANAGEMENT

Comply with the Traffic Management requirements in PROVISION FOR TRAFFIC.

Obtain a Permit to Work in a Road Reserve and comply with any conditions imposed in the Permit.

Provide a Traffic Management Plan that caters for vehicular traffic. Include provisions in the Traffic Management Plan for pedestrians, cyclists and water transport if pedestrians, cyclists or water craft might be affected by the works.

### 20.6 BARRIERS

Install barriers and warning signs for fire hazards, dust, abrasive blasting operations, dangerous fumes and the like, during blasting and coating activities.

Protect adjacent areas and equipment from abrasive blasting grit, water, and detritus and overspray by the erection of screens, hoardings, or drop sheets.

Remove all materials used to mask areas requiring protection during blasting and painting operations upon completion.

### 20.7 EQUIPMENT

Use equipment including, but not necessarily limited to, ladders, scaffold, compressors and

electrical and pneumatic equipment conforming to the requirements in force by the appropriate statutory Acts, regulations and by-laws. Maintain and use this equipment in strict accordance with any safety regulations or requirements pertaining to them.

Do not use ladders as work platforms.

All equipment including dust collectors, air compressors, lifting devices etc. shall conform to the relevant Standards for safety and performance.

Use air supply hoses and couplings of the anti-static type which are safety wired.

Note: Compliance to site safety instructions will be in addition to regulatory requirements.

#### **20.7.1 Personal Air Supply**

Where personal breathing equipment is used, the operator's hood or headgear shall be ventilated by clean, cool, oil free air served through a regulator filter. Air supply must be of respiratory quality.

#### **20.7.2 Equipment – Witness Point**

Use compressors used for blasting, cleaning and spray painting which have oil and moisture separators with properly maintained filters in the airlines. Perform oil carry-over tests prior to the start of blasting and coating application and on a weekly basis thereafter. Record the results.

**Witness Point** – Give notice so that this test may be witnessed by the Superintendent or their nominated representative.

### **20.8 ENVIRONMENTAL CONDITIONS**

Comply with coating manufacturers' specifications, particularly with reference to ambient environmental conditions, such as temperature, relative humidity and substrate temperature, prevailing at the location where surface preparation and coating system application is to take place.

Provide copies of Environmental Test Reports to AS 3894, Parts 10, 11, and 12.

In addition provide Reports to AS 3894 Parts 13 and 14 for structural steel.

Consider the movements of the tide or work to be conducted on components located in tidal waters.

### **20.9 SURFACE PREPARATION**

Remove all substrate surface defects including weld spatter, slag, burrs, fins, sharp edges and corrosion product.

Remove all surface contaminants such as oil, grease and dirt in accordance with AS 1627.1 using a suitable solvent, oil emulsifier, alkaline degreaser or other approved product.

Assess compatibility and substrate and inter-coat adhesion between the original and new coating systems during maintenance activities by coating a test patch and assessing compatibility and adhesion by ASTM D5064.

Plan and execute all works so as to minimize the possibility of pollution of the Site and adjoining areas from chemicals, dangerous goods and potential contaminants such as dust from abrasive blasting.

#### **20.9.1 Preparation Of Surfaces Prior To Blast Cleaning**

Permanent welds shall be smooth and shall merge evenly with joining surfaces.

All edges, including drilled or punched holes shall be de-burred and rounded where practical to a minimum of 2mm radius.

#### **20.9.2 Abrasive Blasting – Hold Point**

Abrasives shall conform to AS 1627.4 and shall be free from oil, grease, and moisture. The abrasive shall contain no more than 50 ppm soluble salts (TDS) and free from greater than 100 ppm lead.

Do not use silica sand and other potentially silica containing materials. Do not use zinc or copper slag.

Abrasive shall be capable of providing the specified profile.

Do not carry out abrasive blasting if:

- The relative humidity is above 85%.
- The metal temperature is less than 3°C above the dew point.

Blow down blasted surfaces with clean, dry compressed air, or vacuum, or wipe free of dust and spent abrasive media, before any coatings are applied.

**Hold Point** - At the completion of the final blast and prior to coating application, the surface profile of each item shall be measured according to Method A, Profile Replicating Tape, of AS 3894.5. Provide documentary confirmation that the surface is suitable for the application of the specified coatings. This shall be identified as a Hold Point in the contractor's ITP.

#### **20.9.3 Spot And Whip Abrasive Blasting**

Use spot blasting of localised corrosion or coating breakdown to provide a profile suitable for the coating system being applied during maintenance coating activities.

Feather the perimeter of the spot blasted area over a 50mm width from where the original coating system is sound.

Whip blast the generally sound coating surface after spot blasting to provide an adequate key for the coating system being applied.

Where whip blasting is not possible, gloss on sound coating may be removed by power tool or hand sanding.

#### **20.9.4 Alternate Surface Preparation – Hold Point**

**Hold Point** - Do not use forms of surface preparation other than abrasive blasting, such as bristle blaster, needle guns, power tool cleaning

and hand tool cleaning, without written permission from the Superintendent. Alternate methods of surface preparation must be included in the Contractor's ITP.

### 20.9.5 Water Washing and Jetting

#### Low pressure water washing

Low pressure water washing operates at pressures up to 35 MPa (up to 5000 psi).

Used to remove loose millscale, rust, paint chalking and soluble salts.

#### High pressure water washing

For effective high pressure water washing 35 MPa to 70 MPa (5000 to 10,000 psi).

Used to remove light to moderate rust scale, concrete splashes, severe marine fouling and loose coatings.

#### High pressure water jetting

High pressure water jetting operates at 70 MPa to 210 MPa (10 000 to 30 000 psi).

Used to remove some rust, intact paints and contaminants.

#### Ultra high pressure water jetting

Ultra high pressure water jetting, equipment needs to operate above 210 MPa (30 000 psi).

Used to remove rust and coatings and to prepare steel to a cleanliness level close to near white metal.

#### Alternate methods

Alternate methods of surface preparation must be included in the Contractor's ITP.

#### Final rinse

To avoid flash rusting final rinse should employ the use of demineralised water.

## 20.10 APPLICATION OF PROTECTIVE COATINGS

### 20.10.1 Atmospheric Conditions

The atmospheric conditions which prevail during the application of coatings shall be such that the surface being coated is completely free of moisture.

Do not apply coatings if:

- The ambient temperature is below 5°C, unless otherwise permitted by the material supplier's data sheet or
- The relative humidity is above 85% or
- The metal temperature is less than 3°C above the dew point or
- The ambient temperature is above 35°C, unless otherwise permitted by the material supplier's data sheet or
- Any combination of the above.

Record the ambient conditions both before and at the completion of each day's coating and at three hourly intervals during coating. Submit this information with other daily records specified.

Refer to Contractor Records in Inspection And Testing.

### 20.10.2 Coating – Witness Point – Hold Point

**Witness Point** – Provide copies of specifications for application of protective coatings from the manufacturers of the products used. Provide copies of manufacturers' product technical data sheets for all products used.

Have all coating materials delivered to the factory, workshop or site in the manufacturers' original containers with the labels intact and seals unbroken.

All materials which have been stored for longer than the specified shelf life or exposed to conditions outside the permissible storage conditions shall be discarded and replaced.

Stored, mix, thin, apply and use all paints strictly in accordance with the coating manufacturers' recommendations.

**Hold Point** - Provide coating manufacturers' written approval for use before using any other additives (eg promoters, accelerators etc).

Do not mix or use coating materials which have livered, gelled or otherwise deteriorated.

Do not exceed the pot life of catalysed materials corresponding to the working temperature. When the pot life limit is reached, the spray pot shall be emptied, remaining material discarded, the equipment cleaned, material line shall be emptied and flushed out with nominated solvent/cleaner, and new material mixed and catalysed.

### 20.10.3 Thinners

Use only thinners and dilutents from the same manufacturer as the specified coating for that coating. Use these only at the rate recommended by the coating manufacturer for the specific application.

### 20.10.4 Stripe Coating

Stripe coat all metal with edges (100mm either side of the weld or edge), where practical, prior to applying the remainder of the protective coating.

Apply the stripe coating by brush or spray. Use the specified coating materials. Ensure the correct DFT for each coat is achieved.

### 20.10.5 Multiple Coats

Where multiple coats of paint of the same type are specified, each successive coat of paint shall show, where possible, a distinguishable difference in colour to the one over which it is applied.

Comply with coating manufacturer's recommended recoating times for the ambient conditions and temperatures prevailing at the time of coating. If this cannot be achieved and the recoat period is exceeded submit a Non Conformance Report and Corrective Action Report.

#### 20.10.6 Alternate Coating – Hold Point

**Hold Point** - Do not use coating materials other than specified, without written permission from the Superintendent. Alternate coating materials must be included in the Contractor's ITP.

#### 20.10.7 Coating Defects – Hold Point – Witness Point

Adhesion of coatings shall be sound throughout. All coatings shall be free of sagging, pinholes, dry overspray and other defects.

**Hold Point** – Provide details of repairs required and procedures and processes proposed for making the repairs to the Superintendent prior to making any repairs. Any requirements for the repair of protective coatings shall be identified as a Hold Point in the contractor's ITP.

Marking of defective areas shall be made using a marker compatible with the coating over which it is applied. Crayons and paint pens shall not be used.

**Witness Point** - This compatibility between marker and coating is to be confirmed by the coating manufacturer. Provide written evidence of this compatibility if requested by the Superintendent.

Sand, or whip blast, and recoat surfaces contaminated by embedded dust to the specified DFT using the full system selected. If the defects cannot be rectified through the above means, then the Contractor is required to submit a Non Conformance Report and a Corrective Action Report.

#### 20.10.8 Transit And Erection Damage And Field Weld Margins

Spot abrasive blast all coating damaged during transit and erection, including field weld margins, such that it is thoroughly cleaned. Restore the area according to the coating manufacturer's recommendations with a material compatible with, and providing at least the same performance as, the parent coating.

#### 20.10.9 Surfaces Not To Be Coated

Do not blast or coat the following surfaces and materials unless specifically directed by the Superintendent:

- Stainless Steel
- Other surfaces nominated by the Superintendent.

#### 20.10.10 Inspection And Testing

All work performed may be subject to inspection by the Superintendent or a nominated representative.

Ensure all necessary inspections are carried out.

#### 20.11 QUALITY ASSURANCE AND TRACEABILITY

The Superintendent will give preference to Protective Coating System manufacturers and applicators certified to ISO 9000 Series or

equivalent, or holding approval from the Paint Contractors' Certification Program (Class 4).

#### 20.12 ITP, JSA AND SWMS – HOLD POINT

**Hold Point** – Provide ITPs, JSAs, a SWMS and other quality control procedures and documents to be used during protective coating systems application. These must be approved prior to commencement of work.

#### 20.13 CONTRACTOR RECORDS – WITNESS POINT – HOLD POINT

Maintain written records of the work so that complete traceability of all work and materials provided under this Specification is maintained. Use the relevant sections of AS 3894.10, AS 3894.11 & AS 3894.12 QA report forms as a basis of this record keeping format for all protective coating work under this contract. Use AS 3894.13 and AS 3894.14, in addition to the preceding Australian Standards, for structural steel work coated under this contract.

**Witness Point** - Maintain these reports on a daily basis. Submit them to the Superintendent when requested, or, if not specifically requested, at least weekly.

**Hold Point** - Provide copies of all NCRs (Non Conformance Reports) immediately they are completed or received. The NCRs must detail the non-conformance and be accompanied by a Corrective Action Report (CAR) which is to detail the action proposed to be undertaken to rectify the non-conformance.

#### 20.13.1 Film Thickness – Hold Point – Witness Point

The film thickness is the minimum average dry film thickness, with an exception criteria as defined in AS 3894.3, including primer coats specified in the painting system.

**Hold Point** - Final acceptance of each increment of work will not be made until the dry film thickness meets or exceeds the specified thickness. Regardless of the number of coats specified, additional coats shall be applied as may be necessary to achieve the specified thickness, at the contractor's expense.

**Witness Point** - Provide and operate wet film and dry film thickness gauges of approved types to ensure the correct thickness of each coat and the full system is achieved. Provide details of the gauges proposed for use.

Use an electronic thickness gauge to determine the total dry film thickness on metallic substrates.

Calibrate the gauges in accordance with AS 3894.3 (dry film thickness) or AS/NZS 1580.108.1 (wet film thickness).

#### 20.13.2 Inspector – Hold Point

Appoint an inspector of coatings, qualified or certified under ACA, NACE, or ICorr, for inspection and testing of substrate preparation

and protective coating systems applied under this contract.

**Hold Point** – Provide the name and qualifications of the inspector prior to commencement of work.

All work may be subject to inspection by the Superintendent. This shall not relieve the Contractor of his own Quality Assurance/Quality Control responsibilities.

#### 20.14 HANDLING OF FINISH COATED ITEMS

Handle with care all metalwork that has been coated to preserve the coating in the best practicable condition.

Do not handle coated metalwork until the coating has dried hard.

Use web slings or slings covered with a rubber hose or similar soft material for the handling of finish coated items.

Protect finish coated items with soft material such as cloth, carpet or rubber sheeting on areas of contact (eg. wooden supports and holding down chains or slings) during transport and storage.

Repair and make good any damage to finish coated items.

Items with any damage caused by insufficient care are to have the entire coating removed and be recoated in accordance with this specification at the Contractor's expense.

#### 20.15 PROTECTIVE COATING SPECIFICATIONS - SYSTEMS AND APPROVED PRODUCTS

Refer to: **20.17 TABLES - PROTECTIVE COATING SPECIFICATIONS - SYSTEMS AND APPROVED PRODUCTS**

<b>ARID REGIONS: Corrosivity Category C2 Low</b>	Areas south of, and including, Tennant Creek. (NTCZ01)
<b>INLAND REGIONS: Corrosivity Category C3 Medium</b>	Areas north of Tennant Creek and south of, and including, Katherine and areas more than 50 km from the coast or tidal estuaries. (NTCZ02)
<b>COASTAL / TROPICAL: Corrosivity Category C5-M Very High and T (Inland Tropical)</b>	Areas north of Katherine and areas up to 50 km from the coast or tidal estuaries. (NTCZ03 & NTCZ04)

Refer to PROJECT SPECIFIC REQUIREMENTS section of RFT

#### NOTES

Coating systems are to be compatible with level of surface preparation available or proposed.

Refer to NT CLIMATE ZONES TABLE.

#### 20.16 OTHER REQUIREMENTS

Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender document.



## 20.17 TABLES - PROTECTIVE COATING SPECIFICATIONS - SYSTEMS AND APPROVED PRODUCTS

**Table 20.1 - Corrosivity Categories of Areas of the NT**

<b>ARID REGIONS: Corrosivity Category C2 Low</b>	Areas south of, and including, Tennant Creek. (NTCZ01)
<b>INLAND REGIONS: Corrosivity Category C3 Medium</b>	Areas north of Tennant Creek and south of, and including, Katherine and areas more than 50 km from the coast or tidal estuaries. (NTCZ02)
<b>COASTAL / TROPICAL: Corrosivity Category C5-M Very High and T (Inland Tropical)</b>	Areas north of Katherine and areas up to 50 km from the coast or tidal estuaries. (NTCZ03 & NTCZ04)

**Table 20.2 - Protective Coating Specification # PS1**

<b>General</b>							
Coating Specification for Steel – Arid Regions Corrosivity Category C2 Low							
<b>Areas</b>							
Coating system for Steel where Abrasive Blasting cannot be undertaken. Typical Exposure: Atmospheric exposure for arid regions including areas of Alice Springs, Tennant Creek and all central Australian locations. Areas south of, and including, Tennant Creek. (NTCZ01)							
<b>Surface Preparation</b>							
Surfaces to be clean, free of oil and grease and all contaminants and salts. All loose and flaking coating to be removed. All edges to be feathered back to a sound tightly adhered surface. All corrosion to be removed by power or hand tool cleaning to AS 1627.2 and AS 1627.9 Class St 3 standard.							
<b>Protective Coating System as per AS 2312</b>							
<b>1<sup>st</sup> Coat</b>	<b>DFT in µm</b>	<b>Int'l Paints</b>	<b>Dulux</b>	<b>Jotun</b>	<b>PPG Industries</b>	<b>Hempel</b>	<b>Wattyl</b>
Epoxy Mastic	100-150	Interplus 1180	Durebild STE	Jotamastic 90	Amerlock 400	Hempadur Quattro 17634	Epinamel DTM 985
<b>Optional 2<sup>nd</sup> Coat</b>							
Finish Coat Polyurethane	75	Interthane 990	Weathermax HBR	Hardtop Flexi	Amershield	Hempathane HS 55610	Poly U750
<b>Total DFT in µm</b>	175-225						
<b>Notes:</b> Apply all coatings in strict accordance with the manufacturers' technical data sheets. Provide coatings manufacturers' recommendations prior to commencing work. The coating systems in these tables form part of, and should be read in conjunction with, the other clauses in this work section.							

**Table 20.3 - Protective Coating Specification # PS2****General**

Coating Specification for Steel – Arid Regions Corrosivity Category C2 Low

**Areas**

Coating system for Steel where Abrasive Blasting can be undertaken.

Typical Exposure: Atmospheric exposure for arid regions including areas of Alice Springs, Tennant Creek and all central Australian locations. Areas south of, and including, Tennant Creek. (NTCZ01)

**Surface Preparation**

Surfaces to be clean, free of oil and grease and all contaminants and salts

Abrasive blast to AS 1627.4 &amp; AS 1627.9 Sa 2½, near white metal with angular surface profile 40 – 75 microns.

**Protective Coating System as per AS 2312**

1 <sup>st</sup> Coat	DFT in µm	Int'l Paints	Dulux	Jotun	PPG Industries	Hempel	Wattyl
Zinc Rich Epoxy Primer	75	Interzinc 52	Zincanode 402	Barrier Plus	Sigmazinc 471	Hempadur Zinc 17360	Galvit EP100
2 <sup>nd</sup> Coat							
Finish Coat Polyurethane	75	Interthane 990	Weathermax HBR	Hardtop Flexi	Amershield	Hempathane HS 55610	Poly U750
Total DFT in µm	150						

**Notes:**

Apply all coatings in strict accordance with the manufacturers' technical data sheets.

Provide coatings manufacturers' recommendations prior to commencing work.

The coating systems in these tables form part of, and should be read in conjunction with, the other clauses in this work section.

**Table 20.4 - Protective Coating Specification # PS3****General**

Coating Specification for Steel – Inland Regions Corrosivity Category C3 Medium

**Areas**

Coating system for Steel where Abrasive Blasting cannot be undertaken.

Typical Exposure: Atmospheric exposure for inland regions including Katherine and other inland regions. Areas north of Tennant Creek and south of, and including, Katherine and areas more than 50 km from the coast or tidal estuaries. (NTCZ02)

**Surface Preparation**

Surfaces to be clean, free of oil and grease and all contaminants and salts. All loose and flaking coating to be removed. All edges to be feathered back to a sound tightly adhered surface. All corrosion to be removed by power or hand tool cleaning to AS 1627.2 and AS 1627.9 Class St 3 standard.

**Protective Coating System as per AS 2312**

1 <sup>st</sup> Coat	DFT in $\mu\text{m}$	Int'l Paints	Dulux	Jotun	PPG Industries	Hempel	Wattyl
Epoxy Mastic	75-100	Interplus 356	Durebild STE	Jotamastic 90	Amerlock 400	Hempadur Quattro 17364	Epinamel DTS 680
2 <sup>nd</sup> Coat							
Intermediate Epoxy Mastic	75-100	Interplus 356	Durebild STE	Jotamastic 90	Amerlock 400	Hempadur Quattro 17364	Epinamel DTS 680
Optional Top Coat							
Finish Coat Polyurethane	75	Interthane 990	Weathermax HBR	Hardtop Flexi	Amershield	Hempathane HS 55610	Poly U 750
Total DFT in $\mu\text{m}$	225-275						

**Notes:**

Apply all coatings in strict accordance with the manufacturers' technical data sheets.

Provide coatings manufacturers' recommendations prior to commencing work.

The coating systems in these tables form part of, and should be read in conjunction with, the other clauses in this work section.

