Tiger Brennan Drive Extension Stage 2

Project Environmental Management Plan

Macmahon Ref No: N016

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ABBREVIATIONS

AAPA: NT Aboriginal Areas Protection Authority

Action Register: Continuous Improvement & Corrective Action Register, this is used to record any corrective actions identified in inspections, audits, incident etc. It is used for both environmental and safety issues.

EMP: Environmental Management Plan

EMS: Environmental Management System

EPBC: Environment Protection & Biodiversity Conservation Act

DPI: Department of Planning and Infrastructure

JSEA: Job Safety & Environmental Analysis

NRETAS: Department of Natural Resources, Environment, the Arts and Sport

DPI: Department of Planning and Infrastructure (the client)

HSEQ: Health, Safety, Environment and Quality

MBS/MDL: Macmahon Business System/Macmahon Document Library which is certified under ISO 14001 (Environmental Management Systems), ISO 9001 (Quality Management Systems) and AS/NZ 4801 (Occupational Health and Safety Management Systems)

MSDS: Material Safety Data Sheet

NEPM: National Environment Protection Measure (various measures have been developed as guidelines for States and Territories to adopt in their legislation)

NOI: Notice of Intent (a formal document submitted to NRETAS for assessment under the NT Environmental Assessment Act to determine if formal assessment in the form of an Environmental Impact Statement or Public Environment Report is necessary or if an EMP is sufficient to address the environment impacts associated with the project)

PASS: Potential Acid Sulfate Soil
1. INTRODUCTION AND PROJECT BACKGROUND

1.1. Background and Project Details

The Northern Territory Government has identified a need for an arterial network to effectively connect Palmerston to the Darwin Central Business District, as well as providing satisfactory levels of access along the corridor for freight and commuter traffic. The Tiger Brennan Drive arterial will form part of the planned regional road transport link. The overall East Arm Port Access project route will provide a direct link between the Stuart Highway, East Arm Port and the increasing number of transport-related and other businesses around the Berrimah Road/ East Arm Port area. The Northern Territory Government and the Federal Department of Transport and Regional Services are share funding of these projects.

The East Arm Port Access project consists of four stages:
1. Berrimah Road duplication – Tiger Brennan Drive to south of Wishart Road
2. Tiger Brennan Drive Extension from Berrimah Road to Stuart Highway/ Roystonea Avenue
3. Berrimah Road – Rail Overpass (Wishart Road to the Weighbridge on Berrimah Road)
4. Overpass at Tiger Brennan/ Roystonea Avenue/ Stuart Highway

Stage 1 was awarded to Macmahon and this was be finalised in May 2009, with final landscaping works completed in October 2009.

Stage 2 and Stage 4 were combined by Northern Territory Government as “Stage 2” and this project was awarded to Macmahon in November 2008. Stage 3 will be tendered in the future, funds permitting.

The Federal and Northern Territory Governments are jointly funding the upgrading of the East Arm Port Access Route. The project objectives are to enhance freight capacity and also improve corridor capacity between Darwin and Palmerston and the rural areas by reducing congestion and providing direct link to East Arm Port.

The Works are separated into two parts – Part A and Part B. Part A includes 7.5km of road works to extend Tiger Brennan Drive from Berrimah Road to the Stuart Highway. Part B consists of the grade separated interchange. Included in the works are the

- Provision of temporary traffic arrangements as necessary to ensure minimal disruption to all road users and ensure the continued functioning of the surrounding traffic network and property access;
- Provision of local service roads;
- Provision of bicycle and pedestrian paths and underpasses;
- Provision of lighting;
- Provision of fencing;
- Irrigation and landscaping;
- Signs, safety barriers, other road furniture;
- Identification and relocation of affected public utility plant;
- Clearing activities
- Bulk earthworks
- Sealed road pavement construction
- Drainage
Bridge construction

The main construction works will commence in April 2009 and the project will be completed in 2010.

1.2. Environmental Management Plan

1.2.1. Purpose and scope of the Plan

The client, the Department of Planning and Infrastructure (DPI), submitted two Notices of Intent (for original Stages 2 and 4) in January and February 2008, to the Department of Natural Resources, Environment, the Arts and Sports (NRETAS) for assessment. NRETAS assessed the Notices of Intent under the Environmental Assessment Act and made the decision that formal assessment is not required under the Act. However, a number of matters will need to be dealt with, which are to be incorporated into an Environmental Management Plan for the project.