**Table 20.5 - Protective Coating Specification # PS4**

<b>General</b>							
Coating Specification for Steel – Inland Regions Corrosivity Category C3 Medium							
<b>Areas</b>							
Coating system for Steel where Abrasive Blasting can be undertaken. Typical Exposure: Atmospheric exposure for inland regions including Katherine and other inland regions. Areas north of Tennant Creek and south of, and including, Katherine and areas more than 50 km from the coast or tidal estuaries. (NTCZ02)							
<b>Surface Preparation</b>							
Surfaces to be clean, free of oil and grease and all contaminants and salts. Abrasive blast to AS 1627.4 & AS 1627.9 Sa 2½, near white metal with angular surface profile 40 – 75 microns.							
<b>Protective Coating System as per AS 2312</b>							
<b>1<sup>st</sup> Coat</b>	<b>DFT in µm</b>	<b>Int'l Paints</b>	<b>Dulux</b>	<b>Jotun</b>	<b>PPG Industries</b>	<b>Hempel</b>	<b>Wattyl</b>
PRIMER Zinc Rich Epoxy	50-75	Interzinc 52	Zincanode 402	Barrier Plus	Sigmazinc 471	Hempadur Zinc 17360	Epiname PR360ZPS
<b>2<sup>nd</sup> Coat</b>							
Intermediate High Build Epoxy	100-150	Interplus 1180	Duremax GPE	Jotacote Universal	Amerlock 400	Hempadur Quattro 17364	Epiname DTM 985
<b>Optional Top Coat</b>							
Finish Coat Polyurethane	75	Interthane 990	Weathermax HBR	Hardtop Flexi	Amershield	Hempathane HS 55610	Poly U750
<b>Total DFT in µm</b>	225-300						
<b>Notes:</b> Apply all coatings in strict accordance with the manufacturers' technical data sheets. Provide coatings manufacturers' recommendations prior to commencing work. The coating systems in these tables form part of, and should be read in conjunction with, the other clauses in this work section.							

**Table 20.6 - Protective Coating Specification # PS5**

<b>General</b>							
Coating Specification for Steel – Coastal Regions Corrosivity Category C5M Very High and T (Inland Tropical)							
<b>Areas</b>							
Coating system for Steel where Abrasive Blasting cannot be undertaken. Typical Exposure: Atmospheric exposure for coastal regions including Darwin and other coastal establishments. Areas north of Katherine and areas up to 50 km from the coast or tidal estuaries. (NTCZ03 & NTCZ04)							
<b>Surface Preparation</b>							
Surfaces to be clean, free of oil and grease and all contaminants and salts. All loose and flaking coating to be removed. All edges to be feathered back to a sound tightly adhered surface. All corrosion to be removed by power or hand tool cleaning to AS 1627.2 and AS 1627.9 Class St 3 standard.							
<b>Protective Coating System as per AS 2312</b>							
<b>1<sup>st</sup> Coat</b>	<b>DFT in µm</b>	<b>Int'l Paints</b>	<b>Dulux</b>	<b>Jotun</b>	<b>PPG Industries</b>	<b>Hempel</b>	<b>Wattyl</b>
Epoxy Mastic MIO	125-150	Interplus 356	Durebild STE MIO	Jotacote 605 MIO	Amerlock 400 MIO	Hempadur Mastic 45881	Epiname DTM 985 MIO
<b>2<sup>nd</sup> Coat</b>							
Intermediate High Build Epoxy	100-150	Interplus 1180	Duremax GPE	Jotacote Universal	Amerlock 400	Hempadur Quattro 17364	Epiname DTM 985
<b>Optional Top Coat</b>							
Finish Coat Polyurethane	75	Interthane 990	Weathermax HBR	Hardtop Flexi	Amershield	Hempathane HS 55610	Poly U750
<b>Total DFT in µm</b>	325-375						
<b>Notes:</b> Apply all coatings in strict accordance with the manufacturers' technical data sheets. Provide coatings manufacturers' recommendations prior to commencing work. The coating systems in these tables form part of, and should be read in conjunction with, the other clauses in this work section.							

<b>Table 20.7 - Protective Coating Specification # PS6</b>							
<b>General</b>							
Coating Specification for Steel – Coastal Regions Corrosivity Category C5M Very High and T (Inland Tropical)							
<b>Areas</b>							
Coating system for Steel where Abrasive Blasting can be undertaken. Typical Exposure: Atmospheric exposure for coastal regions including Darwin and other coastal establishments. Areas north of Katherine and areas up to 50 km from the coast or tidal estuaries. (NTCZ03 & NTCZ04)							
<b>Surface Preparation</b>							
Surfaces to be clean, free of oil and grease and all contaminants and salts. Abrasive blast to AS 1627.4 & AS 1627.9 Sa 2½, near white metal with angular surface profile 40 – 75 microns.							
<b>Protective Coating System as per AS 2312</b>							
1 <sup>st</sup> Coat	DFT in µm	Int'l Paints	Dulux	Jotun	PPG Industries	Hempel	Wattyl
PRIMER Zinc Rich Epoxy	50-75	Interzinc 52	Zincanode 402	Barrier Plus	Sigmazinc 471	Hempadur Zinc 17360	Galvit EP100
2 <sup>nd</sup> Coat							
Intermediate High Build MIO Epoxy	150-200	Interplus 1180	Duremax GPE MIO	Penguard Express MIO	Amerlock 400 MIO	Hempadur Mastic 45881	Epinamel DTM 985 MIO
Optional Top Coat							
Finish Coat Polyurethane	75	Interthane 990	Weathermax HBR	Hardtop Flexi	Amershield	Hempathane HS 55610	Poly U 750
<b>Total DFT in µm</b>	275-350						
<b>Notes:</b> Apply all coatings in strict accordance with the manufacturers' technical data sheets. Provide coatings manufacturers' recommendations prior to commencing work. The coating systems in these tables form part of, and should be read in conjunction with, the other clauses in this work section.							

**Table 20.8 - Protective Coating Specification # PS7****General**

Existing Hot Dipped Galvanised Steel Subject to Severe - Atmospheric Exposure – New and Maintenance

**Areas**

Coating system for galvanized steel.

**Surface Preparation**

Surfaces to be clean, free of oil and grease, salts and all other contaminants.

Abrasive Sweep (brush) blast to AS 1627.4 Appendix 'D' to achieve an angular surface profile using garnet to 25-40 microns. Rust affected areas to be spot blasted to AS 1627.4 &amp; AS 1627.9 Sa 2½ with an angular surface profile of 40-75 microns.

**Protective Coating System as per AS 2312**

<b>1<sup>st</sup> Coat</b>	<b>DFT in µm</b>	<b>Int'l Paints</b>	<b>Dulux</b>	<b>Jotun</b>	<b>PPG Industries</b>	<b>Hempel</b>	<b>Wattyl</b>
Primer Zinc Phosphate Epoxy Primer	50 - 75	Intergard 251	Durepon P14	Pengard Special Grey	Sigmacover 280LT	Hempadur 15590	Epiname PR 250
<b>2<sup>nd</sup> Coat</b>							
Finish Coat High Build Epoxy	300 - 350	Interzone 505GF	Durebild STE GF	Jotamastic 87 GF	Sigmashield 825 LT (Amerlock 2K Glass Flake)	Hempadur Multi- Strength 45540	Epiname DTM 985
<b>Total DFT In µm</b>	350 - 475						

Allowance should be made for the galvanizing approximately 85 microns.

**Notes:**

Apply all coatings in strict accordance with the manufacturers' technical data sheets.

Provide coatings manufacturers' recommendations prior to commencing work.

The coating systems in these tables form part of, and should be read in conjunction with, the other clauses in this work section.

**Table 20.9 - Protective Coating Specification # PS8****General**

Repair specification for wharf structures, steel piling, ship loading facilities, oil spill clean up equipment and plant piping operating at <40°C.

**Areas**

Marine environment : onshore and offshore

**Surface Preparation**

Abrasive blast clean to remove all previous coatings and corrosion products. Bevel all edges.

Surface shall be high pressure water blasted at a minimum pressure of 3,000 psi then tested to ensure free from soluble salts (see Clause 6).

Abrasive blast clean to AS 1627.4 Class 2½ Surface profile 30-60µm

**Protective Coating System as per AS 2312****Protective Coating – PS8.1 Steel with light to minimal pitting**

1st Coat	DFT in µ	Int'l Paints	Dulux	Jotun	PPG	Hempel	Wattyl
High build epoxy	200-250	Interzone 954	Durebild STE Glass Flake	Marathon 500	Sigmashield 880	Hempadur Quattro 17634	Epiname DTM 985
2nd Coat							
High build epoxy	200-250	Interzone 954	Durebild STE Glass Flake	Marathon 500	Sigmashield 880	Hempadur Quattro 17634	Epiname DTM 985
Total DFT	400-500						

**Protective Coating System as per AS 2312****Protective Coating – PS8.2 Heavily pitted steel**

1st Coat	DFT in µ	Int'l Paints	Dulux	Jotun	PPG	Hempel	Wattyl
High build epoxy	450-500	Interzone 954	Durebild STE Glass Flake	Marathon 500	Sigmashield 880	Hempadur Quattro 17634	Epiname DTM 985
2nd Coat							
High build epoxy	450-5000	Interzone 954	Durebild STE Glass Flake	Marathon 500	Sigmashield 880	Hempadur Quattro 17634	Epiname DTM 985
Total DFT	900-1000						

**Notes:**

Apply all coatings in strict accordance with the manufacturers' technical data sheets.

Provide coatings manufacturers' recommendations prior to commencing work.

The coating systems in these tables form part of, and should be read in conjunction with, the other clauses in this work section.



<b>Table 20.10 - Protective Coating Specification # PS9</b>							
<b>General</b>							
Ultra high build epoxy for coating <b>new</b> piles, and other surfaces in underwater or splash zone environment.							
<b>Areas</b>							
Underwater & splash zone							
<b>Surface Preparation</b>							
Abrasive blast clean to remove all corrosion products and/or previous coatings. Bevel all edges. Surface shall be high pressure water blasted at a minimum pressure of 3,000 psi then tested to ensure free from soluble salts (see Clause 6). Abrasive blast clean to AS 1627.4 Class 2½ 75-100µm (angular profile)							
<b>Protective Coating System as per AS 2312</b>							
<b>1st Coat</b>	<b>DFT in µ</b>	<b>Int'l Paints</b>	<b>Dulux</b>	<b>Jotun</b>	<b>PPG</b>	<b>Hempel</b>	<b>Wattyl</b>
Primer Holding Primer (if required)	30-50	Interline 982	Luxepoxy 66	N/A	Sigmacover 280LT	Hempadur 15590	EpinameI PR 250 (thinned)
<b>2<sup>nd</sup> Coat</b>							
Ultra High Build Epoxy	1000-1500	Interzone 485	Luxepoxy UHB	Jotacote UHB	Sigmashield 880	Hempadur Multi Strength 45540 (2 coats of 500 um)	EpinameI UHB 1000
<b>Total DFT</b>	1030 - 1550						
<b>Notes:</b> Apply all coatings in strict accordance with the manufacturers' technical data sheets. Provide coatings manufacturers' recommendations prior to commencing work. The coating systems in these tables form part of, and should be read in conjunction with, the other clauses in this work section.							

## PROTECTIVE COATINGS

<b>Table 20.11 - Protective Coating Specification # PS10</b>	
<b>General</b>	
Repair coating for cylindrical piling using petrolatum tape system, for use in very exposed sites and harsh environments.	
<b>Areas</b>	
Very exposed sites and harsh environments.	
<b>Surface Preparation</b>	
Remove all loose rust, original coating, marine growth etc, by scraping, chipping, water blast cleaning or ship's hull scrubber. Close examination, after preparation, to ensure thoroughly clean surface without growth, sharp or protruding edges.	
<b>System</b>	
<b>Primer</b>	Denso Seashield Primer (or equal approved)
<b>Tape</b>	Denso Seashield Tape (or equal approved) Overlap of 55%
<b>Outer Cover</b>	Denso Seashield 2000 FD Outer Cover (or equal approved) Fixed with 316 stainless bolts
<b>Note:</b> Inspection points as per Denso Seashield published instructions.	
<b>Notes:</b> Apply all coatings in strict accordance with the manufacturers' technical data sheets. Provide coatings manufacturers' recommendations prior to commencing work. The coating systems in these tables form part of, and should be read in conjunction with, the other clauses in this work section.	

## 21. MEASUREMENT AND PAYMENT

The following Measurement and Payment clauses refer to the specification sections of the same name, however, the clause numbers do not match the section numbers of the same title.

### 21.1 MISCELLANEOUS PROVISIONS

#### Environmental Management

Generally

Not measured separately.

Include the cost of environmental management in the rates for the applicable items.

#### 21.1.1 Environmental Management Plan

Measured as an item.

#### 21.1.2 Cleaning of Vehicles and Plant

Measured by number cleaned.

Vehicles and plant items are priced separately.

#### 21.1.3 Establishment

##### Mobilisation:

Not measured separately included in rates for applicable items.

Measured per kilometre, one way, 40 km from the regional post office to the furthest location of the initial work order, along the shortest practical route for the applicable work crew.

Mobilisation will not be paid for work within 40 km of the regional post office Or determined by regional requirements.

When side roads are included in the work order, mobilisation will be paid for the one way distance from the beginning of the side road to the furthestmost point of the work.

Where subsequent work orders are issued, the distance is calculated from the furthest location of the original work site to the furthest location of the new work site along the shortest practical route.

Kilometre measurement will be consistent with DoI Permanent Reference Points (PRP's), Or determined by regional requirements,

(If applicable) Refer to Project Specific Requirements section of Request for Tender.

Include in the rates, the cost of escort as required.

Refer to Figure 20.1 Mobilisation Diagrams at Clause 20.22.

##### Demobilisation:

Not measured separately. Include all costs associated with demobilisation in with the costs of mobilisation.

#### 21.1.4 Officer and Vehicle

Officer and vehicle to be paid for on hourly rate inclusive of vehicle and reports.

#### 21.1.5 Rehabilitation of Existing Material Extraction Areas

Measured by hectare rehabilitated.

#### 21.1.6 Progressive Rehabilitation of New Material Extraction Areas

Not measured separately. Include the cost of progressively rehabilitating new Material Extraction Areas in the cost of gravel supply etc.

#### 21.2 Negotiated Rate

Where a type of works is described but does not appear in the schedule of rates or is not defined in the specification and not included in the Schedule of Rates items, a rate shall be negotiated to cover the works required.

The item of works may then be included in the contract Schedule of Rates at the Superintendents discretion.

### 21.3 PROVISION FOR TRAFFIC

#### 21.3.1 Traffic Management Plan

Measured as an item. Includes Traffic Control Diagrams.

##### Provision For Traffic

Not measured separately. Included in rates for applicable items.

##### Specific Traffic Control Diagrams

Measured by number.

Payment will be made progressively in proportion to the value of work carried out.

##### Variable message boards

Measured as an item.

#### 21.3.2 Provision for Traffic – Rural Areas

Not measured as a separate item for work in rural areas. Allow for in other items.

#### 21.3.3 Provision for Traffic – Urban Areas

To be at a negotiated rate per work site, or as nominated in the Schedule of Rates

#### 21.3.4 Gravelling of Side Tracks for Detours

Measured in square metres for the specified gravel thickness and width.

Make allowance for supply, delivery, and compaction of material.

### 21.4 TRAFFIC MANAGEMENT

Complex Traffic Management items are inclusive of minor traffic management requirements for the entire site of works.

The following item/s shall be submitted to Superintendent for approval prior to use;

#### 21.4.1 Site Specific Traffic Management Plan and Traffic Control Diagrams

Measured by number.

Payment will include the labour, equipment and materials required to compile and submit a site specific Traffic Management Plan and associated

TCDs, in accordance with the Provision for Traffic, to the Superintendent.

Note; the Template TMP's and Generic and TCD's required under the Provision for Traffic Clause 2.5.1 are not to be classed as chargeable items.

## **21.5 EARTHWORKS AND DRAINAGE**

### **21.5.1 Formation Width Clearing**

Measured by kilometre for 1 side of the road.

### **21.5.2 Mulching**

Measured by kilometre for 1 side of the road.

### **21.5.3 Earthworks in Cut – General Material**

Measured in in-situ cubic metres.

### **21.5.4 Earthworks in Cut - Rock**

Measured in in-situ cubic metres.

Payment only for works directed by the Superintendent.

Payment for excavation only and payment for filling is at the rate for Select Fill.

### **21.5.5 Earthworks in Cut – Unsuitable Material and/or Weathered Rock**

Measured in in-situ cubic metres.

Payment only for works directed by the Superintendent.

Payment for excavation only, and payment for filling is at the rate for Select Fill.

### **21.5.6 Earthworks in Fill – Scour and Washout Repair**

Measured in compacted cubic metres.

### **21.5.7 Earthworks in Fill – General Filling**

Measured in compacted cubic metres.

### **21.5.8 Select Fill**

Measured in compacted cubic metres for material sourced and imported from a location up to a distance of 15 km from the site.

### **21.5.9 Select Fill Excess Haulage**

Measured in loose cubic metres per kilometre over and above importing distance of 15 km.

1 compacted cubic metre measured in place is nominated as equal to 1.5 loose cubic metre.

### **21.5.10 Removal of Excess Material**

Measured in in-situ cubic metres.

### **21.5.11 Preparation and Maintenance of Sub-grade Surface**

Measured in square metres.

### **21.5.12 Table Drains**

Measured by kilometre for 1 side of road.

### **21.5.13 Table Drain Offlets**

Measured by number.

### **21.5.14 Table Drain Blocks**

Measured by number.

A table drain block has approximate volume of 20 compacted cubic metres.

Allow for material sourced and imported from a location up to a distance of 15 km from the site. Payment for excess haulage shall be at the rate for Select Fill Excess Haulage.

### **21.5.15 Stop Berms**

Measured by number.

A stop berm has approximate volume of 15 compacted cubic metres.

Allow for material sourced and imported from a location up to a distance of 15 km from the site. Payment for excess haulage shall be at the rate for Select Fill Excess Haulage.

### **21.5.16 Catch Drains**

Measured in linear metres.

### **21.5.17 Repair Existing Formation Width**

Measured in linear metres.

### **21.5.18 Trim and Compact Unpaved Areas**

Measured in square metres.

### **21.5.19 Surface Formation**

Measured in linear metres.

## **21.6 CONFORMANCE TESTING**

The Superintendent will pay for all conformance testing directly to the Panel Period Contractor selected to perform the conformance tests required under the contract and nominated as the Superintendent's responsibility.

If any tests fail to meet specification, all retesting costs will be a negative variation to the contract.

When testing has been ordered and the site is not ready for testing at the time specified by the Contractor, the Contractor will bear the cost of time and travel incurred by the Panel Period Contractor and the Superintendent, where applicable.

### **21.6.1 Process Testing**

The Contractor is responsible for the ordering up and payment for all process tests carried out.

This is not measured separately.

Include the cost of process testing under the relevant items in the Schedule of Rates.

## **21.7 GRADING AND GRAVEL SHEETING**

Generally; include all costs within the rates, including the supply of materials, where applicable.

### **21.7.1 Gravel Resheeting**

Measured in square metres for 150 mm compacted thickness of gravel material in pavement and shoulder, where material is sourced and imported from a location up to a distance of 15 km from the site.

This item applies to lot section sizes greater than 600 m<sup>2</sup>.

Include in the rate, the pavement or shoulder materials outside the carriageway width not included in measurement.

**21.7.2 Stockpile Gravel Material**

Measured in cubic metres in the stockpile.

Include in the rate, the locating, pushing up, stockpiling and trimming to a uniform shape.

**21.7.3 Gravel Resheeting from Stockpile**

Measured in square metres for 150 mm compacted thickness of gravel material in pavement and shoulder, where material is imported from an existing gravel material stockpile up to a distance of 15 km from the site.

This item applies to lot section sizes greater than 600 m<sup>2</sup>.

Include in the rate, the pavement or shoulder materials outside the carriageway width not included in measurement.

**21.7.4 Gravel Repairs to Wash outs and Blow outs**

Measured in square metres for 150 mm compacted thickness of gravel material in pavement and shoulder, where material is sourced and imported from a location up to a distance of 15 km from the site.

This item applies to lot section sizes less than 600 m<sup>2</sup>.

**21.7.5 Gravel Repairs to Wash outs and Blow outs from Stockpile**

Measured in square metres for 150 mm compacted thickness of gravel material in pavement and shoulder, where material is imported from an existing gravel material stockpile up to a distance of 15 km from the site.

This item applies to lot section sizes less than 600m<sup>2</sup>.

**21.7.6 Gravel Excess Haulage**

Measured in loose cubic metres per kilometre over and above importing distance of 15 km.

1 compacted cubic metre measured in place is nominated as equal to 1.5 loose cubic metre.

**21.7.7 Opening Grade - Unsealed Pavements**

Measured in kilometres.

**21.7.8 Maintenance Grade - Carriageway - Unsealed Pavements**

Measured in kilometres.

**21.7.9 Maintenance Grade – Between Inverts - Unsealed Pavements**

Measured in kilometres.

Include in the rate, the reinstatement of table drain blocks.

**21.7.10 Maintenance Grade – Between Batters - Unsealed Pavements**

Measured in kilometres.

Include in the rate, the reinstatement of table drains and table drain blocks.

**21.7.11 Full Maintenance Grade - Unsealed Pavements**

Measured in kilometres.

Include in the rate, the reinstatement of table drains, offlet drains and table drain blocks.

**21.7.12 Grade and Roll - Unsealed Pavements**

Measured in kilometres.