The development and implementation of an Environmental Management Plan is also a requirement under the Macmahon Systems, which is certified under ISO 14001 – Environmental Management Systems. The Macmahon Systems (MBS/MDL) are also certified under ISO 9001 – Quality Management Systems and AS/NZ 4801 – Occupational Health and Safety Systems.

As the form of the Tiger Brennan Drive Extension contract is similar to an alliance, this Environmental Management Plan (EMP) has been combined to cover the environmental aspects of the project for the Contractor, Macmahon Contractors and the Principal, DPI.

The EMP provides a framework for implementing environmental management practices and procedures to manage and minimise potential environmental impacts during construction activities. It aims to ensure compliance with legislation, relevant guidelines, contract requirements and ISO 14001 for Environmental Management Systems.

The aims of this EMP are to:

1) Capture all relevant environmental issues associated with the Tiger Brennan Drive Extension Project.
2) Develop environmental mitigation measures to minimise the potential impacts associated with the construction phase of the Project.
3) Incorporate the environmental mitigation measures identified into a comprehensive framework to facilitate and ensure their appropriate management through the construction stage of the project.

All employees and subcontractors will be made familiar with the main environmental issues and controls of the project and all activities will be undertaken in accordance with this EMP.

As a minimum, all environmental issues as identified by DPI in the two Notices of Intent will be addressed in this EMP.

1.2.2. Structure of the EMP
• Section 1 outlines the background to the project and the purpose of the EMP.
• Section 2 explains the framework for the Macmahon Environmental Management System and how all relevant requirements from ISO 14001 are addressed in this project.
• Section 3 details all specific environmental issues, and how they will be managed during the project.

Appendices
• Appendix 1: Site Plan
• Appendix 2: Organisation chart, showing project positions and reporting relationship.
• Appendix 3: Environmental Risk Register detailing the strategies for managing the environmental aspects and impacts associated with the project
• Appendix 4: Weekly Environment & Safety Inspection Checklist
• Appendix 5: Activity Planner
• Appendix 6: DPI Strategy – Roads and the Environment
• Appendix 7: DPI Technical Standard – Recycling Following Clearing
• Appendix 8A: Site plan indicating inundated and water logged areas, water courses, stockpiles, offices, site accesses and typical location of erosion controls
• Appendix 8B: Typical sections for erosion controls
14. Appendix 9: External catchment areas with existing site contours
   A. General site
   B. Interchange
15. Appendix 10: Longitudinal sections/ final site contours with cut and fill locations
16. Appendix 11: Typical cross sections and grades and batter slopes
17. Appendix 12: Drainage plans
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1.2.3. Review of the EMP

The EMP will be reviewed annually as a minimum and will also be reviewed in response to:
• Significant incidents
• Findings of inspections and audits
• Changes in legislation
• Change in project scope and risk profile
• Changes in Macmahon systems and/or practices
• Management reviews
• As per DPI requirements as set out in this document.

The review of the EMP will be useful to determine the suitability and effectiveness of the current control measures. If the EMP is amended, the amended and endorsed document will be provided to controlled document holders within five working days.
2. ENVIRONMENTAL MANAGEMENT SYSTEM AND PROCEDURES

2.1 Macmahon Environmental Management System and Procedures

The integrated Macmahon Document Library (MDL) is an essential element of our business and serves to meet customer requirements, reduce business risk, improve profitability and demonstrate responsible management to our stakeholders. The Macmahon Document library contains standard procedures and forms, and also provides for links to Chemwatch and Australian Standards.

The environmental, quality and safety management systems have been certified by NCS International (third party certification body) as meeting the requirements of the following management system standards:

- AS/NZS ISO 9001:2000 - Quality systems
- AS/NZS ISO 14001:2004 - Environmental management systems
- AS/NZS 4801:2000 - Occupational health and safety management systems

The ultimate objective of the Environmental Management System (EMS) is to provide a consistent approach to the environmental management of operations, whilst ensuring the required corporate, contractual and legislative requirements are met and environmental impacts are prevented or at least minimised.

This EMP incorporates contract and legislative requirements as well as the relevant elements of AS/NZS ISO 14001:2004.

An overview of the Environmental Management System to be implemented for the works is illustrated in the flowchart overleaf.
Responsibilities
CEO – Chief Executive Officer
QEM/QEC/QEO – Quality & Environmental Manager/Coordinator/Officer
PM – Project Manager
PEMR – Project Environmental Management Representative
LA – Lead Auditor

Objective

“To demonstrate top management commitment and communicate policy and objectives to stakeholders.”

“To identify, assess and document the methodology to control risks and ensure legal requirements are understood and communicated.”

“To execute planned arrangements and strive to achieve the highest levels of quality and environmental service performance to meet or exceed customer requirements.”

“To determine the measure of compliance with planned arrangements, evaluate the effectiveness of systems implemented, and to identify opportunities for improvement.”

“To review the Management System to determine its continuing suitability, adequacy and effectiveness, and to identify opportunities for improvement.”

Activities

Environmental Policy (G-048)

Construction Tendering Procedure (G-116)
Head Contract Execution Procedure (Post-Tender) (G-506)
Project Launch Procedure (G-376)
Project Planning Procedure (G-492)
Correspondence & Filing Procedure (G-072)
HSE Risk Management Procedure (G-405)
Evaluation of Subcontractors (C-100; C-101; C-104; G-533; G-534; G-535)
Legal & Other Requirements Procedure (G-365)
Contract Requirements
Project Plan

Responsibilities & Authorities Guideline (G-405)
Emergency Preparedness & Response Procedure (G-540)
Document Control Procedure (G-073)
IT Electronic Data Back-up Procedure (G-528)
Evaluation of Subcontractors (C-100; C-101; C-104; G-533; G-534; G-535)
Induction Procedure (G-456)
Procurement Procedure (G-510)
Pre-Start Check Procedure (G-279)
Consultation, Communication and Interface Procedure (G-207)
Monitoring and Measurement Procedure (G-495)
Waste Management Procedure (G-500)
Control of Hazardous Substances (G-064)
Hydrocarbons Management (PEPC35)

Monitoring & Measurement Procedure (G-495)
Auditing Procedure (G-505)
Nonconformance, Corrective & Preventive Action (G-450)
Incident Reporting & Investigation Procedure (G-542)
HSEQ Incident Investigation & Trigger Action Response Plan (G-264)
Construction Project Reporting Procedure (C-173)
Archive Procedure (G-075)

Customer Satisfaction Procedure (G-426)
Management Review and Continual Improvement (G-492)
2.1. Environmental Policy

To work effectively in a diverse range of environments and social settings, Macmahon recognises the importance of integral environmental management into how we do business. Our environmental policy objective is to minimise the adverse impact on the environment as a result of our business activities.

To achieve this objective we will:

- Establish and maintain an environmental Management system in accordance with AS/NZS ISO 14001.
- Comply with contract conditions, relevant legislation and other criteria to which the company subscribes.
- Regularly review business operations, identify and implement opportunities for improvement.
- Educate our work force on key environmental issues, management controls and associated responsibilities.
- Establish defined environmental objectives and targets to measure our performance and identify opportunities for improvement.
- Strive to prevent pollution, reduce waste and commit to recovery and recycling where feasible.

Nick Bowen
Chief Executive Officer
October 2009
2.2. Department of Planning and Infrastructure Strategy for Roads and the Environment

Currently, DPI operates under the Roads and the Environment strategy. This strategy establishes the policy framework for sustainable and integrated road development and road use management through an Environmental Management System. It aims to provide guidance to staff, consultants and contractors on road related planning, design, construction and maintenance projects, as well as being a general information document for the public. It will be reviewed regularly to make sure it remains effective. The strategy is based on the following principles:

- Demonstrating duty of care in environmental protection as a good corporate citizen
- Implementing relevant policy and legislation on environmental protection relating to the provision of road transport
- Applying environmental management and ecologically sustainable development.