Include in the rate, the reinstatement of table drain blocks.

**21.7.13 Grade Water and Roll - Unsealed Pavements**

Measured in kilometres.

Include in the rate, the reinstatement of table drains and table drain blocks.

**21.7.14 Rip and Re-compaction - Unsealed Pavements**

Measured in kilometres.

Include in the rate, the reinstatement of table drains, offlet drains and table drain blocks.

**21.7.15 Reformation and Re-compaction - Unsealed Pavements**

Measured in square metres for nominated top up compacted thickness of gravel material of 50 mm or 100 mm.

Include in the rate, the reinstatement of table drains, offlet drains and table drain blocks.

**21.7.16 Drainage Maintenance Grade – Sealed Road Shoulder Maintenance**

Measured in kilometres for 1 side of road.

Include in the rate, the reinstatement of table drains, offlet drains and table drain blocks.

**21.7.17 Grade and Roll – Sealed Road Shoulder Maintenance**

Measured in kilometres for 1 side of road.

**21.7.18 Grade Water and Roll – Sealed Road Shoulder Maintenance**

Measured in kilometres for 1 side of road.

Include in the rate, the reinstatement of table drain blocks.

**21.7.19 Rip And Re-compaction – Sealed Road Shoulder Maintenance**

Measured in kilometres for 1 side of road.

Include in the rate, the reinstatement of table drains, offlet drains and table drain blocks.

**21.7.20 Reformation and Re-compaction - Sealed Pavements**

Measured in square metres for nominated top up compacted thickness of gravel material of 50 mm or 100 mm.

Include in the rate, the reinstatement of table drains, offlet drains and table drain blocks.

**21.7.21 Protection of Road Furniture**

Not measured separately.

Include in the rates of other items for the removal, protection, storage, replacement of any road furniture damaged during the work, and the reinstatement of all removed road furniture items within the work zone.

**21.8 STABILISATION MAINTENANCE****21.8.1 Supply and Spread Stabilising Agent**

For in-situ methods.

Measured in tonnes.

Determined by multiplying the application rate of cement and lime indicated in the procedure by the area to be treated.

**21.8.2 Supply Top-up Materials**

Measured in square metres for nominated top up compacted thickness layer material of 50 mm in subgrade, pavement and shoulder, where material is sourced and imported from a location up to a distance of 15 km from the site.

**21.8.3 Mixing, Compacting, Trimming and Curing Stabilised Layer**

Measured in square metres for 150 mm compacted thickness for each specified layer:

**21.8.4 Mixing, Compacting and Trimming Pulverised Wet Mix Layer**

Measured in square metres for 150 mm compacted thickness for each specified layer.

**21.9 BITUMINOUS SURFACE MAINTENANCE****21.9.1 Pothole Patching, Edge Patching and Regulation Patching**

Measured in tonnes placed for the type specified.

Regulation patching will be measured as evidenced by weigh bridge docket.

**21.9.2 Reconstruction Patching**

Measured in square metres for the thickness specified and asphalt type specified.

**21.9.3 Crack Sealing**

Measured in litres for the sealant specified.

Include all preparation, application, and blinding materials.

**21.9.4 Profiling Work**

Measured in square metres for depth specified.

Includes profiling and material disposal.

**21.10 SPRAY SEALING FOR MAINTENANCE AREAS LESS THAN 300m<sup>2</sup>****21.10.1 General**

Measured in square metres for specified aggregate size

Allow for surface preparation, precoat, binder, aggregate and all activities to achieve the final sealed surface.

**21.10.2 Primer Seal**

Measured in square metres for the size nominated.

Allow for preparation, precoat, binder and aggregate and all activities to achieve the final sealed surface.

**21.10.3 Reseal work**

Measured in square metres for the size nominated and binder type nominated.

Allow for preparation, precoat, binder and aggregate and all activities to achieve the final sealed surface.

Make allowance for existing texture.

**21.10.4 Geofabric**

Measured in square metres of completed area.

Make allowance for supply and placement.

Make allowance for overlapping at joins.

**AREAS GREATER THAN 300m<sup>2</sup>****21.10.5 Preparation of Pavement**

Measured in square metres of the prepared area.

**21.10.6 Prime Coat, Enrichment Coat, Emulsion Coat, Primer Seal and Seal Coats**

Measured in litres at 15 °C. Adjust volumes using **Table 7.9 - Bitumen Equivalent Volumes**.

**Refer to Clause 7.22 for Tables**

Payment calculated for each spray run. Quantity sprayed is determined by dipping the sprayer tank for each spray run.

Allow for the temperature of the mixture in determining the actual application rate.

The designated volume is determined from the area sprayed and the rate of application indicated in the procedure for such area at 15 °C. Multipliers for reducing the volume of hot bitumen to the equivalent volume at 15 °C are contained in **Table 7.9 - Bitumen Equivalent Volumes**.

For primers, enrichment coats, primer seals, polymer modified binder or emulsion seals the rate of application refers to the whole of the mixture.

Allow for adhesion agent in the rate for polymer modified binder.

Adjustment to payment for the sprayed volume when the spray application rates equal or exceed 0.8 L/m<sup>2</sup>:

- Application 90% to 95% of the designated volume:
- Payment for the sprayed volume less one-half the difference between the sprayed volume and 95% of the designated volume.

(Example: Application = 92% of designated volume. Pay for  $(92\% - 0.5 \times (95\% - 92\%)) = 90.5\%$  of designated volume.)

- Application 95% to 105% of the designated volume:
- Payment for the sprayed volume.
- Application 105% to 115% of the designated volume:
- Payment for 105% of the designated volume.
- Application less than 90% or more than 115% of the designated volume will be rejected. Rectify by methods approved by the Superintendent, at the Contractor's expense.
- Adjustment to payment for the sprayed volume when spray application rates below  $0.8 \text{ L/m}^2$ :
- Application plus  $0.05 \text{ L/m}^2$  and minus  $0.05 \text{ L/m}^2$  of the designated spray rate:
- Payment for the sprayed volume.
- Application more or less than  $0.05 \text{ L/m}^2$  of the designated spray rate will be rejected. Rectify by methods approved by the Superintendent, at the Contractor's expense.

Payment will be made for the designated volume upon satisfactory reseal of the rejected area at no extra expense to the Principal.

Adjustment to payment for seal coat items (binder, additive, precoat, aggregate) is in accordance with **Table 21.1 Payment Adjustments**.

**Refer to Clause 21.24 for Tables**

#### 21.10.7 Additives

Measured in litres at  $15^\circ\text{C}$ .

Polymer additives in polymer modified binders not measured separately.

Make allowance in the rates for seal coats.

#### 21.10.8 Precoat Applied to Aggregate

Measured in litres.

Make allowance for adhesion agent.

#### 21.10.9 Stockpile Sites

Make allowance for in the relevant rates for sealing aggregate.

#### 21.10.10 Sealing Aggregate

##### SUPPLY AND DELIVERY

Measured in cubic metres in the stockpile; or in loaded vehicles at the work site.

##### SUPPLY AND APPLICATION

Measured in square metres of finished aggregate work for each size of aggregate.

Measured in square metres of completed area.

Make allowance for supply and placement.

Make allowance for overlapping at joins.

### 21.11 CONCRETE MAINTENANCE

#### 21.11.1 General

Make allowance for saw cutting, excavation, bedding, reinforcement, installation of expansion joints and backfilling in the following items.

#### 21.11.2 Cycle/Footpaths

Measured in square metres. Dependent on the number of square meters ordered. Allow for a minimum 100 mm depth of concrete and the requirements of reinforcement. Nominate and determined in the PSRs.

#### 21.11.3 Vehicle Crossings and Access Strips

Measured in square metres.

#### 21.11.4 Kerbs and Gutters

Measured in linear metres for each type

Drainage structures or crossings are excluded from the measured lengths.

#### 21.11.5 Side Entry/Letter Box Pit Lids

Measured in square metres.

#### 21.11.6 Side Entry Pit Lintels

Measured by the number of bays to be repaired.

#### 21.11.7 Wing/Head Walls, Aprons and Cut Off Walls

Measured in square metres

#### 21.11.8 Miscellaneous Concrete Works

Including but not limited to: Vehicle Accesses, Pram Crossings, Wheel Chair Accesses and Traffic Island Median Infill. Measured in square metres. (For tender purposes, make allowance for 100 mm thick concrete.)

### 21.12 DRAINAGE MAINTENANCE

#### 21.12.1 Excavation in Trenching

Measured in in-situ cubic metres for the specified range of depths to invert.

The length of the trench shall be measured between the outside face of headwalls or between the centre of pits.

The width of the trench shall be the outside width of the culvert plus 300 mm on each side.

The depth of the trench is the average of the depths to invert measured at the structure at each end of the section.

The depth to invert is the lesser of the depth below natural surface and the depth below finished surface level. In the case of kerbside structures, the finished surface level is measured at the top of kerb.

Make allowance for shoring, bedding, inlet and outlet structures and irregularities in the natural surface where applicable.

#### **21.12.2 Embankment Protection - Concrete**

Measured in square metres of the face area.

Make allowance for weep holes.

#### **21.12.3 Margins**

Measured in linear metres.

Make allowance for reinforcement.

#### **21.12.4 Supply, Load, Transport, Bed, Lay and Backfill Culverts**

Measured in linear metres along the invert of the culvert as the distance between the outside face of headwalls or other structures for the type and size scheduled.

Multiple barrel culverts are measured as the single distance between the outside face of headwalls or other structures.

Excavation is measured separately.

#### **21.12.5 Excavate, Supply, Load, Transport, Bed, Lay and Backfill Culverts**

Measured in linear metres along the invert of the culvert between the outside face of headwalls/inside face of pits or other structures for the type and size scheduled.

Multiple barrel culverts are measured as the single distance between the outside face of headwalls or other structures.

Make allowance for RC floor slabs for precast box culverts.

#### **21.12.6 Concrete Headwalls, Maintenance Holes and Other Structures**

Measured in cubic metres of concrete for repairs.

Measured by number for replacements.

#### **21.12.7 Collar Joints, Bandage Joints, Anchor Blocks and End Caps**

Measured by number.

Make allowance for splay ends.

#### **21.12.8 Inlet and Outlet Channels**

Measured in in-situ cubic metres.

Not measured separately for culvert waterways less than 2 square metres in cross-sectional area and channels less than 50 metres long.

#### **21.12.9 Open Unlined Drains**

Measured in in-situ cubic metres.

#### **21.12.10 Subsoil Drains**

Measured in linear metres.

Make allowance for blocks, headwalls, filter material, geotextiles, and connection to existing drainage system.

#### **21.12.11 Demolish and Remove Existing Drainage Structures**

Measured as an item.

Make allowance for backfilling

### **21.13 PROTECTION WORKS MAINTENANCE**

#### **21.13.1 Geotextile Fabric**

Measured in square metres of completed area.

Make allowance for supply and placement.

Make allowance for laps and folds.

#### **21.13.2 Stone Pitching**

Measured in square metres of the face area.

#### **21.13.3 Grouted Stone Pitching**

Measured in square metres of the face area.

Make allowance for weep holes.

#### **21.13.4 Dumped Rock Protection**

Measured in cubic metres.

#### **21.13.5 Rubble**

Measured in cubic metres.

#### **21.13.6 Gabions**

Measured in cubic metres.

Includes the excavation, steel wire mesh box and the stone filling.

#### **21.13.7 Reno Mattresses**

Measured in square metres.

Includes the excavation, steel wire mesh box and the stone filling.

#### **21.13.8 Revetment Mattresses**

### **21.14 MEASURED IN SQUARE METRES. ROAD FURNITURE MAINTENANCE**

#### **21.14.1 Fencing**

Measured in linear metres for each type of fencing.

Make allowance for gates which are not measured separately.

Make allowance for clearing of fence lines which is not measured separately.

#### **21.14.2 Guide Posts**

Measured by number.

Make allowance for delineators.

#### **21.14.3 Road Signs, Manufacture, Supply and Delivery**

Measured by number of each sign type or classification.

Freight: to be paid on receipt of invoice

#### **21.14.4 Road Signs: Remove existing signs. Install new sign on existing post**

Measured by number of each sign type or classification within the sign surface area range.

( $\leq 2\text{m}^2$ ;  $2\text{m}^2 \rightarrow 6\text{m}^2$ ;  $6\text{m}^2 \rightarrow 12\text{m}^2$ )



**21.14.5 Road Signs and post: remove existing sign posts. Supply, deliver and install new road signs and posts.**

Measured by number of each sign type or classification

**21.14.6 Road Signs: Relocate existing signs and posts**

Measured by number of each sign type or classification, and/or each post type

**21.14.7 Road Signs, Supply and Install new Posts and remove and re-install existing sign**

Measured by number of each sign type or classification

Make allowance for new brackets, bolts, nuts and bracings for each sign, and new caps for each post.

**21.14.8 Flood Gauge Posts, supply deliver and install**

Measured by number.

Make allowance for gauge.

**21.14.9 Cattle Grids**

Payment will be made at the tendered rates as defined in the Schedule of Rates as nominated for the type of repair and maintenance to cattle grids.

Grid Maintenance Service Crew travel measured by kilometres for rural regions only.

Make allowance for all plant and materials irrespective of the type of repair.

**21.14.10 Removal of Graffiti**

Measured by hours inclusive of the solvents and procedure required to remove the graffiti.

**21.14.11 Steel Beam Guardrail**

Supply, remove and replace guardrail measured in linear metres.

Supply, remove and replace posts measured by number.

Supply, remove and replace terminals, end posts and cable, measured by number.

Make allowance for delineators, nuts, bolts and fittings in all works.

Steel Beam Guardrail Maintenance Service Crew travel measured by kilometres for rural regions only.

**21.14.12 Supply Install Guide Posts**

Measured by number.

**21.14.13 Supply and Install 150 mm Round Recycled Plastic Bollard**

Measured by number irrespective of colour.

**21.14.14 Supply and Install Vehicle Movement Barrier**

Measured by number of stock or half stock sections.

**21.14.15 Supply Install Cycle Holding Rail**

Measured by number.

**21.14.16 Remove Cycle Holding Rail**

Measured by number.

**21.14.17 Supply and Install Culvert Crossing Guard Rail**

Measured by number of stock or half stock sections including delineators.

**21.14.18 Remove Culvert Crossing Guard Rail**

Measured by number of stock or half stock sections including delineators.

**21.15 PAVEMENT MARKING**

**21.15.1 Setting Out**

Rate to be negotiated on a site-specific basis for new work.

Make allowance for all plant and materials irrespective of the type repair.

**21.15.2 Pavement Marking**

Lengths of line being painted are based on the total length for the work item. For example, 2,500 m of broken line will paid as a single rate item 'Broken Line (BL) 1,000 – 5,000 m'.

The following are measured in linear metres for type of painted line, inclusive of unpainted gaps:

- Continuity line - (single broken).
- Continuity line special (single broken).
- Unbroken lane line - (single continuous).
- Broken lane line or separation line - (single).
- Barrier lines both directions - (double continuous longitudinal lines).
- Barrier lines one direction - (double longitudinal lines broken on one side, continuous on the other).
- Edge line - (single continuous).
- Single Yellow Line - (yellow single continuous).
- Outline (around medians)
- Stop Lines (single continuous)
- Hold Lines (single continuous)
- Turn Lines (single broken)
- Signalized Pedestrian Crossings (single broken)
- Car / Bus / Truck Parking Bays

The following are measured by number:

- Arrow Heads (single, double, triple, merge)
- Numbers and Letters
- Disabled Symbols

Chevrons and Speed Humps are measured by square meter (painted area only)

Make allowance for the supply and application of specified glass beads with all markings.

#### **21.15.3 Raised Retroreflective Pavement Markers**

Measured by number.

Raised Retroreflective Pavement Markers will be supplied by the contractor and paid at cost plus mark up.

Payment for installation will be by number.

The scheduled rate for the Installation of Raised Retroreflective Pavement Markers in Urban Areas is inclusive of traffic control.

#### **21.15.4 Removal of Linemarking**

Measured by square metre of actual painted area.

### **21.16 LANDSCAPE MAINTENANCE**

The following landscape maintenance operations are measured in kilometres for all areas between road reserve boundaries for each specified road for 12 months to specified service levels.

- 21.16.1 Grass Cutting**
- 21.16.2 Grass Trimming**
- 21.16.3 Weeding**
- 21.16.4 Pruning**
- 21.16.5 Removal of Vegetation**
- 21.16.6 Replacement of Plants**
- 21.16.7 Litter Collection**
- 21.16.8 Removal of Dead Animals**
- 21.16.9 Treatment of Pest Species**
- 21.16.10 Fertilising**
- 21.16.11 Clearing of Drainage Lines**
- 21.16.12 Replenishment of Mulch**
- 21.16.13 Disposal of Cut Materials**
- 21.16.14 Irrigation Systems Maintenance**

### **21.17 SLASHING AND WEED CONTROL**

#### **21.17.1 Opening Slash**

Slashing measured in kilometres including both sides of road for each specified road.

#### **21.17.2 Full Slash**

Slashing measured in kilometres including both sides of road for each specified road.

Include for additional slashing on curves and at intersections to provide specified sight distance.

#### **21.17.3 Cleaning of Plant and Equipment**

Measured by item of unit (tractor and slasher)

#### **21.17.4 Slash Specific Areas**

Slashing of areas other than road reserves measured in square metres.

#### **21.17.5 Slash Table Drain Offlets**

Measured by number.

#### **21.17.6 Slash Firebreaks**

Measured in kilometres for nominated width.

#### **21.17.7 Slash and Rake Firebreaks**

Slash and rake firebreaks measured in square metres.

#### **21.17.8 Litter Collection & Disposal**

Not measured separately when included in slashing items.

Measured in kilometres including full width of road reserve both sides of road for each specified road.

#### **21.17.9 Replacement of Damaged Roadside Furniture and Structures**

Not measured separately, include in slashing items.

#### **21.17.10 Bushfire prevention**

Not measured separately, include in slashing items.

#### **21.17.11 Vegetation Control around Guideposts, Signs, and at Bridges, Guardrails, Flood-ways, Culverts**

Spraying measured in kilometres including both sides of road for each specified road.

#### **21.17.12 Vegetation Control at Rest Areas and Truck-bays.**

Slashing measured in square metres.

Spraying measured in square metres.

#### **21.17.13 Vegetation Control at Aerodromes**

Slashing measured in square metres.

Spraying measured in square metres.

#### **21.17.14 Weed Control**

Measured in kilometres including both sides of road for each specified road for 12 months treatment.

Progress payments will be paid for each treatment of the weed control program as a direct proportion of 90% of the scheduled rate.

Final payment will be paid for effective eradication of noxious weeds as a scaled proportion of the remaining 10% of the scheduled rate, based on:

<b>Effective Eradication Percentage Value:</b>	<b>Final payment as a percentage of scheduled rate:</b>
81-100%	30%
51-80%	15%

### **21.18 TRAFFIC SIGNAL & ITS MAINTENANCE**

The following Measurement and Payment clauses refer to the specification sections of the same name, however, the clause numbers do not match the section numbers of the same title.

**21.18.1 Payment Generally**

Payment for Scheduled Work will be made at the tendered rate.

**21.18.2 Rates Generally**

The rates tendered are deemed to represent the full value of the work inclusive of plant, labour, messing, clearances, permits, transportation, fuel, oil, maintenance, tools, material procurement and delivery, all incidentals to complete the work, attendance in accordance with Appendix B 'Response Times', supervision, and for overheads and profit. All works shall be in accordance with any standard drawings if applicable. If no standard drawing is appropriate for the works required, seek direction from the Superintendent's Representative prior to completing any works.

Where a Schedule of Rate item for Scheduled Works is defined as "Labour Only" the rate tendered shall be inclusive of all of the above relating to the labour component.

Payment will be made for all activities associated with completing the work detailed in this Specification in accordance with the following Pay Items. A lump sum price for any of these items will not be accepted.

Payment for the various pay items for all work carried out under this Specification shall include the costs for the following:

- Installation and maintenance of 'minor traffic management' setups (see below),
- Submission of generic Traffic Management Plan & associated TCD's & risk assessments,
- Photographs provided digitally of any works completed, such as damaged and replaced items (before and after) to justify any completed works, or to assist with any additional works identified or outstanding,
- Salvage of any usable parts and testing for reuse in this contract,
- Maintaining the DoI stock database so that it is always current, and;
- Travel from contractor's base to the asset requiring works to be undertaken as instructed, and return to base.

**Minor (Non Complex) Traffic Management**

Minor Traffic Management is defined as consisting of all warning signs, work signs and traffic management devices required to carry out work within the road reserve on all approaches to the work site, including safe management of pedestrian movements and in accordance with AS1742.3 and the 2014 / 15 Standard Specification for Road Maintenance titled "Provision for Traffic". Advising pedestrians of works, hazards, or giving directions around the works is considered minor traffic management and will not be paid separately.

Minor Non Complex traffic management setups would be generally acceptable for lamp changing, pedestrian button replacements, and other Routine Maintenance Repairs, as appropriately addressed in the contractors risk assessment.

**Complex Traffic Management**

Complex Traffic Management is defined as consisting of any works requiring traffic management that is considered complex due to high risk or high speed environments. Complex situational requirements such as speed reductions, lane closures and manual controlling of traffic with WZ2 qualified personnel (control traffic with a stop / slow bat) are considered complex. These complex situations have been itemised and will be charged per approach as scheduled items.

If any item for which a quantity of work is listed in the Schedule of Rates has not been priced by you, it shall be understood that due allowance has been made in the prices of other items for the cost of the activity which has not been priced.

**21.18.3 Fault Maintenance**

Payment will be for labour, plant, equipment and minor non-complex traffic management required to attend and rectify the fault in accordance with Appendix B "Response Times". Payment for materials required to repair the fault will be itemised and paid separately at the tendered rate for Routine Maintenance or the Supply of Materials.

**21.18.4 Fault Attendance – Business Hours**

Measured by number.

Payment will generally be a one off fee for each traffic signal or ITS fault occurring between 0700hrs and 1700hrs Monday to Friday exclusive of public holidays.

The 'Fault Attendance – Business Hours' requires the contractor to attend site with a traffic maintenance equipped vehicle within the nominated response time (Refer Appendix B), undertaking the works as directed or identifying the fault, and returning traffic signals, and / or UPS, CCTV and / or other ITS equipment to normal operating condition.

'Fault Attendance – Business Hours' will be payable once only for each time the Contractor leaves and returns to base, however if the same fault occurs at the same location within twenty four (24) hours\* following the initial fault i.e. a controller fault, or if faults have been added to the system through works undertaken i.e. installing a controller module with a fault, the contractor shall attend at their own expense as soon as possible within the nominated time limit for repair. A separate fault attendance shall be paid if work can be proven to be unrelated to the previous work undertaken, based on detailed records of work undertaken on the site job sheet and recorded fault log codes.

Payment for this item includes checking, testing and cleaning of equipment being worked on including communications, router, test and replace surge diverters, modem, uninterruptable power supply (UPS), wireless receivers and encoder, and reporting and documenting the fault/s.

Cost of materials supply is not included. Refer to 'Supply of Materials' items, or Unspecified Materials items.

Cost of installation of scheduled items is not included. Refer to 'Labour' items.

Note: If a Fault Attendance has exceeded two (2) hours and has become complex with the fault being a suspected cable fault in the field, the 'Hourly Rate – Business Hours' may be requested for use for additional staff member/s to attend to check pole tops and pits to assist rectify the fault. Subject to approval by Superintendent's Representative, Traffic Section staff member or DoI On-Call Officer.

\*Does not override warranty or defects.

#### **21.18.5 Fault Attendance - After Hours**

Measured by number.

Payment will generally be a one off fee for each traffic signal or ITS fault occurring not between 0700hrs and 1700hrs Monday to Friday exclusive of weekends and public holidays.

The 'Fault Attendance – After Hours' requires the contractor to attend site with a traffic maintenance equipped vehicle within the nominated response time (Refer Appendix B), undertaking the works as directed or identifying the fault, and returning traffic signals, and / or UPS, and / or other ITS equipment to normal operating condition.

'Fault Attendance – After Hours' will be payable once only for each time the Contractor leaves and returns to base, however if the same fault occurs at the same location within twenty four (24) hours\* following the initial fault i.e. a controller fault, or if faults have been added to the system through works undertaken i.e. installing a controller module with a fault, the contractor shall attend at their own expense within the nominated time limit for repair. A separate Fault Attendance – After Hours shall be paid if work can be proven to be unrelated to the previous work undertaken.

If the Contractor is required to attend an additional site after being called to the first site, and has not returned to base, or is required to return to a previously worked on site, only one 'Fault Attendance – After Hours' will be paid. If the work is at an additional site a 'Fault Attendance – Business Hours' will be paid.

If the callout is initiated during business hours but extends beyond normal working hours, the 'Fault Attendance – After Hours' shall not be paid unless the callout extends beyond two hours after business hours.

Payment for this item includes checking, testing and cleaning of equipment being worked on including communications, router, test and replace surge diverters, modem, uninterruptable power supply (UPS), wireless receivers and encoder, and reporting and documenting the fault/s.

Cost of materials supply is not included. Refer to 'Supply of Materials' items, or Unspecified Materials items.

Cost of installation of scheduled items is not included. Refer to 'Labour' items.

Note: If a Fault Attendance has exceeded two (2) hours and has become complex with the fault being a suspected cable fault in the field, the 'Hourly Rate – After Hours' may be requested for use for additional staff member/s to attend to check pole tops and pits to assist rectify the fault. Subject to approval by Superintendent's Representative, Traffic Section staff member or DoI On-Call Officer.

\*Does not override warranty or defects.

#### **21.18.6 Accident Attendance – Business Hours**

Measured by number.

Payment will be a one off fee for traffic signal faults that has resulted from severe damage to traffic signals, CCTV, and / or UPS, and / or other ITS equipment by a vehicle accident or similar, occurring during business hours 0700hrs to 1700hrs Monday to Friday. The 'Accident Attendance' item requires a minimum of two of the contractor's appropriately qualified staff to attend site with a traffic maintenance equipped vehicle to allow them to make the site safe, photograph, and remove all damaged items from site, and return the site to fully operational conditions.

The 'Accident Attendance – Business Hours' item will be payable once only for each site requiring an accident attendance, however if there is a fault at the same location within four (4) hours following the accident attendance, the contractor shall attend at their own expense within the nominated time limit for repair.

If the 'Accident Attendance – Business Hours' type callout is initiated during business hours but extends beyond, the 'Accident Attendance - After Hours' type fee shall not be paid unless the callout extends beyond two hours after business hours - the 'Accident Attendance - After Hours' type fee will be paid in lieu of the business hours type in this instance.

Maintenance resulting from an accident is not to be included in the monthly CSR's. A separate CSR shall be raised by the Superintendent's Representative or Traffic Section staff for works resulting from an accident. The CSR will include all fault attendances, after hour's fees and associated labour, plant and materials required to carry out the work.

Cost of materials supply is not included. Refer to 'Supply of Materials' items.

Cost of installation of scheduled items is not included. Refer to 'Labour' items.

#### **21.18.7 Accident Attendance – After Hours**

Measured by number.

Payment will be a one off fee for traffic signal faults that has resulted from severe damage to traffic signals, CCTV and / or UPS, and / or other ITS equipment by a vehicle accident or similar, occurring not between 0700hrs and 1700hrs Monday to Friday exclusive of weekends and public holidays. The 'Accident Attendance – After Hours' requires a minimum of two of the contractor's appropriately qualified staff to attend site with a traffic maintenance equipped vehicle to allow them to make the site safe, photograph, and remove all damaged items from site, and return the site to fully operational conditions..

The 'Accident Attendance – After Hours' will be payable once only for each site requiring an accident attendance, however if there is a fault at the same location within four (4) hours following the accident attendance, the contractor shall attend at their own expense within the nominated time limit for repair.

Maintenance resulting from an accident is not to be included in the monthly CSR's. A separate CSR shall be raised by the Superintendent's Representative or Traffic Section staff for works resulting from an accident. The CSR will include all fault attendances, after hour's fees and associated labour, plant and materials required to carry out the work.

Cost of materials supply is not included. Refer to 'Supply of Materials' items.

Cost of installation of scheduled items is not included. Refer to 'Labour' items.

#### **21.18.8 Site Inspection / Routine Maintenance Inspection**

Measured by number.

Note: This item is intended to require less involvement by the contractor than a Fault Attendance as the only requirement is to visually check an asset, photograph and report to Traffic Section. The reason may be to confirm a fault reported by a member of the public, or to provide other visual confirmation required.

Payment will include the establishment of plant and labour to visually inspect a site or asset and identify any Routine Maintenance required to be scheduled for another time, or to visually provide other advice. A photograph may be required to be forwarded.

If the technician attends site on a Site Inspection, however deems the fault to be of an urgent nature, Traffic Section is to be notified immediately to permit works to be carried out

without delay. A Fault Attendance or other applicable item/s will then be paid in lieu of the Site Inspection / Routine Maintenance Inspection item.

Labour item only.

#### **ROUTINE MAINTENANCE (LABOUR ITEMS)**

Payment will be for all labour, plant, equipment, and minor non-complex traffic management items required to carry out the work in accordance with *Table 16.12 - Response Times in Clause 16.32*. Material will be paid separately if included in the Schedule of Rates for Supply of Material.

#### **21.18.9 Lamp Replacement / Reset**

Measured by number.

Payment will include the establishment of plant, labour, equipment and sundries, required to change a traffic signal lamp regardless of its type i.e. incandescent, halogen or LED. If the lamp is situated on the mast of a highmast, 'Supply Lifting Equipment' item shall be used.

If it is found a transformer is required to be replaced, a 'Fault Attendance – Business Hours' shall be paid in lieu of the lamp replacement.

Cost of lamp is not included. Refer to Supply of Materials items.

#### **21.18.10 Install Traffic Signal Lantern**

Measured by number.

Payment will include the establishment of plant, labour, equipment and sundries required to install, relocate or change a traffic signal vehicle lantern (200mm or 300mm), for all single/ vertical aspect configurations.

Items included in installing the lantern are attaching target boards, louvres, cowls, cable and accessories to connect the aspect and test.

If the lantern required to be installed or replaced is situated on the mast of a highmast, 'Supply Lifting Equipment' item shall be used.

Cost of aspect, target board, brackets, louvres, cowls etc. are not included. Refer to Supply of Materials items.

#### **21.18.11 Install Double Traffic Signal Lantern**

Measured by number.

Payment will include the establishment of plant, labour, equipment and sundries required to install, relocate or change a double traffic signal vehicle lantern (200mm or 300mm), for all double aspect configurations.

Items included in installing the aspect are attaching target boards, louvres, cowls, cable and accessories to connect the lantern and test.

If the lantern required to be installed or replaced is situated on the mast of a highmast, 'Supply Lifting Equipment' item shall be used.

Cost of aspect, target board, brackets, louvres, cowls etc. are not included. Refer to Supply of Materials items.

**21.18.12 Install Pedestrian Lantern**

Measured by number.

Payment will include the establishment of plant, labour and equipment and sundries required to install, relocate or change a pedestrian lantern and test.

Items included in installing the aspect are attaching cowls, cable and accessories to connect the lantern.

Cost of pedestrian aspect, cowls, brackets etc. are not included. Refer to Supply of Materials items.

**21.18.13 Install / Replace Pole Top Assembly**

Measured by number.

Payment will include the establishment of plant, labour and equipment and sundries required to install or change a complete pole top assembly including brackets, mounting points, cover and connector rack, and the removal and reinstatement of traffic signal aspects as required. Items shall include cable connections. Payment will also include the painting of the pole top in the appropriate colour when that pole top being worked on has been identified as having a junction or open link.

If only the connector rack requires replacing (with Traffic Section staff approval), it will be paid as a rewire pole top item.

Cost of pole top is not included. Refer to Supply of Materials items.

**21.18.14 Rewire Pole Top Assembly**

Measured by number.

Payment will include the establishment of plant, labour and equipment required to completely rewire a pole top assembly. The item shall include disconnecting, re-terminating each active core, reconnecting and relabelling cable at the pole top assembly and additional cable connections if required. Payment will also include the painting of the pole top in the appropriate colour when that pole top being worked on has been identified as having a junction or open link.

Partial rewire will not be paid under this item.

If the connector rack requires replacing (with Traffic Section staff approval), it will be paid as a rewire pole top item, however the connector rack will be paid for under the negotiated rate item.

**21.18.15 Install Traffic Signal Pedestal**

Measured by number.

Payment will include the establishment of plant, labour and equipment required to install or change a traffic signal pedestal, connect cables, fixing the pedestal to functional footings, and mortaring the

base of the pole. The pedestal shall be straight & level.

Cost of pedestal is not included. Refer to Supply of Materials items.

If required Multi Core cable will be available from the Superintendent unless directed otherwise.

**21.18.16 Install Traffic Signal Base Plate**

Measured by number.

Payment will include the establishment of plant, labour, equipment and sundries required to install or change a base plate on a traffic signal footing.

Cost of the base plate is not included. Refer to Supply of Materials items.

**21.18.17 Install Traffic Signal Pedestal Footing**

Measured by number.

Payment will include the establishment of plant, labour and equipment required to install or replace a traffic signal footing in accordance with the standard drawing, inclusive of all items and sundries to excavate material and damaged footing, backfill and compact, in situ concrete, formwork, bedding, grouting, reinstatement of surfaces and disposal of material.

Cost of footing rag bolt assembly is not included. Refer to Supply of Materials items.

If the footing is in a new position and the connecting conduit junction pit is more than 5 meters from the footing location or crosses a sealed surface i.e. concrete, or a rock base, the contractor shall provide quote for negotiated rate in addition to this item to allow for the additional works.

**21.18.18 Repair Traffic Signal Footing**

Measured by number.

Payment will include the establishment of plant, labour and equipment required to repair a traffic signal footing where only the thread on the existing footing has been damaged. Payment is inclusive of all items and sundries to excavate any materials, cut off damaged threaded rods, drill holes for new threaded rods, install with chemset or similar, in situ concrete, formwork, bedding, grouting, reinstatement of surfaces and disposal of material.

**21.18.19 Detector Test and Repair**

Measured by number.

Payment will include the establishment of plant, labour, equipment and sundries required to test and repair a faulty traffic signal detector, including to reduce the detector to a half loop where instructed to by Traffic Section. Payment will also include the technician providing the readings verbally to Traffic Section from site, then written on the job sheet and response.

**21.18.20 Install Detector (Saw cut)**

Measured by number.

Payment will include the establishment of plant, labour, material and equipment required to install a vehicle detector in accordance with the Standard Drawing, connect to the controller, testing, and provide readings.

If required detector feeder cable will be available from the Superintendent's Representative unless directed otherwise.

**21.18.21 Install Detector (Pre-fabricated)**

Measured by number.

Payment will include the establishment of plant, labour, material and equipment required to install a pre-fabricated vehicle detector, connect to the controller, testing, and provide readings. Liaise with sealing or asphalt contractors to coordinate the works program accordingly.

If required detector feeder cable will be available from the Superintendent's Representative unless directed otherwise.

**21.18.22 Install Detector Pit**

Measured by number.

Payment will include the establishment of plant, labour, materials, sundries and equipment required to install a detector pit. The pit shall have 75mm of 20mm aggregate installed underneath the pit to allow for drainage, separated by a membrane to stop ingress of material into the pit. The pit shall have a tooled concrete surround supporting the pit, minimum of 100mm wide x 100mm deep.

NOTE: The current standard drawing does not reflect this requirement and is soon to be updated. Different types of pits may be considered subject to Superintendent's Representative's approval for use.

Cost of detector pit is not included. Refer to Supply of Materials items.

**21.18.23 Pedestrian Button Test and Repair / Replace**

Measured by number.

Payment will include the establishment of plant, labour, sundries and equipment required to test and repair, and / or replace, a faulty or damaged pedestrian button.

If the pedestrian button is deemed unrepairable by the contractor when sent to test and repair, and a new pedestrian button is required to be installed, this item will only be paid once for replacement. Items shall include disconnecting, reconnecting cables and testing the operation.

Cost of Audio tactile driver card and pedestrian push button is not included. Refer to Supply of Materials items.

**21.18.24 Audio Tactile Test and Repair / Replace**

Measured by number.

Payment will include the establishment of plant, labour, sundries and equipment required to test and repair, and / or replace, a faulty or damaged audio tactile unit, including speaker.

If the audio tactile component or speaker is deemed unrepairable by the contractor when sent to test and repair, and a new audio tactile component is required to be installed, this item will only be paid once for replacement of the item. Items shall include disconnecting, reconnecting cables and testing the operation. Cost of audio tactile unit, components or speaker is not included. Refer to Supply of Materials items.

**21.18.25 Test and Restore Communications / SCATS Communications**

Measured by number.

Payment will include the establishment of plant, labour, sundries and equipment required to test and repair communication links to SCATS or other ITS equipment.

Cost of hardware material is not included. Superintendent's Representative to advise of authorised suppliers.

**21.18.26 Supply and Connection of Generator**

Measured by hours (Rounded up and payable in 30 minute blocks).

Payment will include the establishment of plant, labour, sundries and equipment required to connect, secure and maintain the operation of a 15amp / 240 volt generator to a traffic signal controller box, or UPS to power and maintain the operation of traffic signalised sites and associated ITS as specified by the Superintendent's Representative or Traffic Section staff. Payment includes attendance for disconnection at completion of use, and the first tank of fuel.

Generators shall be tested on a site to prove suitability for use.

Subsequent tanks of fuel will be paid as per 'Unscheduled Items'.

**21.18.27 Install Multi Core Cable – including and below 21 cores**

Measured by Lineal Meter.

Payment will include the establishment of plant, labour, sundries and equipment required to install multi core cable (including and below 16 core) and other cable such as data cable (fibre / cat 5/6) into an existing conduit/s, pits, and posts, and to remove any existing damaged cable from conduit if necessary.

Note. Any fibre termination is not included within this rate.

**21.18.28 Install Multi Core Cable – including and below 51 cores**

Measured by Lineal Meter.

Payment will include the establishment of plant, labour, sundries and equipment required to install multi core cable (between 21 and 51 cores) into an existing conduit/s, pits, and posts, and to remove any existing damaged cable from conduit if necessary.

Multi Core cable (51 core) may be available from the Superintendent and will be utilised unless directed otherwise.

**21.18.29 Install Detector Feeder Cable**

Measured by Lineal Meter of conduit that the cable is drawn through.

Payment will include the establishment of plant, labour, sundries and equipment required to install Detector Feeder cable into an existing conduit/s and to remove existing damaged cable from conduit if necessary.

Detector Feeder cable will be available from the Superintendent unless directed otherwise.

The Lineal Meter rate for 'Install Detector Feeder Cables' is not to be measured as per Lm of cable installed in the ground as this cable is often installed as multiple layers in the one conduit. The rate shall be measured as per Lineal Meter of conduit drawn through for this cable to be installed.

**21.18.30 Replace or Upgrade Traffic Signal Controller, or Integrated UPS & Controller**

Measured by number.

Payment will include the establishment of plant, labour and equipment required to collect from the storage yard, install or upgrade a traffic signal controller, inclusive of all items and sundries, reinstatement of surfaces and disposal of material if previous controller had been damaged. This item includes some modification of existing footing/plinth in relation to new tie-down rods to secure the controller to the existing footing regardless of the controller type.

Any modifications regarding significant concrete works required, new or replacement plinth, or extension of plinth, shall be undertaken under a negotiated rate.

The cost of the Traffic Signal Controller unit is not included. Traffic Signal Controller unit will be available from the Superintendent unless directed otherwise.

**21.18.31 Install Auxiliary Cabinet**

Measured by number.

Payment will include the establishment of plant, labour, all sundries, cables (power / Cat 5 data / fibre) and equipment required to prepare, install and connect an auxiliary cabinet to a traffic signal

controller including all the electrical components within.

Payment includes installation of the equipment required within the cabinet, including connection and establishment of communications with all items, tidy installation of all cables and equipment including to racks where possible, and use of appropriate length data cables.

Note: A standard drawing was not finalised at the time of advertising this contract. A standard drawing may be provided during the contract term.

**21.18.32 Provide Lifting Equipment**

Measured per day.

Payment will include the establishment of plant, labour, safety devices and equipment required to provide and operate lifting equipment in order to carry out other works.

The 'Provide Lifting Equipment' item will be used to provide access for highmast aspect installations, realignments, and lamp replacements, also CCTV maintenance and installation, or any other requirements for lifting equipment as directed by Traffic Section.

Payment will include all lifting equipment required to reach a high mast or CCTV pole.

Cost of Traffic Management is not included. Refer to 'Traffic Management' items.

Cost of traffic signal/CCTV hardware is not included. Refer to Supply of Materials items.

Cost of installation of hardware not included – refer to Routine Maintenance items.

**21.18.33 Pest Eradication**

Measured by number.

Payment will include eradication of ants, cockroaches, spiders and other insects from the asset for a period of at least 3 months. If the pest returns to the same location within 3 months, a further treatment will be required at the contractor's expense.

Payment includes the treatment of a controller and associated communications pillar. If the pest issue is in a pit, payment includes that pit and nearest two pits.

Payment does not include termites, this will be a negotiated rate if needed.

**21.18.34 Hourly Rate – Business Hours**

Measured by hours (Rounded up and payable in 30 minute blocks).

Minimum payment of one hour applies.

Payment will include labour for an appropriately qualified technician to be available during business hours, for the services required by DoI where other scheduled items are not separately addressed. Use of this item may be utilised where a Fault Attendance has exceeded two hours and has become complex, or where the services of a technician are required for a known or unknown



duration such as post cyclone refuelling of generators, or other duties as directed by Traffic Section.