The Department will demonstrate due diligence in the provision of its road network services and will strive for continual improvement by:

- Ensuring compliance with relevant environmental legislation and regulations
- Setting appropriate environmental management strategies
- Developing and implementing sound environmental policies and practices
- Minimising the environmental impacts of its activities
- Providing our employees with the skills to achieve environmental outcomes
- Improving the way we manage our contractors and suppliers
- Involving the community in planning and implementation issues
- Reporting publicly on environmental performance.

Appendix 6 gives the DPI Strategy for Roads and the Environment.

2.3 Environmental Aspects/ Impacts and Risk Assessment

The environmental aspects for the project activities have been identified through a risk assessment process, consideration of DPI’s Notice of Intent, relevant guidelines and standards, and is also based upon Macmahon’s practical experience gained during delivery of many construction projects within the Northern Territory. For each environmental aspect, the issues and controls are detailed in the Sub-Plans in Section 3 of this EMP.

In order to determine the significant environmental aspects, an environmental risk assessment is undertaken for the project. This is documented in the Environmental Risk Register in Appendix 3. The level of risk associated with each environmental factor is determined using procedure G-495 ‘Health, Safety and Environmental Risk Management Procedure’. The risk assessment process is based on the Australian Standard for risk assessment (AS/NZS 4360:1999) and covers all aspects of construction including normal and abnormal operations or activities and any potential emergency situations. The Environmental Risk Register is revised as needed to reflect any significant changes to the project and/or construction techniques.
The Environmental Risk Register has been structured so that for each environmental aspect, there is a stated:

- Environmental impact;
- Risk analysis (inherent risk) - the likelihood and consequence of an environmental hazard/impact occurring in the absence of any control measures;
- Control measures - to be implemented to meet management objectives;
- Monitoring - includes relevant equipment, location of monitors, parameters, baseline monitoring, frequency of monitoring/inspections, recording of complaints and reporting of results (format/frequency); and
- Level of residual risk - the likelihood and consequence of an environmental hazard occurring following the implementation of control measures.

At an operational level, all identified controls are included in task specific Job Safety & Environmental Analysis (JSEA), to ensure that all relevant employees are aware of the environmental issues and controls needed for the task they are performing.

The effectiveness of the controls stated in the relevant Sub-Plans and JSEA’s will be assessed through regular monitoring (refer 2.12 Monitoring & Auditing).

For any subcontracted works, the nominated Subcontractor shall implement the stated environmental controls. Any monitoring will be undertaken by Macmahon, in accordance with contract requirements.

### Table 1: Scope of the Environmental Risk Register (Appendix 3)

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<th>Risk Register Reference Item № (Appendix 3)</th>
<th>Environmental Hazard / Aspect</th>
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<td>1</td>
<td>Erosion &amp; Sediment control</td>
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<td>2</td>
<td>Stormwater</td>
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<tr>
<td>3</td>
<td>Use of hazardous substances</td>
</tr>
<tr>
<td>4</td>
<td>Noise</td>
</tr>
<tr>
<td>5</td>
<td>Air quality and dust</td>
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<tr>
<td>6</td>
<td>Native vegetation and significant flora species, clearing</td>
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<tr>
<td>7</td>
<td>Weeds</td>
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<tr>
<td>8</td>
<td>Significant fauna species</td>
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<tr>
<td>9</td>
<td>Pests</td>
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<tr>
<td>10</td>
<td>Waste</td>
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<td>11</td>
<td>Biting insects</td>
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<tr>
<td>12</td>
<td>Fire</td>
</tr>
<tr>
<td>13</td>
<td>Aboriginal Heritage Sites</td>
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</table>
2.4. Legal and Other Requirements

Table 2 lists the legal and other requirements relevant to the project, including the application and responsible government department. Sub-Plans to the EMP have been developed and are included in section 3 of this EMP to address specific significant environmental issues for the project, taking into account all relevant legal & other requirements.

Job Safety & Environmental Analysis (JSEA’s) address any specific requirements from the Sub-Plans to ensure that environmental and safety related issues are addressed at an operational level. The JSEA incorporates references to specific tasks relating to environmental controls, such as installation of sediment control devices and spill management.

Changes in environmental legislation and/or the environmental management procedures developed for this project may change at some time during the project. This EMP will be updated to reflect these changes.