This item shall only be approved for use with prior approval from the Superintendent's Representative, Traffic Section staff member, or DoI On-Call Officer. If all of these DoI personnel are unavailable, leave voice messages and proceed with works, however make contact as soon as possible thereafter.

This item is reliant on the contractor providing evidence of attendance and duration on site via logon / logoff, door event or communication with Traffic Section / DoI On-Call Officer at commencement and completion for substantiation. Be advised that lack of evidence may result in item not been authorised.

Labour and tools item only.

#### **21.18.35 Hourly Rate – After Hours**

Measured by hours (Rounded up and payable in 30 minute blocks).

Minimum payment of three hours applies.

Payment will include labour for an appropriately qualified technician to be available after hours, for the services required by DoI where other scheduled items are not separately addressed. Use of this item may be utilised where a Fault Attendance has exceeded two hours and has become complex, or where the services of a technician are required for a known or unknown duration such as post cyclone refuelling of generators, or other duties as directed by Traffic Section.

This item shall only be approved for use with prior approval from the Superintendent's Representative, Traffic Section staff member, or DoI On-Call Officer. If all of these DoI personnel are unavailable, leave voice messages and proceed with works, however make contact as soon as possible thereafter.

This item is reliant on the contractor providing evidence of attendance and duration on site via logon / logoff, door event or communication with Traffic Section / DoI On-Call Officer at commencement and completion for substantiation. Be advised that lack of evidence may result in item not been authorised.

Labour and tools item only.

#### **21.18.36 Negotiated Rate**

Measured by number.

To be determined as negotiated between the Superintendent's Representative or Traffic Section staff and the Contractor for labour, equipment and services are requested to be provided by the contractor. All Negotiated Rate items are to be submitted and itemised on the Quote Sheet.

All Negotiated Rate items shall be agreed upon based on the Quote provided in writing prior to the

execution of the works or ordering of the items, unless deemed an emergency by Superintendent's Representative, Traffic Section staff, or DoI On-Call Officer and agreed to verbally. In an emergency instance the item shall be followed up in writing no later than the next working day thereafter.

This item is not to be priced in the Response Schedule – a Provisional Sum has been allowed for in the Schedule of Rates.

### **SPECIFIC MAINTENANCE**

#### **21.18.37 Site Audit and Report- Vehicle Signalised Intersection & ITS**

Measured by number.

Vehicle sites are defined in clauses 16.30 and 16.31.

Payment will include the establishment of plant, labour and equipment, and collection of lighting plant if required, to audit and submit a corresponding report to the Superintendent's Representative for a vehicle site in accordance with the site audit template shown in **Figure 16.3 - Sample Template Traffic Signal and ITS Audit Report Template**. The Site Audit will also include carrying out minor repairs such as replacing lamps or arrays, damaged or missing cowls, and all other similar activities that can be undertaken within activities associated with the audit. Any pole top assemblies identified at or prior to the audit shall be replaced as a priority while traffic management is on site.

This item shall also include written quotes for any works identified from the audit or other recommended maintenance.

The report shall also include fully detailed diagrams or drawings of the intersection.

The report shall be submitted to Traffic Section within 5 working days of the audit being completed.

Cost of hardware material is not included. See Unspecified Materials items.

Cost of traffic management is not included. See traffic management items.

#### **21.18.38 Site Audit and Report – Pedestrian Signalised Intersection & ITS**

Measured by number.

Pedestrian sites are defined in clauses 16.30 and 16.31.

Payment will include the establishment of plant, labour and equipment, and collection of lighting plant if required, to audit and submit a corresponding report to the Superintendent's Representative for a pedestrian site in accordance with the site audit template shown in **Figure 16.3 - Sample Template Traffic Signal and ITS Audit Report Template**. The Site Audit will also include carrying out minor repairs such as replacing burnt

out lenses or lamps, damaged or missing, cowls, visors and louvers and all other similar activities that can be undertaken within activities associated with the audit. Any pole top assemblies identified at or prior to the audit shall be replaced as a priority while traffic management is on site.

This item shall also include written quotes for any works identified from the audit or other recommended maintenance.

The report shall also include fully detailed diagrams or drawings of the intersection.

The report shall be submitted to Traffic Section within 5 working days of the audit being completed.

Cost of hardware material is not included. See Unspecified Materials items.

Cost of traffic management is not included. See traffic management items.

#### **21.18.39 UPS Maintenance & Condition Report**

Measured by number

Payment for the Specific maintenance for UPS systems includes the establishment of plant, labour sundries and equipment including terminal grease, inspection and testing of all on-site equipment to identify its physical condition, operational performance and configuration of hardware in accordance with the scheduled tasks in **Figure 16.4 – Sample Template UPS Maintenance and Battery Condition Report**.

The required two hour discharge test will be undertaken remotely by Traffic Section.

The report shall be submitted to Traffic Section within 5 working days of the audit being completed.

### **SUPPLY OF MATERIALS**

#### **21.18.40 Specified Materials**

Measured by number.

Payment will be wholly inclusive of all mark up and freight charges.

All materials will be sourced from suppliers approved by the Superintendent.

Refer to Response Schedule for list of specified materials.

#### **21.18.41 Traffic Signal Component Repairs**

Measured by number.

Payment will include 10% mark up and freight. Invoices from supplier / repairer and freight handlers shall accompany CSR for payment authorisation.

This item is not to be priced in the Response Schedule – a Provisional Sum has been allowed for in the Schedule of Rates.

#### **21.18.42 Non Specified / Unscheduled Materials or Items**

Measured by number.

Payment will include 10% mark up and freight. Invoices from supplier and freight handlers must accompany CSR for payment authorisation.

This item is not to be priced in the Response Schedule – a Provisional Sum has been allowed for in the Schedule of Rates.

#### **21.18.43 Supply LED Traffic Signal Lantern or Aspect – Various sizes**

Measured by number. Lantern sizes are priced separately in schedule of rates.

Payment will include the supply of a new LED traffic signal aspect or lanterns (regardless of size), complete with all cowls, louvres, target board, LED arrays, transformers, brackets and fittings required to form a complete lantern.

Payment includes manufacturer's warranty, and handling.

Cost of installation not included – refer to Routine Maintenance.

#### **21.18.44 LED Array – Various Sizes and Colours**

Measured by number. LED array sizes, colours, roundels and arrows priced separately in the schedule of rates.

Payment will include the supply of a new traffic signal LED array required for an existing LED aspect.

Payment includes manufacturer's warranty, and handling.

Cost of installation not included – refer to Routine Maintenance.

#### **21.18.45 Supply LED Pedestrian Lantern**

Measured by number.

Payment will include the supply of a new LED pedestrian lantern, complete with all cowls, LED arrays, transformers, brackets and fittings required to form a complete pedestrian lantern.

Payment includes manufacturer's warranty, and handling.

Cost of installation not included – refer to Routine Maintenance.

#### **21.18.46 Supply Target Board – Various sizes**

Measured by number. Target Board sizes priced separately in schedule of rates.

Payment will include the supply of a new traffic signal target board as a complete item for the corresponding size required for the aspect to be fitted, including any blank panels required for 4 or 5 way aspect configurations.

Cost of installation not included – refer to Routine Maintenance.

**21.18.47 Miscellaneous Traffic Signal Aspect Items**

Measured by number. Various sizes, types of items listed below all priced separately in the schedule of rates.

Cowls - Payment will include the supply of new open or closed cowls of various sizes, complete with all fittings required to install on a traffic signal aspect.

Aspect Doors - Payment will include the supply of new aspect doors, for traffic signal aspects and for pedestrian aspects, complete with all fittings required to install on a traffic signal aspect.

Aspect Seals – Payment will include the supply of new aspect seals, for traffic signal aspects and for pedestrian aspects, complete to install within a traffic signal aspect.

Cost of installation of above not included – refer to Routine Maintenance.

**21.18.48 Lamps – Various Types**

Measured by number. Lamp types priced separately in schedule of rates.

Payment will include the supply of new traffic signal aspect lamps for older style Halogen and Incandescent lamps.

Cost of installation not included – refer to Routine Maintenance.

**21.18.49 Supply LED Transformer**

Measured by number.

Payment will include the supply of a new traffic signal transformer required for an LED array / Halogen, regardless of the type or size required for 200mm or 300mm green, yellow or red.

Cost of installation not included – refer to Routine Maintenance.

**21.18.50 Supply 50 Way Finial Pole Top Complete**

Measured by number.

Payment will include the supply of a new 50 way finial pole top assembly complete.

Cost of installation not included – refer to Routine Maintenance.

**21.18.51 Supply Pole Top Cover**

Measured by number.

Payment will include the supply of a new pole top cover only and will also include the painting of the pole top in the appropriate colour if that pole top being worked on has been identified as having a junction or open link.

Cost of installation not included – refer to Routine Maintenance.

**21.18.52 Brackets – Full and Half**

Measured by number.

Payment will include the supply of new full or half brackets complete with all fittings required to install an aspect on a traffic signal pedestal.

Cost of installation not included – refer to Routine Maintenance.

**21.18.53 Standard Traffic Signal Pedestal**

Measured by number.

Payment will include the supply of a new hot dipped galvanised traffic signal pedestal in one continuous length without joints, threaded suitably for connection to the base plate, for use to mount traffic signal hardware.

Cost of installation not included – refer to Routine Maintenance.

**21.18.54 Traffic Signal Pedestal Base Plate**

Measured by number.

Payment will include the supply of a new hot dipped galvanised traffic signal pedestal base plate, threaded suitably for connection to mount traffic signal pedestal.

Cost of installation not included – refer to Routine Maintenance.

**21.18.55 Traffic Signal Pedestal Footing**

Measured by number.

Payment will include the supply of a new traffic signal pedestal footing for use to mount traffic signal pedestal base plate.

Cost of installation not included – refer to Routine Maintenance.

**21.18.56 Pedestrian Push Button**

Measured by number.

Payment will include the supply of a new pedestrian push button complete with button, housing, audio tactile speaker and fixings.

Cost of installation not included – refer to Routine Maintenance.

**21.18.57 Audio Tactile Speaker**

Measured by number.

Payment will include the supply of a new audio tactile speaker and wiring required for installation, for use within a pedestrian push button.

Cost of installation not included – refer to Routine Maintenance.

**21.18.58 Audio Tactile Driver Card**

Measured by number.

Payment will include the supply of a new audio tactile driver card to be fitted within the housing unit, for use with pedestrian push button.

Cost of installation not included – refer to Routine Maintenance.

**21.18.59 Detector Pit (Polycrete Type)**

Measured by number.

Payment will include the supply of a new traffic signal detector pit complete, of Polycrete construction similar to pit ACO Type 33 (L 340 mm x W 340 mm x D 440 mm). Two drain holes to be installed in the base of the pit.

Payment includes supply of pit and class B galvanised steel lid with a chain connection to the pit.

NOTE: The current standard drawing does not reflect this requirement and is soon to be updated. Different types of pits may be considered subject to Superintendent's Representative's approval for use.

Cost of installation not included – refer to Routine Maintenance.

**21.18.60 Handheld Terminal (HHT)**

Measured by number.

Payment will include the supply of a new traffic signal Hand Held Terminal (HHT), inclusive of freight.

**21.18.61 Telephone Line Surge Diverter**

Measured by number.

Payment includes the supply of Surge Protection equipment for traffic signal communications lines. Protection equipment should be the same as that supplied by Microconnect for use with their equipment, Novaris #MPP-RJ12-001.

**21.18.62 Krone Rack**

Measured by number. Payment includes the supply of a Krone Rack for installation within a traffic signal communications pillar for traffic signal communications lines.

Cost of installation not included – refer to Routine Maintenance.

**21.18.63 Fuses**

Measured by number.

Payment includes the supply of 5mm x 20mm fuses required for use within a traffic signal controller.

Fuse types nominated for supply include all amperages for 5mm x 20mm fuses including:

- 5mm by 20mm Quick acting 5 A fuse
- 5mm by 20mm medium acting 6.3 A fuse
- 5mm by 20mm medium acting 1 A fuse
- 5mm by 20mm medium fast acting 1 A fuse
- 5mm by 20mm medium fast acting 0.5 A fuse
- 5mm by 20mm medium slow blow 3.15 A fuse

Different sized fuses, Circuit Breakers and Miniature Circuit Breakers (MCBs) if required shall be paid utilising the unscheduled items / materials item.

Cost of installation not included.

**21.18.64 Sea Wasp**

Measured by number.

Payment includes the supply of a sea wasp surge diverter and sundries required for use within a traffic signal communications pillar.

Cost of installation not included.

**21.18.65 Prefabricated Communication Box**

Measured by number.

Payment includes the supply of a traffic signal communications pillar cover (communications box), constructed of aluminium, powder-coated in a bright orange colour similar to others previously installed. Four 'hex' bolts shall be supplied to fit the cover to the footing when installed, and remove any previously installed 'D' bolts.

Payment includes supply of communications box to suit various types of footings currently installed.

Cost of installation not included.

**21.18.66 Supply Underground Junction Box**

Measured by number.

Payment includes the supply of a permanently installed junction box to join multi core cable within a conduit junction pit. The junction box shall be entirely waterproof.

Connector should be isolation tag type like in pole tops and should be numbered / identified as per pole top.

Payment includes all sundries required for use in installation.

Cost of installation not included - Payment does not include painting the associated pole top nearest to the pit when installed, however when installed the bottom half of the pole top shall be painted white.

**21.18.67 Supply Auxiliary Cabinet**

Measured by number.

Payment includes the supply of an auxiliary cabinet (top hat) to suit the nominated controller/s listed within this specification. The auxiliary cabinet shall be constructed with the same materials as the traffic signal controller and be painted the same colour. It shall be ventilated, waterproof and keyed in accordance with the Superintendent's nominated key type, with 2 keys provided.

Payment will include a small suitable exhaust fan (IP rated to suit the environment) pre-installed, a sub-switchboard, and computer equipment racking to neatly store and secure items such as routers.

Cost of installation not included.

**21.18.68 TRAFFIC MANAGEMENT****Complex Traffic Management**

Complex Traffic Management is defined as consisting of any works requiring traffic management that is considered complex due to high risk or high speed environments. Complex situational requirements such as speed reductions, lane closures and manual controlling of traffic with WZ2 qualified personnel (control traffic with a stop / slow bat) are considered complex. These complex situations have been itemised and will be charged per approach.

Complex Traffic Management items are inclusive of Minor Non Complex traffic management requirements for the entire site of works, including all pedestrian management.

All Traffic Management Plans (TMPs) and Traffic Control Diagrams (TCDs) submitted for use in this contract (specific or generic) shall be reused within this contract for the same or similar works where possible, or as advised by the Superintendent's Representative.

Payment for all traffic management items includes the submission of a Temporary Speed Limit Authorisation (TSLA) along with the TCD to be utilised, and any permits required for the works. Daily Diaries from the traffic management company shall also be provided following the works, for any traffic management items utilised.

NOTE: SCATS can be utilised to assist with controlling traffic in some instances where it may otherwise not be possible due to speed or volume. For example, requesting Traffic Section staff to dwell an approach in order to hold another approach for a short duration to enable a technician to access a pit or an aspect safely. The contractor shall consider this as an option to assist with works.

The following item/s shall be submitted to Superintendent's Representative or Traffic Section staff for approval prior to use:

**21.18.69 Traffic Management Type A  
(Speed Reduction - Non Lane Closure)**

Measured per approach.

Payment will include the establishment of all plant, equipment, signage and labour to install appropriate traffic management for speed reductions and to maintain the setup with accredited staff and modify the existing traffic management setup for as long as required for a period of one working day.

This item will be paid per approach that speed reductions are required to complete the works and shall include other minor traffic management requirements for the site including safe pedestrian management.

This item may be paid in accordance with Traffic Management Type C for the period that type C is

required but is not to be used in accordance with Traffic Management Type B for that approach.

**21.18.70 Traffic Management Type B  
(Lane Closure/s)**

Measured per approach.

Payment will include the establishment of all plant, equipment, signage and labour to install appropriate traffic management for lane closures and to maintain the setup with accredited staff and modify the existing traffic management setup for as long as required for a period of one working day.

This item will be paid per approach that lane closure/s are required to complete the works and are inclusive of any requirement of a closure change to an adjacent lane. This item shall include other minor traffic management requirements for the site including safe pedestrian management.

This item may be paid in accordance with Traffic Management Type C for the period that type C is required but is not to be used in accordance with Traffic Management Type A for that approach.

**21.18.71 Traffic Management Type C  
(Traffic Controller/s)**

Measured by hours (Rounded up and payable in 30 minute blocks).

Payment will include the establishment of all plant, equipment and labour to install appropriate traffic management for manual traffic control and to maintain the setup with accredited staff and modify the existing traffic management setup for as long as required.

This item will be paid per lane of traffic under control / per hour that WZ2 qualified controllers are required for the contractor to complete the works and shall include other minor traffic management requirements for the site including safe pedestrian management.

This item may be used in accordance with Traffic Management Type A or B for the period required.

**21.18.72 Traffic Management Type D  
(Frequently Changing Work Area)**

Measured by number / per site.

Payment will include the establishment of all plant, equipment and labour to install appropriate traffic management for a frequently changing work area and maintain the setup with accredited staff and modify the existing traffic management setup, regardless of how many approaches are required. This item may require a speed reduction in accordance with these standards which is included in this item.

Appropriate shadow vehicles and / or attenuator shall be utilised.

This item will be paid per site that this item is utilised for.

### **21.18.73 Site Specific Traffic Control Diagrams (TCDs)**

Measured by number / per site.

Payment will include the labour, equipment and materials required to compile and submit site specific Traffic Control Diagram/s (TCD), associated specific Risk Assessment, to the Superintendent's Representative or Traffic Section staff in order to undertake the required maintenance works task. If the works require two (2) or more TCDs in order to document the works required, or for after-hours care, this shall be included in the rate.

The TCDs and Risk Assessment shall reference the specific TMP for traffic signals maintenance, and ensure that it complies with this document. Alternately, provide a separate summarised TMP where details contradict the primary maintenance TMP.

Site Specific TCDs shall join the suite of TCDs, including generic TCDs, under the Traffic Signals Maintenance contract TMP, and shall be reused for other works associated with this contract where possible.

Note: the Template TMP's and Generic and TCD's required are not to be classed as chargeable items.

### **21.19 STREET SWEEPING**

#### **21.19.1 Scheduled Works – Sweeping of Intersections, Median Breaks and Kerbed Sections of Roads**

Measured by the number of monthly sweeping cycles for each nominated road. Sweeping will include intersections, median breaks and kerbed sections of roads.

#### **21.19.2 Scheduled Works – Sweeping of Cycleways and Footpaths**

Measured by the number of monthly sweeping cycles for each nominated cycleway or footpath.

#### **21.19.3 Priority Works**

Road Sweeping Equipment: Measured as an hourly rate for on-site hours worked.

Cycleway and Footpath Sweeping Equipment: Measured as an hourly rate for on-site hours worked.

#### **21.19.4 Urgent Works**

Road Sweeping Equipment: Measured as an hourly rate for on-site hours worked.

Cycleway and Footpath Sweeping Equipment: Measured as an hourly rate for on-site hours worked.

Water not measured separately

### **21.19.5 Supply and Use of Detergent**

Measured by litres of detergent used.

#### **21.19.6 Manual Sweeping of Medians, Splitter Islands, etc.**

Measured as an hourly rate per person for on-site hours worked.

#### **21.19.7 Travel Allowance past Stuart Highway/Arnhem Highway Intersection**

- Road Sweeping Equipment: Measured per kilometre from the Stuart Highway / Arnhem Highway intersection to the most distant point of the works, by the most direct route.
- Cycleway and Footpath Sweeping Equipment: Measured per kilometre from the Stuart Highway / Arnhem Highway intersection to the most distant point of the works, by the most direct route.

#### **21.19.8 Disposal of Recovered Waste**

Not measured separately. Make allowance for these items within other rates.

#### **21.19.9 Traffic Control/ Provision for Traffic**

Not measured separately. Make allowance for compliance with the contract requirements within other rates.

Provision for Traffic not measured separately.

### **21.20 AERODROME MAINTENANCE**

Refer to the specification text for the full extent of work required under each scheduled item.

#### **21.20.1 Slashing of grassed areas**

Measured as an item for the particular aerodrome.

#### **21.20.2 Cutting of re-growth**

Measured as an item for the particular aerodrome.

#### **21.20.3 Dragging of Aerodrome**

Measured as an item for the particular aerodrome.

#### **21.20.4 Rolling of sealed runways**

Measured in square metres.

#### **21.20.5 Rolling of gravel runways**

Measured in square metres.

#### **21.20.6 Maintenance grade – Runways**

Measured in square metres.

#### **21.20.7 Maintain fences and gates**

Measured in lineal metres.