The procedure G-395 ‘Legal and Other Requirements’ describes how relevant legislation is identified, accessed and controlled.

Table 2: Legal and Other Requirements

<table>
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<tr>
<th>Legislation</th>
<th>Application</th>
<th>Responsible Department/</th>
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<tr>
<td>Acts &amp; Regulations</td>
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<td></td>
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<tr>
<td>Dangerous Goods Act 2008 and Regulations</td>
<td>Provide for the safe storage, handling and transport of certain dangerous goods</td>
<td>Department of Justice</td>
</tr>
<tr>
<td>Environmental Assessment Act 1982 and Administrative Procedures 1994</td>
<td>Provide for the assessment of the environmental effects of development proposals and for the protection of the environment</td>
<td>NRETAS</td>
</tr>
<tr>
<td>Environmental Offences and Penalties Act 1997</td>
<td>Establishes penalties for certain offences relating to the protection of the environment, and for related purposes</td>
<td>NRETAS</td>
</tr>
<tr>
<td>Environmental Protection and Biodiversity Conservation Act 1999 (Federal)</td>
<td>Provides a national framework for environment protection through a focus on protecting matters of national environmental significance and on the conservation of Australia's biodiversity.</td>
<td>Federal Department of the Environment and Heritage</td>
</tr>
<tr>
<td>Fire and Emergency Act 2007 and Regulation</td>
<td>Provides for the establishment of the Northern Territory Fire and Rescue Service, the operational and emergency response activities of the Service, the protection of life, property and the environment against fires and other emergencies.</td>
<td>Northern Territory Fire and Rescue Service</td>
</tr>
<tr>
<td>Legislation</td>
<td>Application</td>
<td>Responsible Department/</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Fisheries Act 2007</td>
<td>Provides for the regulation, conservation and management of fisheries and fishery resources so as to maintain their sustainable utilisation, and to regulate the sale and processing of fish and aquatic life.</td>
<td>Department of Regional Development, Primary Industry, Fisheries and Resources</td>
</tr>
<tr>
<td>Heritage Conservation Act 2000 and Regulations</td>
<td>Relates to the natural and cultural heritage of the Northern Territory – to identify, conserve and where appropriate enhance those places within the Northern Territory which are of significance to the culture</td>
<td>NRETAS</td>
</tr>
<tr>
<td>Litter Act 2008</td>
<td>An Act relating to Litter</td>
<td>NRETAS</td>
</tr>
<tr>
<td>Planning Act 2007</td>
<td>To provide for appropriate and orderly planning and control of the use and development of land (in this case, no planning permit is required because under the Act road reserves are exempt).</td>
<td>DPI</td>
</tr>
<tr>
<td>Public Health Act 2005 and Regulations</td>
<td>Provides a framework for the management of public health issues.</td>
<td>Department of Health and Families</td>
</tr>
<tr>
<td>Soil Conservation and Land Utilisation Act 2008</td>
<td>Makes provision for the prevention of soil erosion and for the conservation and reclamation of soil.</td>
<td>DPI</td>
</tr>
<tr>
<td>Territory Parks and Wildlife Conservation Act, Regs and By-Laws 2007</td>
<td>Provides a framework for parks &amp; reserves, and management of wildlife and protected species</td>
<td>NRETAS</td>
</tr>
<tr>
<td>Waste Management and Pollution Control Act 2007 and Regulations</td>
<td>An Act to provide for the protection of the environment through encouragement of effective waste management and pollution prevention and control practices and for related purposes</td>
<td>NRETAS</td>
</tr>
<tr>
<td>Water Act 2004 and Water Regulations 2002</td>
<td>Provides the framework for controlling and regulating the discharge of pollutants in to all waters and the issuing and management of Waste Discharge Licences.</td>
<td>NRETAS</td>
</tr>
<tr>
<td>Weed Management Act 2001 and Regulations</td>
<td>An Act to protect the Territory’s economy, community, industry and environment from the adverse impact of weeds</td>
<td>NRETAS</td>
</tr>
<tr>
<td>Workplace Health and Safety Act 2008 and Regulations</td>
<td>To promote occupational health and safety in the Territory to prevent workplace injuries and diseases, to protect the health and safety of the public in relation to work activities, to promote the rehabilitation and maximum recovery from incapacity of injured workers, to provide financial compensation to workers incapacitated from workplace injuries or diseases and to the dependants of workers who die as the results of such injuries or disease.</td>
<td>NT Worksafe (within the Department of Justice)</td>
</tr>
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</table>
Table 3 lists the applicable environmental approvals for the project. It should be noted that no planning permit is required because road reserves are exempt under the Planning Act. Also, DPI advised that notification has been given that formal assessment under the Federal Environment Protection and Biodiversity Conservation Act was not required and no approval is needed.