#### **21.20.8 Maintain aerodrome furniture**

Measured as an item for the particular aerodrome.

**21.21 ROAD AND MARINE AMENITY MAINTENANCE**

The following routine maintenance operations for the maintenance of the nominated amenities are measured by month to the specified service levels:

Adjustments to payment for these items will be subject to independent auditors report.

**21.21.1 Rubbish Collection****21.21.2 Rubbish Removal****21.21.3 Bin Placement and Replacement****21.21.4 Cleaning of Road Amenity Area Furniture****21.21.5 Cleaning of Road Amenity Area Toilet Block****21.21.6 Cleaning of Amenity Area Structures and Furniture****21.21.7 Cleaning of Amenity Area Toilets and Toilet Block****21.21.8 Maintenance of Toilet Systems****21.21.9 Water Tanks and Water Maintenance****21.21.10 Cleaning of Barbecues and Provision of Firewood****21.21.11 Cleaning and Pressure Cleaning Jetty Decks****21.21.12 Cleaning and Pressure Cleaning of Boat Ramp and Pontoons****21.21.13 Maintenance of Toilet Systems****21.21.14 Graffiti Removal****21.21.15 Grass Cutting****21.21.16 Grass Trimming****21.21.17 Weeding****21.21.18 Irrigation Systems maintenance****21.21.19 Tree replacement****21.21.20 Water Tanks and Water Maintenance****21.21.21 Cleaning and maintenance of Barbecues Provision of Firewood****21.21.22 Painting Existing Furniture****21.21.23 Repair and Replacement of Road Amenity Area Furniture**

The following specific maintenance operations are measured as specified and directed by the Superintendent (travel allowance to be paid where not mentioned separately for works in rural areas only)

**21.21.24 Information Sign**

Measured by number.

**21.21.25 Initial Painting of Furniture**

Measured as an item for all road amenity area furniture.

**21.21.26 Touch Up Painting of Furniture**

Measured as an item for all road amenity area furniture.

The following specific maintenance items are measured as specified.

**21.21.27 Bin Placement and Replacement**

Measured by number including NTG decals

**21.21.28 Pumping of Septic tanks**

Measured by number of operations for each Amenity site.

Clean Out Toilet Compost Chambers

Measured by number.

**21.21.29 Roadside Rubbish Collection**

Measured per kilometre including both sides of road.

**21.21.30 Provision of Firewood Storage Bins**

Measured by number.

**21.21.31 Removal of Dead Animals**

Measured by number.

Include in the rate for the specified rapid response time and removal of both large and small carcasses.

**21.21.32 Removal of Graffiti**

Measured by hours inclusive of the solvents and procedure required to remove the graffiti.

**21.21.33 Removal of Abandoned Vehicles**

Measured by number.

**21.21.34 Illegal Rubbish Collection**

Measured by lots of up to 250 kilo maximum weight

Provide weighbridge dockets to verification for payments.

Provide photographic evidence to verification of payments

**21.21.35 Repair and Replacement of Road Amenity Area Furniture**

To be paid at negotiated rate between the Contractor and Superintendent.

**21.21.36 Painting Existing Furniture**

To be paid at negotiated rate between the Contractor and Superintendent.

**21.21.37 Tree and Plant Removal and or Replacement**

To be paid at negotiated rate between the Contractor and Superintendent.

**21.21.38 Maintenance for Marine Growth/  
Shellfish Encrustations on Structures**

To be paid at negotiated rate between the Contractor and Superintendent

**21.22 Unscheduled items/materials and  
Negotiated Rate**

Items not categorised in the Schedule Of Rates will be paid for by the following items.

Unscheduled items: Instances where the contractor has been requested to engage the sub-contractor (such as cross-hire of equipment), or provided unscheduled materials (freight to another region), the unscheduled item/material rate shall be utilised. This item is where the contractor would be required to pay a third party.

Negotiated rate: Instances where the contractor has been requested to provide labour items, or provide other.

**21.22.1 Unscheduled Items /material**

Measured by number and / or items.

Payment shall include 10% mark-up on evidence of cost of Unscheduled items.

Evidence of cost in the form of an invoice from the supplier, or freight handler must accompany the CSR for payment authorisation. Other evidence such as timesheets, log books or photos may be requested as evidence.

**21.22.2 Negotiated Rate**

Measured by number and/ or items.

To be determined as negotiated between the Superintendent and the Contractor for unscheduled labour, service or hire provided by the contractor under existing conditions and contract.

Where a type of works is described but does not appear in the schedule of rates or is not defined in the specification and not included in the Schedule of Rates items, a rate shall be negotiated to cover the works required.

The item of works may then be included in the contract Schedule of Rates at the Superintendents discretion.

**21.23 OTHER REQUIREMENTS**

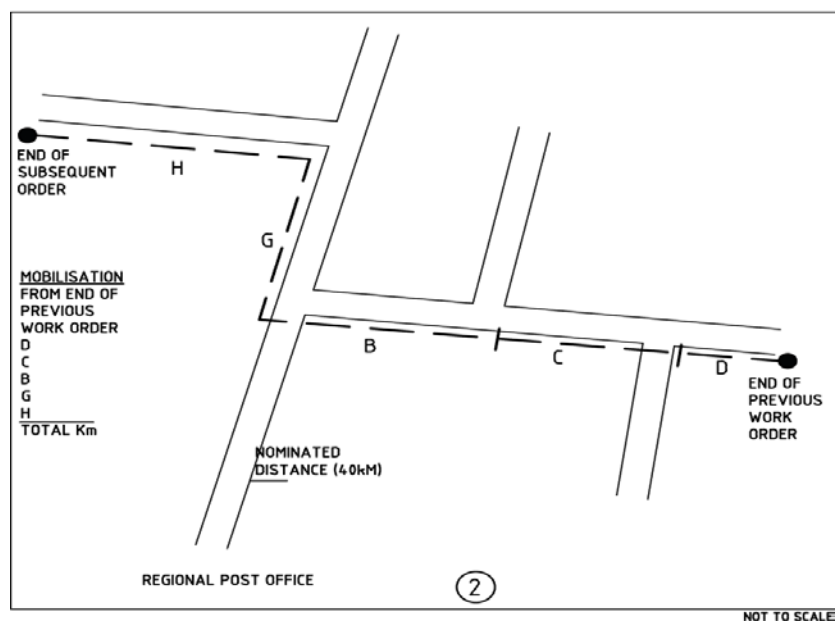
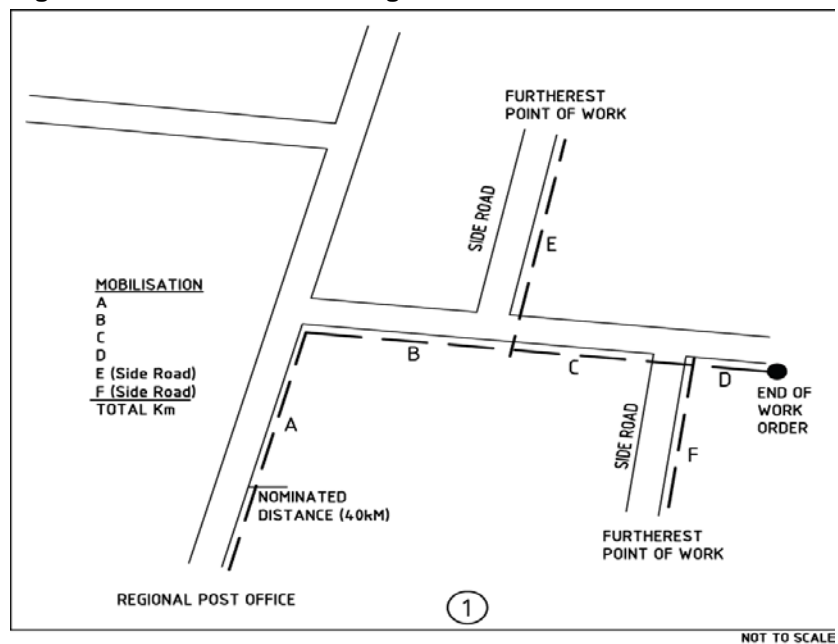
(If applicable) Refer to PROJECT SPECIFIC REQUIREMENTS section of Request for Tender.



## 21.24 PAYMENT ADJUSTMENTS TABLE AND MOBILISATION DIAGRAMS

<b>Table 21.1 Payment Adjustments</b>	
<b>Viscosity (At 60 °C Pa.Sec) Of Class 320 Bitumen Component Of The Binder</b>	<b>Reduction In Payment Of Seal Coat Items</b>
Under 260	10% reduction for each 10 Pa.sec (or part thereof) below 260.
260 – 380	Nil.
Over 380	10% reduction for each 10 Pa.sec (or part thereof) over 380.

Figure 21.1 – Mobilisation Diagrams



## 22. REFERENCED DOCUMENTS

### 22.1 AUSTRALIAN STANDARDS

Table – Referenced Documents – Australian Standards		
AS 1012 (set)	-	Method of testing concrete
AS 1074	1989	Steel tubes and tubulars for ordinary services
AS 1111(set)	2015	ISO metric hexagon commercial bolts and screws - Product grade C
AS 1112(set)	2015	ISO metric hexagon nuts
AS 1141 (set)	-	Methods for sampling and testing aggregates
AS 1141.0	1999	- <i>List of Methods</i>
AS 1141.1	2015	- <i>Definitions</i>
AS 1141.2	2015	- <i>Basic testing equipment</i>
AS 1141.3.1	2012	- <i>Sampling - Aggregates</i>
AS 1141.11.1	2009	- Particle size distribution – Sieving method
AS 1141.14	2007	- Particle shape, by proportional calliper
AS 1141.15	1999	- Flakiness index
AS 1141.18	1996	- Crushed particles in coarse aggregate derived from gravel
AS 1141.20.1	2000	- Average least dimension - Direct measurement (nominal size 10mm and greater)
AS 1141.20.2	2000	- Average least dimension – Direct measurement (nominal size 7mm and 5mm)
AS 1141.20.3	2000	- Average least dimension – Calculation (nomograph)
AS 1141.23	2009	- Los Angeles value
AS 1141.24	2013	- Aggregate soundness – Evaluation by exposure to sodium sulphate solution
AS 1141.25.1	2003	- Degradation factor – Source rock
AS 1141.26	2008	- Secondary minerals content in igneous rocks
AS 1141.29	2014	- Accelerated soundness index by reflux
AS 1141.40	1999	- Polished aggregate friction value - Vertical road-wheel machine
AS 1141.41	1999	- Polished aggregate friction value – Horizontal bed machine
AS 1141.50	1998	- Resistance to stripping of cover aggregates from binders
AS 1160	1996	Bitumen emulsions for the construction and maintenance of pavements
AS/NZS 1163	2009	Cold formed structural steel hollow sections
AS 1231	2000	Aluminium and aluminium alloys – Anodic oxidation coatings
AS 1273	1991	<i>Unplasticised PVC (UPVC) downpipe and fittings for rainwater</i>
AS 1289(set)	-	Methods of testing soils for engineering purposes
AS 1289.0	2014	- <i>Definitions and general requirements</i>
AS 1289.1.1	2001	- <i>Soil classification tests - Sampling and preparation of soils – Disturbed soil samples (Includes Amdt 1:2002 and Amdt 2: 2008)</i>
AS 1289.2.1.1	2005	- <i>Soil classification tests - Moisture content – Oven drying method (standard method)</i>
AS 1289.3.1.1	2009	- <i>Soil classification tests - Determination of the liquid limit of a soil – Four point Casagrande method</i>

## REFERENCED DOCUMENTS

<b>Table – Referenced Documents – Australian Standards</b>		
AS 1289.3.2.1	2009	- Soil classification tests - Determination of the plastic limit of a soil - Standard method
AS 1289.3.3.1	2009	- Soil classification tests - Calculation of the plasticity index of a soil
AS 1289.3.4.1	2008	- Soil classification tests - Determination of the linear shrinkage of a soil – Standard method
AS 1289.3.6.1	2009	Soil classification tests - Determination of the particle size distribution of a soil – Standard method of analysis by sieving
AS 1289.3.7.1	2002	- <i>Soil classification tests - Determination of the sand equivalent of a soil using a power-operated shaker</i>
AS 1289.5.1.1	2003	- Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standard compactive effort
AS 1289.5.2.1	2003	- Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using modified compactive effort
AS 1289.5.4.1	2007	- Soil compaction and density tests - Compaction control test - Dry density ratio, moisture variation and moisture ratio
AS 1289.5.8.1	2007	- Determination of field density and field moisture content of a soil using a nuclear surface moisture density gauge – Direct transmission mode
AS 1289.6.1.1	2014	- Soil strength and consolidation tests - Determination of the California Bearing Ratio of a soil – Standard laboratory methods for a remoulded specimen
AS 1289.7 (set)	-	- <i>Soil reactivity tests - Determination of the shrinkage index of a soil</i>
AS 1345	1995	<i>Identification of the contents of pipes, conduits and ducts</i>
AS 1348	2002	Glossary of terms - Road and traffic engineering
AS 1379	2007	Specification and supply of concrete (Includes Amdt 1: 2009, Amdt 2: 2015 & Supp 1: 2009)
AS 1397	2011	<i>Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium</i>
AS/NZS 1477	2006	<i>PVC pipes and fittings for pressure applications (Includes Amdt 1:2009)</i>
AS 1478.1	2000	Chemical admixtures for concrete, mortar and grout – Admixtures for concrete
AS/NZS 1554 (set)	-	<i>Structural steel welding</i>
AS 1579	2001	<i>Arc-welded steel pipes and fittings for water and waste-water</i>
AS 1580 (set)	-	Paints and related materials - Methods of test
AS/NZS 1580.108.1	1994	- Determination of dry film thickness on metallic substrates – Non-destructive methods
AS/NZS 1580.205.4	1998	- <i>Application properties – Airless spraying</i>
AS/NZS 1594	2002	<i>Hot rolled steel flat products</i>
AS 1597.1	2010	Precast reinforced concrete box culverts – Small culverts (not exceeding 1200 mm span and 1200 mm height)
AS 1597.2	2014	Precast reinforced concrete box culverts – Large culverts (exceeding 1200 mm span or 1200 mm height and up to and including 4200 mm span and 4200 mm height)
AS 1604.1	2012	Specification for preservative treatment – Sawn and round timber

REFERENCED DOCUMENTS

Table – Referenced Documents – Australian Standards		
AS 1627 (set)	-	Metal finishing—Preparation and pre-treatment of surfaces (Code of Practice for Preparation and Pre-treatment of Metal Surfaces prior to Protective Coating)
AS 1627.1	2003	- Removal of oil, grease and related contamination
AS 1627.2	2002	- Power tool cleaning
AS 1627.4	2005	- Abrasive blast cleaning of steel
AS 1627.9	2002	- Pictorial surface preparation standards for painting steel surfaces
AS 1672.1	1997	Limes and limestones – Limes for building
AS 1678 (set)	-	Emergency procedure guide – Transport
AS 1678.3A1	2004	- Group text EPGs for Class 3 substances – Flammable liquids
AS 1722	1992	<i>Pipe threads of Whitworth form - Fastening pipe threads</i>
AS 1725 (set)	2010	<i>Chain link fabric fencing</i>
AS/NZS 1734	1997	<i>Aluminium and aluminium alloys - Flat sheet, coiled sheet and plate</i>
AS 1742 (set)	-	Manual of uniform traffic control devices
AS 1742.3	2009	- Traffic control for works on roads
AS 1742.6	2014	- Tourist and services signs
AS 1742.9	2000	- Bicycle facilities
AS 1742.10	2009	- Pedestrian control and protection
AS 1743	2001	Road signs – Specifications
AS 1744	2015	<i>Standard alphabets for road signs</i>
AS 1906 (set)	-	Retroreflective materials and devices for road traffic control purposes
AS/NZS 1906.1	2007	- <i>Retroreflective sheeting (Includes Amdt 1:2014)</i>
AS 1906.3	1992	- Raised pavement markers (retroreflective and non-retroreflective)
AS 1940	2004	The storage and handling of flammable and combustible liquids (Includes Amdt 1:2004 & Amdt 2:2006)
AS 2001 (set)	2001	Methods of test for textiles
AS 2001.2.3.2	2001	- Physical tests - Determination of maximum force using the grab method (ISO 13934-2:1999, MOD)
AS 2008	2013	Bitumen for pavements
AS/NZS 2009	2006	Glass beads for pavement-marking materials
AS/NZS 2041 (set)	-	<i>Buried corrugated metal structures</i>
AS/NZS 2041.1	2011	- <i>Design methods</i>
AS/NZS 2041.2	2011	- <i>Installation</i>
AS/NZS 2041.4	2010	- <i>Helically formed sinusoidal pipes</i>
AS/NZS 2053.1	2001	<i>Conduits and fittings for electrical Installations – General requirements</i>
AS 2106.2	2005	Methods for the determination of the flash point of flammable liquids (closed cup) - Determination of flash point - Pensky-Martens closed cup method
AS 2144	2014	Traffic signal lanterns
AS 2150	2005	Hot mix asphalt – A guide to good practice
AS 2157	1997	Cutback bitumen

## REFERENCED DOCUMENTS

<b>Table – Referenced Documents – Australian Standards</b>		
AS/NZS 2276 (set)	-	Cables for traffic signal installations
AS/NZS 2276.1	2004	- Multicore power cables
AS/NZS 2276.2	1998	- Feeder cable for vehicle detectors
AS/NZS 2276.3	2002	- Loop cables for vehicle detectors
AS/NZS 2299 (set)	-	Occupational diving operations
AS/NZS 2299.1	2007	- Standard operational practice (Includes Supp 1:2007)
AS/NZS 2299.2	2002	- Scientific diving
AS/NZS 2299.3	2003	- <i>Recreational industry diving and snorkelling operations</i>
AS/NZS 2299.4	2005	- <i>Film and photographic diving</i>
AS/NZS 2310	2002	<i>Glossary of paint and painting terms</i>
AS/NZS 2311 (set)	2009	Guide to the painting of buildings
AS/NZS 2312 (set)	-	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
AS/NZS 2312.1	2014	- Paint coatings
AS 2339	1997	<i>Traffic signal posts and attachments</i>
AS 2341 (set)	-	Methods of testing bitumen and related roadmaking products
AS/NZS 2341.2	2015	- Determination of dynamic viscosity by vacuum capillary viscometer
AS/NZS 2341.3	1993	- Determination of kinematic viscosity by flow through a capillary tube
AS/NZS 2341.4	2015	- Determination of dynamic viscosity by rotational viscometer
AS/NZS 2341.6	1992	- Determination of density using a hydrometer
AS/NZS 2341.9	1992	- Determination of water content (Dean and Stark)
AS 2341.12	1993	- Determination of penetration (available obsolescent - approximately equivalent to ASTM D5)
AS/NZS 2341.13	1997	- Long-term exposure to heat and air
AS/NZS 2341.18	1992	- Determination of softening point (ring and ball method)
AS/NZS 2350.0	1999	<i>Methods of testing portland and blended cements - General introduction and list of methods</i>
AS/NZS 2350.1	2006	<i>Methods of testing portland, blended and masonry cements – Sampling</i>
AS 2353	1999	Pedestrian push button assemblies
AS 2423	2002	Coated steel wire fencing products for terrestrial, aquatic and general use
AS/NZS 2433	1994	<i>Plastics - Method for exposure to ultraviolet lamps</i>
AS 2439.1	2007	<i>Perforated plastics drainage and effluent pipe and fittings - Perforated drainage pipe and associated fittings</i>
AS 2698.2	2000	<i>Plastics pipes and fittings for irrigation and rural applications - Polyethylene rural pipe</i>
AS 2698.3	1990	<i>Plastics pipes and fittings for irrigation and rural applications - Mechanical joint fittings for use with polyethylene micro-irrigation pipes</i>
AS 2700 S (set)	2011	Colour Standards for general purposes
AS 2703	2008	Vehicle loop detector sensors
AS 2758.1	2014	<i>Aggregates and rock for engineering purposes - Concrete aggregates</i>