### Table 3: List of key environmental approval documentation and associated administrator

<table>
<thead>
<tr>
<th>Document Type</th>
<th>Responsible Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval under NT Environmental Assessment Act: correspondence dated March and April 2008 indicated that no formal assessment is required however issues are to be addressed in an Environmental Management Plan.</td>
<td>NRETAS</td>
</tr>
<tr>
<td>Authority Certificate under Aboriginal Sacred Sites Act: correspondence and approval dated 5 September 2008.</td>
<td>Aboriginal Areas Protection Authority</td>
</tr>
</tbody>
</table>

### 2.5. KPIs and Objectives

In the Sub-Plans in Section 3, specific objectives and targets are set for each significant environmental aspect.

Some general objectives and targets are:

- All personnel working on site have undergone an induction
- Internal audit score of 85% or above for compliance with the EMP
- DPI conducted audit score of 85% or above for compliance with the EMP
- No activity in breach of the provisions of any environmental legislation
• 100% investigation and reporting of any environmental incident at the site

2.6. Project Team and Responsibilities & Authorities

2.6.1. Macmahon

Resources for this project have been identified by the Project Manager and are detailed in the Project Organisation Chart, refer to Appendix 2.

The responsibilities and authorities of Macmahon personnel are defined in position descriptions. The specific responsibilities of staff in relation to environmental matters are detailed below:

**Project Manager**

The Project Manager has overall authority in the determination of all matters affecting the implementation and operation of environmental practices on the project. The Project Manager reports to the Regional Manager NT and is responsible for:

- Identifying resources and equipment for environmental purposes;
- Ensuring training is provided to improve awareness of environmental issues and responsibilities;
- Incorporating environmental management aspects in project planning;
- Ensuring project operations are performed in accordance with legal and other requirements;
- Reviewing the effectiveness of the system for continual improvement.

**HSEQ Manager NT**

- Reviewing of the Project Environmental Management Plan;
- Auditing the Environmental Management System;
- Providing support to the Environment & Safety Advisor for the duration of the project.

**Environmental Advisor**

The Environmental Advisor has a functional reporting link to the HSEQ Manager NT and reports directly to the Project Manager (and is also the Project Environmental Representative (PEMR)).

- Preparation of the Project Environmental Management Plan
- Consulting with the Project Manager on environmental matters;
- Liaising with employees on environmental matters;
- Monitoring and reporting on environmental management system performance;
- Conducting site inspections and assisting with audits;
- Reviewing inspection reports and ensuring any actions required are executed;
• Conduct environmental monitoring such as collection of water samples and noise monitoring and preparing reports
• Facilitate the implementation of environmental improvements and initiatives where practicable;
• Ensuring the EMP and sub-plans are implemented to meet the requirements for the project;
• Arrange the assignment of project staff to perform verification duties;
• Ensuring Environmental non-conformances and environmental incidents are identified, investigated, reported and suitable corrective actions are determined and completed;
• Ensuring subcontractors fulfil their environmental obligations;
• Assisting with the updating of various Project Management Plans;
• Attend meetings to discuss environmental issues;
• Liaising with environmental representatives from DPI, other government authorities and community groups.

**Supervisors/Engineers**

• Fundamental checking by site supervisory staff and subcontractors is a feature of the management system. Placing responsibility for the achievement of company objectives at the workface will lead to greater accountability at this level.

**Employees**

• Report environmental incidents as observed on-site
• Follow instructions given by supervisory personnel in relation to matters that affect the environment
• If trained to do so, conduct initial emergency response activities such as place bunds around spills

**2.6.2. Department of Planning and Infrastructure**

**Principal's Representative**

The Principal’s Representative has overall responsibility of all matters affecting the implementation and operation of environmental practices on the project. The Principal’s Representative reports to the Director of Major Projects and Design and is responsible for:

• Identifying resources, either within the department or outsourced, for environmental purposes such as auditing of the implementation of the EMP;
• Incorporating DPI environmental management aspects in project planning;
• Ensuring project operations are performed in accordance with legal and other requirements;
• Ensuring the successful implementation of the EMP objectives.
Site Staff

- Daily checking and monitoring of the implementation of the EMP.

2.7. Training, Competence and Awareness

2.7.1. Environmental Inductions

It is the policy of Macmahon to ensure that adequate training and instruction is provided to personnel to allow them to perform their duties whilst ensuring the environmental impacts associated with the Project are prevented or minimised.

All Macmahon and Subcontractor personnel must attend a Macmahon induction prior to commencement of work, in accordance with Procedure G-464 ‘Induction’ which includes but will not be limited to the following environmental topics:

- Overview of key environmental issues and personnel responsibilities
- Promoting awareness of significant environmental issues and personnel responsibilities (as outlined in Appendix 3)
- Reporting of environmental incidents - which will include how an event is reported and to whom the event is reported (all incidents are to be reported including near misses).
- Emergency procedures - which will cover the procedure for an emergency and for evacuation of the site in the event of a catastrophic situation arising
- Contingency Plans - e.g. for chemical Spills and in the event that an unidentified aboriginal heritage item is uncovered during the works.

Questions pertaining to environment and heritage will be included in the site induction questionnaire to verify employees’ understanding of the induction content.

2.7.2. Environmental Awareness

Toolbox meetings are held on a fortnightly basis, for all staff and subcontractors, and are mainly aimed at operational staff. Toolbox meetings focus on environmental and safety items relevant for the project during that time, and are used as the main tool to further increase awareness in significant environmental and safety issues and to communicate the relevant items contained in the Environmental and Safety Management Plans. Typical items discussed in these toolbox meetings are detailed under 2.11: “Monitoring auditing and review”, and include environmental items such as new procedures or re-enforcement of existing procedures relating to erosion control, handling of hazardous chemicals, weeds, clearing boundaries, management of waste/ recycling, biting insect problems, need to report all incidents and hazard/ near misses etc.

2.7.2. Training

Macmahon Environment & Safety Advisors at the project will be trained in Environmental Management (as a minimum Cert IV).
Key personnel (e.g. Supervisors) undergo environmental awareness training, specifically developed by the Environmental Advisor for the Tiger Brennan Stage 2 Extension and aimed at relevant environmental issues for the project.

Training of site personnel (inclusive of sub contractors), includes training in environmental awareness in the induction package and ongoing Toolbox meetings. It often includes field instruction on appropriate implementation of environmental controls (dependent on nature of duties).
2.8. Communication and Complaints

2.8.1. Communication and meeting frequencies

Procedure G-207 outlines general communication protocols and meeting frequencies.

For this project, environmental issues will be communicated as follows:

Table 4 Environmental communication requirements

<table>
<thead>
<tr>
<th>Method</th>
<th>Frequency</th>
<th>Participants</th>
<th>Reference</th>
<th>Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toolbox Meetings</td>
<td>Fortnightly</td>
<td>Project personnel</td>
<td>G-207</td>
<td>Minutes of meeting and attendance record</td>
</tr>
<tr>
<td>Contract Meeting (with DPI)</td>
<td>Monthly</td>
<td>DPI, Project Manager / Supervisor / Advisor</td>
<td>Contract</td>
<td>Minutes of meeting</td>
</tr>
<tr>
<td>Contract Meeting (with Subcontractor)</td>
<td>As required</td>
<td>Project Manager / Supervisors / Advisor</td>
<td>Contract</td>
<td>Minutes of meeting</td>
</tr>
<tr>
<td>Authority Consultation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory Body e.g. NRETAS, DPI</td>
<td>As required</td>
<td>Project Manager / Advisor</td>
<td>-</td>
<td>Minutes of meeting or equivalent record</td>
</tr>
<tr>
<td>Community Consultation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other interested parties</td>
<td>As required</td>
<td>DPI, Project Manager, Advisor</td>
<td>-</td>
<td>Minutes of meeting or equivalent record</td>
</tr>
</tbody>
</table>

2.8.2. Complaints

Complaints from any source (e.g. DPI, general public, other government departments) must be registered using Complaint Record G-414. The complaint shall be investigated by an Environment or Safety Advisor in consultation with the Project Manager and action taken to enable satisfactory close-out.
2.9. Documentation

All requirements for document control, correspondence & filing, superseded documents, and other quality control items are described in detail in the Project Quality Management Plan.