REFERENCED DOCUMENTS

<b>Table – Referenced Documents – Australian Standards</b>		
AS 2758.2	2009	<i>Aggregates and rock for engineering purposes - Aggregate for sprayed bituminous surfacing</i>
AS 2758.5	2009	<i>Coarse asphalt aggregates</i>
AS 2809.5	2001	<i>Road tank vehicles for dangerous goods - Tankers for bitumen based products</i>
AS 2815 (set)	-	Training and certification of occupational divers
AS 2815.1	2008	- Occupational SCUBA diver - Standard
AS/NZS 2815.2	2013	- Surface supplied diving to 30 m
AS 2815.3	1992	- Air diving to 50 m
AS 2815.4	1992	- Bell diving
AS/NZS 2815.5	2013	- Dive supervisor
AS 2865	2009	Confined Spaces
AS 2876	2000	<i>Concrete kerbs and channels (gutters) - Manually or machine placed</i>
AS 2891 (set)	-	Methods of sampling and testing asphalt
AS/NZS 2891.1.1	2013	- Sampling – Loose asphalt
AS 2891.1.2	2008	- Sampling – Coring method
AS 2891.1.3	2008	- Sampling – Asphalt from slabs
AS/NZS 2891.3.1	2013	- Bitumen content and aggregate grading - Reflux method
AS/NZS 2891.3.2	2013	- Bitumen content and aggregate grading - Centrifugal extraction method
AS/NZS 2891.3.3	2013	- Bitumen content and aggregate grading - Pressure filter method
AS/NZS 2891.5	2015	- Compaction of asphalt by Marshall method and determination of stability and flow – Marshall procedure
AS/NZS 2891.7.1	2015	- Determination of maximum density of asphalt – Water displacement method
AS/NZS 2891.7.3	2014	- Determination of maximum density of asphalt – Methylated spirits displacement
AS/NZS 2891.8	2014	- Voids and volumetric properties of compacted asphalt mixes
AS/NZS 2891.9.1	2014	- Determination of bulk density of compacted asphalt – Waxing procedure
AS/NZS 2891.9.2	2014	- Determination of bulk density of compacted asphalt – Presaturation method
AS/NZS 2891.9.3	2014	- Determination of bulk density of compacted asphalt – Mensuration method
AS 2979	1998	Traffic signal mast arms
AS/NZS 3000	2007	Electrical installations (known as the Australian/New Zealand Wiring Rules) (Includes Amdt 1:2009, Amdt 2:2012)
AS/NZS 3100	2009	Approval and test specification - General requirements for electrical equipment (Includes Amdt 1:2010, Amdt 2:2012, Amdt 3:2014, Amdt 4:2015)
AS/NZS 3108	1994	Approval and test specification - Particular requirements for isolating transformers and safety isolating transformers
AS/NZS 3191	2008	Electric flexible cords
AS/NZS 3500.1	2003	<i>Plumbing and drainage – Water service</i>

## REFERENCED DOCUMENTS

<b>Table – Referenced Documents – Australian Standards</b>		
AS 3568	1999	Oils for reducing the viscosity of residual bitumen for pavements
AS 3600	2009	Concrete structures
AS 3610.1	2010	Formwork for concrete – Documentation and surface finish
AS 3661.1	1993	<i>Slip resistance of pedestrian surfaces - Requirements</i>
AS 3661.2	1994	<i>Slip resistance of pedestrian surfaces – Guide to the reduction of slip hazards</i>
AS/NZS 3678	2011	Structural steel - Hot-rolled plates, floor plates and slabs
AS 3679.1	2010	Structural steel - Hot rolled bars and sections
AS 3706 (set)	-	Geotextiles – Methods of test
AS 3706.1	2012	- <i>General requirements, sampling, conditioning, basic physical properties and statistical analysis</i>
AS 3706.2	2012	- Determination of tensile properties – Wide strip method
AS 3706.3	2000	- Determination of tearing strength – Trapezoidal method
AS 3706.4	2001	- Determination of bursting strength – California bearing ratio (CBR) – Plunger method
AS 3706.9	2012	- Determination of permittivity, permeability and flow rate
AS 3706.11	2012	- <i>Resistance to degradation by light, heat and moisture</i>
AS/NZS 3725	2007	<i>Design for installation of buried concrete pipes</i>
AS 3727	1993	Guide to residential pavements
AS 3730.14	2006	<i>Guide to properties of paints for buildings - Undercoat - Solvent borne - Exterior/interior</i>
AS/NZS 3750.22	2008	<i>Paints for steel structures – Full gloss enamel – Solvent-borne</i>
AS/NZS 3845.1	2015	Road safety barrier systems and devices - Road safety barrier systems
AS 3894 (set)	-	Site testing of protective coatings
AS 3894.3	2002	- Determination of dry film thickness
AS 3894.5	2002	- Determination of surface profile
AS 3894.10	2002	- Inspection report- daily surface and ambient conditions
AS 3894.11	2002	- Equipment report
AS 3894.12	2002	- Inspection report – coating
AS 3894.13	2002	- Inspection Report – Daily blast and paint
AS 3894.14	2002	- Inspection Report – Daily painting
AS 3972	2010	General purpose and blended cements
AS 4049 (set)	-	Paints and related materials - Pavement marking materials
AS 4049.1	2005	- Solvent borne paint - For use with surface applied glass beads
AS 4049.2	2005	- Thermoplastic pavement marking materials - For use with surface applied glass beads
AS 4049.3	2005	- <i>Waterborne paint - For use with surface applied glass beads</i>
AS 4049.4	2006	- High performance pavement marking systems
AS/NZS 4058	2007	<i>Precast concrete pipes (pressure and non-pressure)</i>
AS 4133 (set)	-	<i>Methods of testing rocks for engineering purposes</i>
AS 4191	1994	Portable traffic signal systems

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REFERENCED DOCUMENTS

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<b>Table – Referenced Documents – Australian Standards</b>		
AS 4373	2007	Pruning of amenity trees
AS 4419	2003	Soils for landscaping and garden use
AS 4586	2013	Slip resistance classification of new pedestrian surface materials
AS/NZS 4671	2001	Steel reinforcing materials
AS/NZS 4680	2006	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS 4742	2003	Earth-moving machinery - Machine-mounted forward and reverse audible warning alarm - Sound test method (withdrawn)
AS/NZS 5000.1	2005	Electric cables – Polymetric insulated – For working voltages up to and including 0.6/1 (1.2) kV
AS 5100.5	2004	Bridge design - Concrete (Includes Amdt 1:2010, Amdt 2:2010, Supp 1:2008)
AS/NZS ISO 9000	2006	Quality management systems - Fundamentals and vocabulary
AS/NZS ISO 31000	2009	<i>Risk Management – Principles and guidelines</i>
AS/NZS 61558 (set)	-	<i>Safety of power transformers, power supply units and similar</i>
AS/NZS 61558.2.4	2001	- <i>Particular requirements for isolating transformers for general use (IEC 61558-2-4:1997, MOD)</i>
AS/NZS 61558.2.6	2001	- <i>Particular requirements for safety isolating transformers for general use (IEC 61558-2-6:1997, MOD)</i>
ISO 9533	2010	Earth-moving machinery - Machine-mounted audible travel alarms and forward horns - Test methods and performance criteria



**22.2 ACTS, REGULATIONS AND CODES APPLICABLE TO THE WORKS AND AUTHORITIES WITH JURISDICTION OVER THE WORKS INCLUDE, BUT ARE NOT LIMITED TO;**

**ACTS & REGULATIONS**

Aboriginal Sacred Sites Act  
Bushfires Act  
Control of Roads Act  
Dangerous Goods Act and Regulations  
Environment Protection and Biodiversity Conservation Act  
Environmental Assessment Act  
Environmental Offences and Penalties Act  
Fair Work Act 2009  
Fire and Emergency Act  
Food Act 2004  
Heritage Conservation Act  
NT Building Act and Regulations  
NT Planning Act and Regulations  
NT Rail Safety Act  
Poisons and Dangerous Drugs Act and Regulations  
Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulations  
Soil Conservation and Land Utilisation Act  
Territory Parks and Wildlife Act  
Territory Parks and Wildlife Conservation Act  
Traffic Act and Regulations  
Waste Management and Pollution Control Act  
Water Act  
Weeds Management Act  
Work Health and Safety (NUL) Act and Regulations

**CODES AND GUIDELINES**

Building Code of Australia (BCA)  
CASA Directives  
CASA Manual of Standards  
Code of Practice, Abrasive Blasting, Safe Work Australia  
Code of Practice, Managing the Risk of Falls at Workplaces, NT WorkSafe  
NT Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Re-use of Sewage Effluent.  
NT Deemed to Comply Manual  
NT Health and Safety Guidelines for Commercial Kitchens

**AUTHORITIES**

Aboriginal Areas Protection Authority (AAPA)  
Development Consent Authority of the NT (DCA)  
NT Department of Health and Community Services  
NT Department of Health and Families  
NT Department of Land Resource Management (DLRM)  
NT Department Lands, Planning and Environment (DLPE)  
NT Environment Protection Authority (NTEPA)  
NT Fire and Rescue Service (NTFRS)  
NT WorkSafe  
PowerWater Corporation of the NT (PWC)  
Requirements of the engaged Building Certifier (if applicable)  
Requirements of the Local Municipal or Shire Councils

## 22.3 OTHER REFERENCED AUTHORITIES AND DOCUMENTS

Table - Other Referenced Authorities And Documents	
AAPA	Australian Asphalt Pavement Association - Guide to the manufacture, storage and handling of polymer modified binders
APAS	Australian Paint Approval Scheme
APVMA	Australian Pesticides and Veterinary Medicines Authority
AGBT	Austroads Guide to Bridge Technology
AGPT	Austroads Guide to Pavement Technology
AGPT04H/08	Austroads Guide to Pavement Technology – Part 4H: Test Methods
AGPT04K/09	Austroads Guide to Pavement Technology – Part4K: Seals
AGRD	Austroads Guide to Road Design
AP-G41-08	Bituminous Material Sealing Safety Guide
AGPT/T190	Specification Framework for Polymer Modified Binders and Multigrade Bitumens
AP-T235-13	Guide to the Selection and use of Polymer Modified Binders and Multigrade Bitumens
AP-C87-15	Austroads Glossary of Terms
ARRB	Specification for Recycled Crushed Glass as an Engineering Material
ASTM D86	Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure
ASTM D445	Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
ASTM D1298	Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products
ASTM D5064	Standard Practice for Conducting a Patch Test to Assess Coating Compatibility
CASA	Civil Aviation Safety Authority
ISSA	International Slurry Surfacing Association
NATA	National Association of Testing Authorities
NTCP	Northern Territory Code of Practice
NTMTM	Northern Territory Materials Testing Manual
NTTM	Northern Territory Testing Methods <a href="http://www.nt.gov.au/infrastructure/publications/materialtesting/index.shtml">http://www.nt.gov.au/infrastructure/publications/materialtesting/index.shtml</a>
WA 730.1	Main Roads Western Australia, Bitumen Content and Particle Size Distribution of Asphalt and Stabilised Soil: Centrifuge Methods
	NTEPA Fact Sheet “Guidelines for Water Extraction as they relate to Road Construction and Maintenance.”
<b>SPECIFICATIONS</b>	Electronically available: <a href="http://www.nt.gov.au/infrastructure/techspecs/index.shtml">http://www.nt.gov.au/infrastructure/techspecs/index.shtml</a>
	Standard Specification for Environmental Management
	Standard Specification for Small Building Works
	Standard Specification for Road Works

## 22.4 STANDARD DRAWINGS FOR ROAD MAINTENANCE

**Table – Standard Drawings for Road Maintenance**

**Note:** Use the most recently issued versions of drawings.

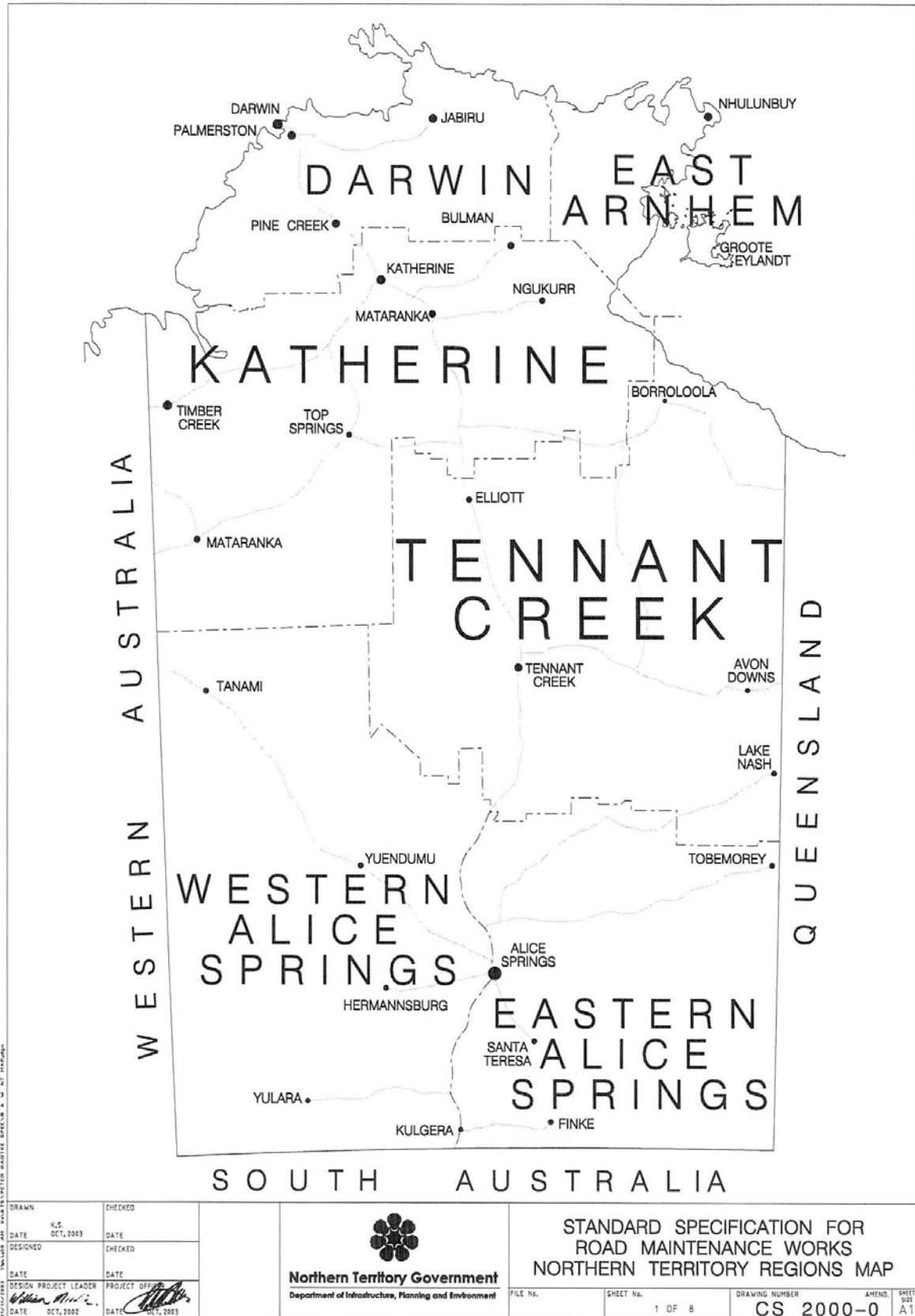
C(S) 0016	Cross Section – Shared Path Railing at Culvert Crossing
C(S) 1203	Standard Kerb Profiles
C(S) 1204	Cyclists' Hold Rail
C(S) 1300	Flexible Guide Posts
C(S) 1301	Flood Gauge Posts
C(S) 1302	Log Barrier Fence
C(S) 1303	Standard Security Fence
C(S) 1306	Stock Fence Design and Details
C(S) 1310	Steel Beam Guard Rail
C(S) 1313	Standard Cattle Grid Plan and Sections with Approach Slab
C(S) 1314	Standard Cattle Grid Plan and Sections without Approach Slab
C(S) 1315	Standard Cattle Grid Details
C(S) 1316	Vehicle Movement Barriers
C(S) 1501	Signal Details Pole Foundation
C(S) 1505	Signal Detail Lantern Mounting Details
C(S) 1507	Signal Detail Detector Installation
C(S) 1520	Line Marking
C(S) 1521	Chevrons and RRPM's
C(S) 2000	Northern Territory Regions Map
C(S) 2001	Road Network – Darwin Region
C(S) 2002	Road Network – East Arnhem Region
C(S) 2003	Road Network – Katherine Region
C(S) 2004	Road Network – Tennant Creek Region
C(S) 2005	Road Network – Alice Springs Region – West
C(S) 2006	Road Network – Alice Springs - East
C(S) 2100	8.0m Gravel Pavement Resurfacing - Typical Cross Section
C(S) 2101	Shoulder Maintenance Works - Gravel Pavement – Typical Cross Section B
C(S) 2102	Shoulder Maintenance on Various Width Sealed Pavement - Typical Cross Section
C(S) 2103	Shoulder Maintenance on Various Width Sealed Pavement - Typical Cross Section D
C(S) 2104	Road Maintenance Works 9m Gravel Pavement - Typical Cross Section
C(S) 2105	Road Maintenance Works 10m Gravel Pavement - Typical Floodway Cross Section

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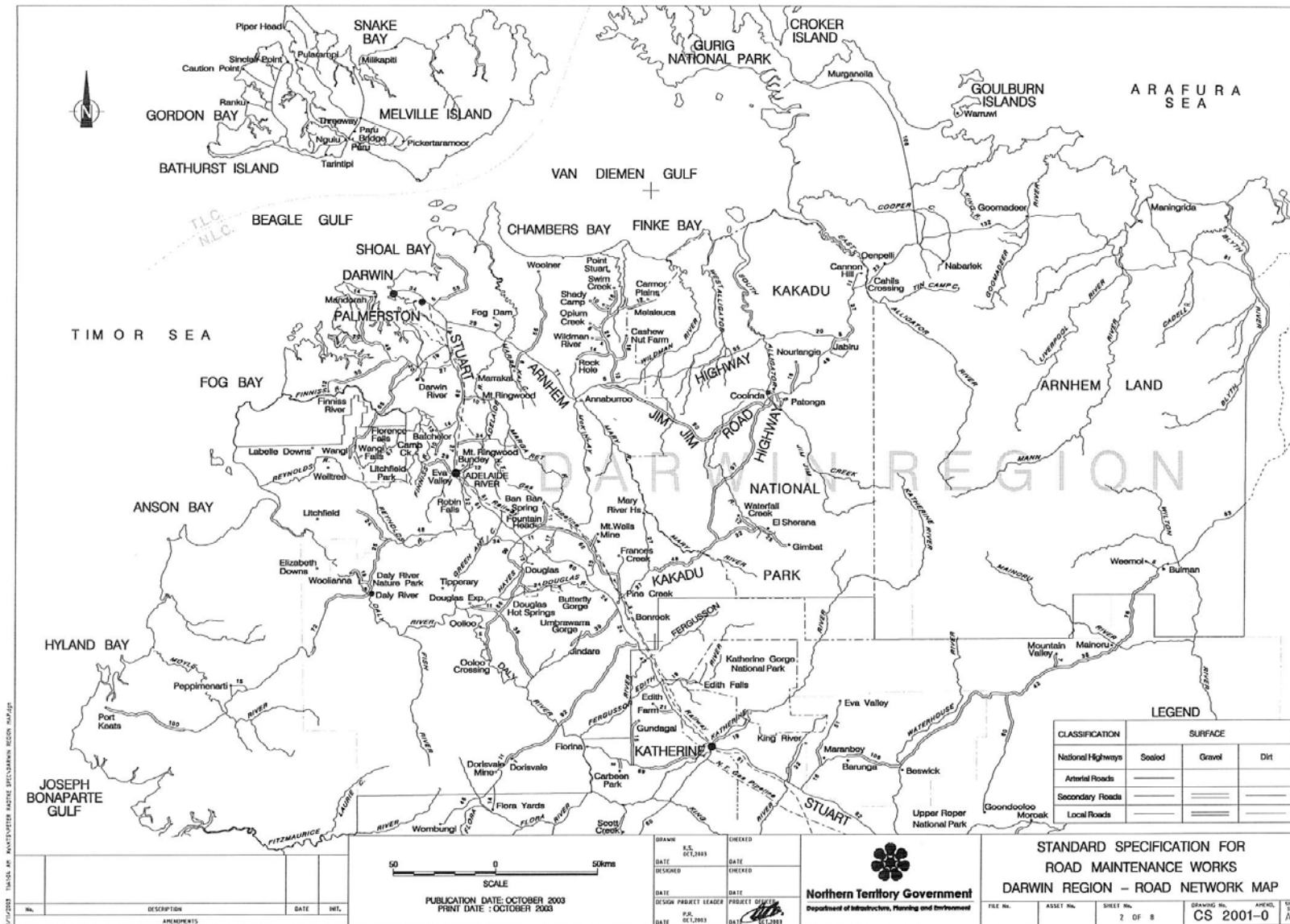
REFERENCED DOCUMENTS

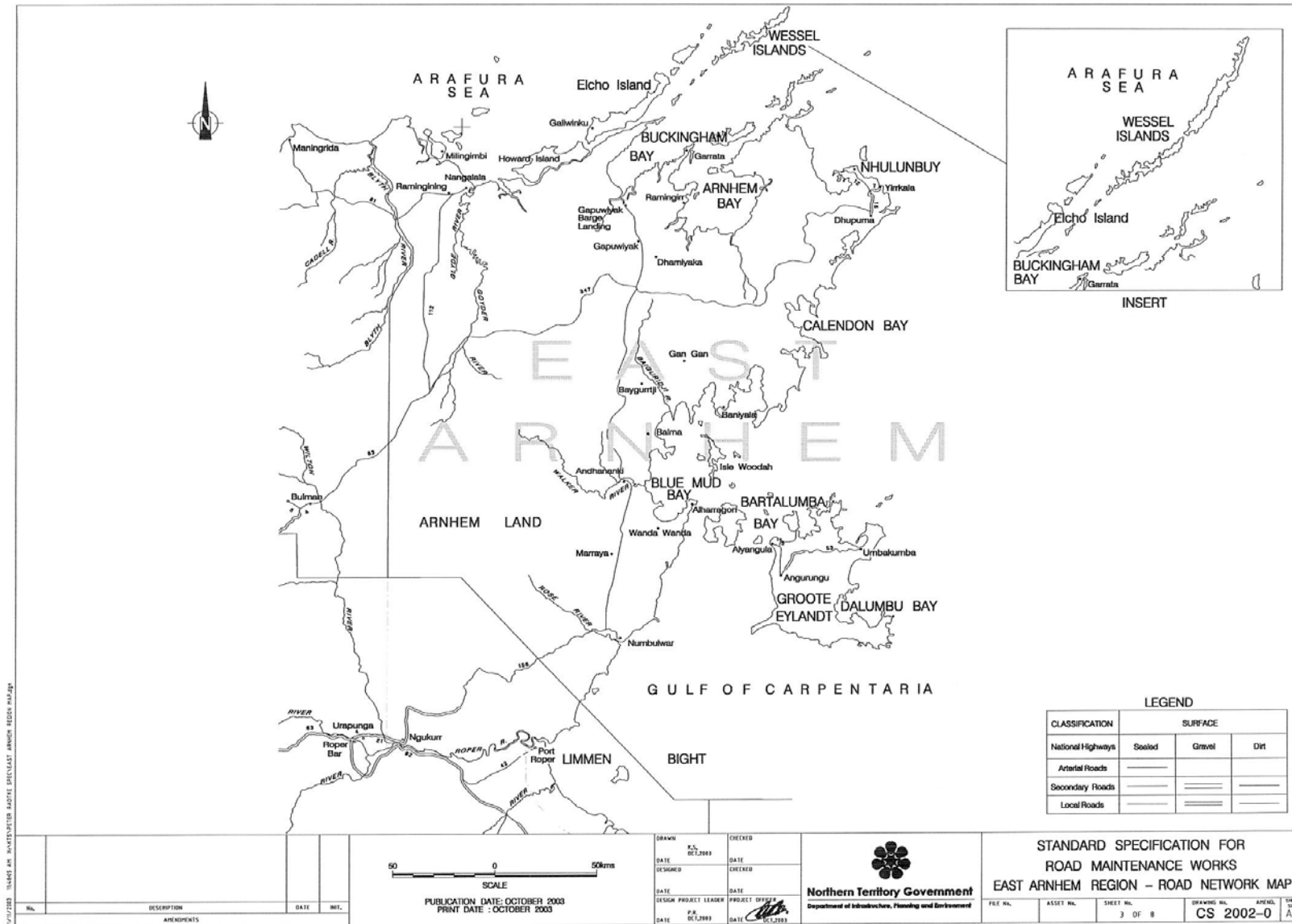
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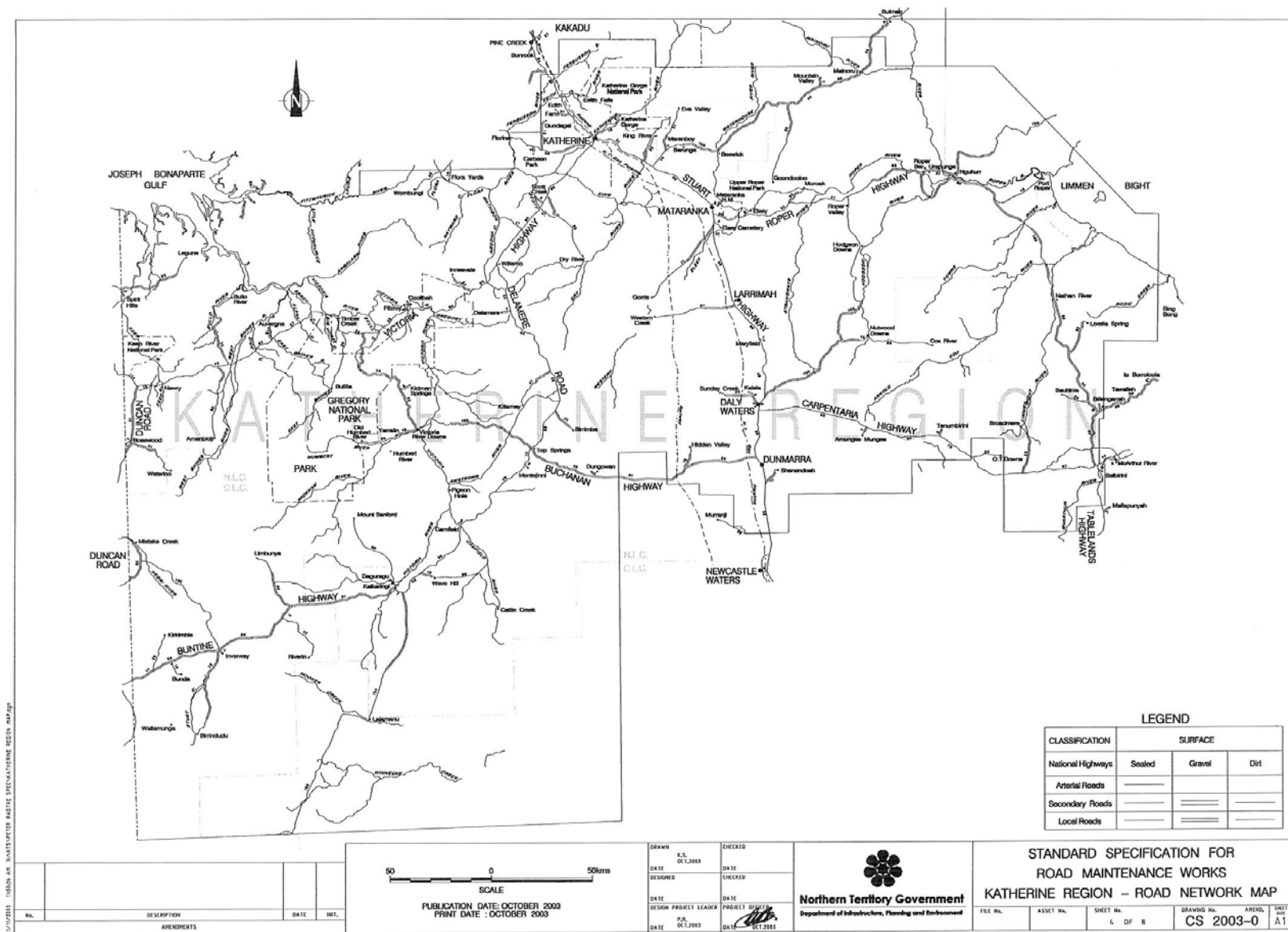
<b>Table – Standard Drawings for Road Maintenance</b>	
C(S) 2106	Road Maintenance Works 7m Sealed Pavement - Typical Floodway Cross Section G
C(S) 2107	Road Maintenance Works 9m Sealed Pavement - Typical Floodway Cross Section
C(S) 2108	Standard Specification 10m Carriageway with 8.0m seal – Typical Cross Section J
C(S) 2109	Standard Drawing 10.0m Carriageway with 8.0m seal – Typical Cross Section
RU3A (B95-2284)	Crow Guard Lid for 200L Drum
Civil Standard Drawings Available: <a href="http://www.nt.gov.au/infrastructure/techspecs/drawings/index.shtml">http://www.nt.gov.au/infrastructure/techspecs/drawings/index.shtml</a>	



# REFERENCED DOCUMENTS

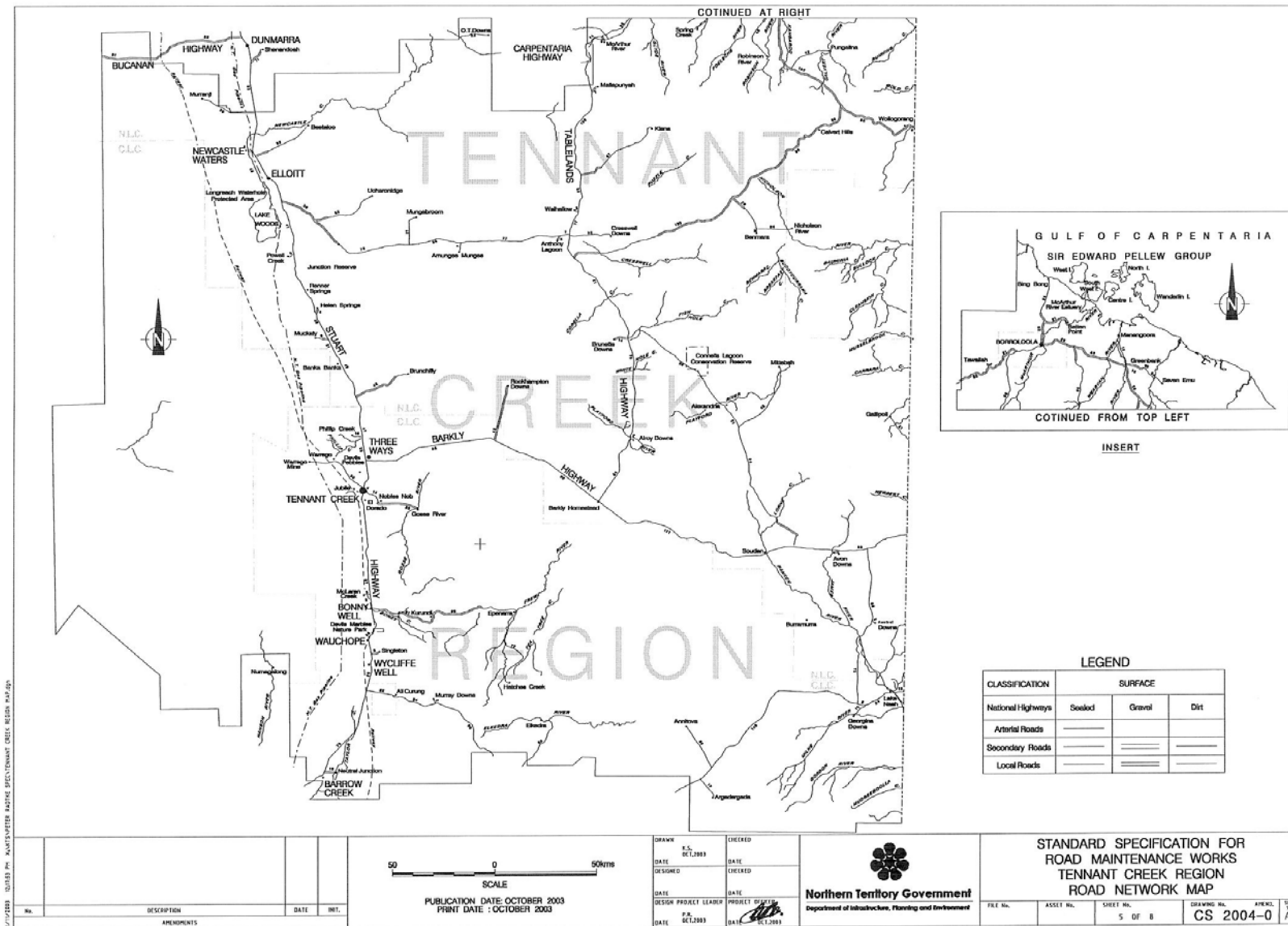


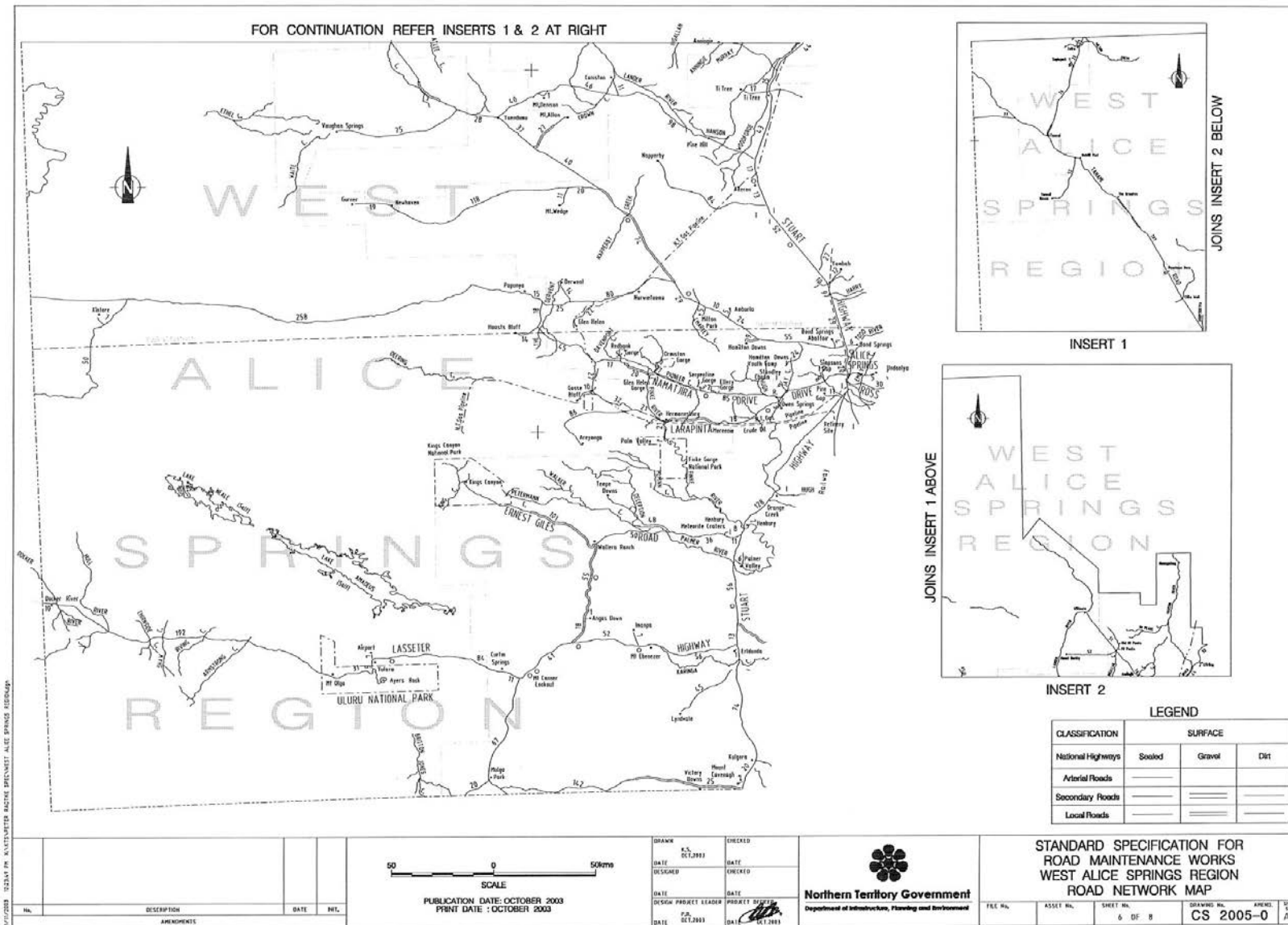


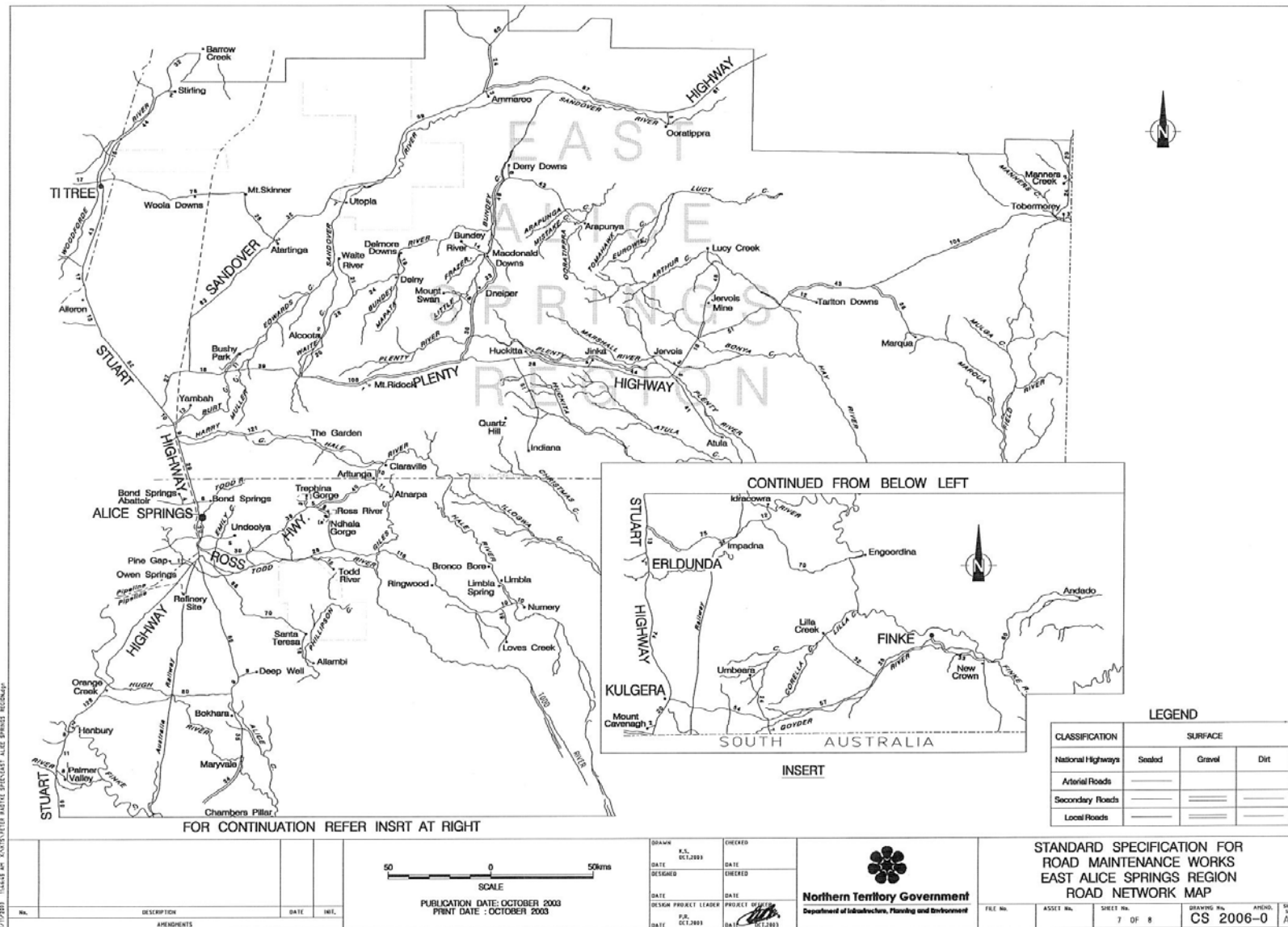




# REFERENCED DOCUMENTS







23. NORTHERN TERRITORY CLIMATE ZONE TABLE						
		NTCZ 01	NTCZ 02	NTCZ 03	NTCZ 04	NTCZ 05
		Areas south of, and including, Tennant Creek	Areas north of Tennant Creek and south of and including Katherine, and areas more than 50 km from the coast or tidal estuaries	Areas north of Katherine and areas between 10 km and 50 km from the coast or tidal estuaries	Areas less than 10 km from the coast or tidal estuaries	Areas inside buildings
ISO 9223	Atmospheric Corrosivity Classification	3	4	5	5	2
AS 1170 (BCA)	Wind Region	A4	B	B & C	C	n/a
AS 1192	Service Condition Category	2	3	4	5	n/a
	Corrosion Category	B	C & F	D	E	C
AS 1231	Thickness Grade	AA15	AA25	AA25	AA25	AA10 Low airborne moisture levels
						AA15 High airborne moisture levels
AS/NZS 2312.1	Climate Category	C2	C3 & T	T	C5-I & C5 - M	C1
AS 2423	Climate Category	B	C & F	F	E & F	n/a
AS/NZS 4534						
AS 2699	Durability Classification	R1 (Green mark)	R2 (Yellow mark)	R3 (Red mark)	R4 (White or blue mark)	R1 (Green mark)
AS 3566.2	Corrosion Resistance Class	3	4	4	4	n/a
AS 3715	Service Condition Category	3	4	5	5	n/a
	Atmospheric Corrosivity Classification	3	4	5	5	n/a
AS 4145	Corrosion resistance category	C6	C6	C7	C7	C6
BCA Table 3.5.1.1a	Environment category	Low	Low	Medium	High - Very High	n/a