2.9.1. Control of environmental records

Macmahon

Project records, including pertinent subcontractor project records, will be maintained to provide evidence of conformity to DPI requirements and of the effective operation of the environmental management system. Such records include, but are not limited to:

- Correspondence to/from DPI and interested parties
- Permits, licenses and approvals
- Induction training records
- Inspection and test documentation (including calibration)
- Non-conformance and corrective action / complaints
- Environmental incidents
- Audits and inspections
- Monitoring Records
- Delivery / waste dockets

Department of Planning and Infrastructure

Environmental records for DPI will conform to department standards for record keeping. Records will include, but are not limited to, contractual correspondence and correspondence with NRETAS, results from EMP audits and inspections, any permits and licences obtained by DPI, environmental incidents and monitoring records.

2.10. Operational Procedures

2.10.1. Process Procedures

Macmahon environmental procedures that have been developed as part of the Macmahon Environmental Management System and are relevant to the project include:

- Erosion/Sediment Control Failure Response (G-494, refer sub-plan 3.1)
- Hydrocarbon Management (refer sub-plan 3.3)
- Control of Hazardous Substances (G-504, refer sub-plan 3.3)
- Hydrocarbon/Chemical Spill Response (G-110, refer sub-plan 3.3)
- Weed/Dieback Management (G-378, refer sub-plan 3.7)
- Waste Management (G-500, refer sub-plan 3.10)
• Management of Unrecorded Aboriginal Heritage Sites (G-177, refer sub-plan 3.13)

These guidelines and procedures have been developed to cover and/or align with relevant requirements, standards, legislation and/or best practice.

All requirements in these procedures have been incorporated in the specific sub-plans for each environmental aspect.

Subcontractor generated procedures, addressing performance of a specific work process/system, are to be reviewed by the Project Manager / Environment Advisor for suitability and adequacy of meeting specified contract requirements. Where changes are required, the comments will be communicated to the subcontractor, for amendment and approval of the procedures prior to commencement of work.

Approved Process Procedures are to be recorded in the Document Control Register

### 2.10.2. Management of Subcontractors

Suppliers/Subcontractors shall be evaluated in accordance with procedure G-533 ‘Evaluation of Subcontractors’. Only Subcontractors who have been evaluated by Macmahon shall be engaged to perform subcontract works. A Subcontractors Database shall be maintained to record details of subcontractors evaluated.

All subcontractors shall undertake the works in accordance with the Macmahon environmental management system requirements and this EMP. If a subcontractor intends to work under their own environmental management system, this will need to be reviewed and approved by the Project Manager/Environment Advisor prior to commencing works, to ensure that all requirements are addressed. Prior to commencement of works, subcontractors shall be required to submit a task specific Job Safety & Environmental Analysis (JSEA) or Work Method Statement to Macmahon for review and acceptance, which covers all relevant environmental items. Often, JSEAs are developed jointly between Macmahon and subcontractor staff to ensure that all environmental items are covered.

For completed works, subcontractors shall submit conformance documentation, in accordance with contract specifications, to Macmahon for review and acceptance.

### 2.11. Emergency Procedures and Incidents

#### 2.11.1. Emergency Procedures

The procedures to be followed during an emergency situation at the site are detailed in the Project Emergency Response Plan.

These procedures are to ensure effective response in the event of an emergency (including environmental emergencies such as fire and large fuel spills) in accordance with procedure G-540 ‘Emergency Preparedness and Response’. The Hydrocarbon/Chemical Spill Response Process (G-110) is included within Sub-Plan 3.2.
A flipchart summarising the various emergency procedures in the Emergency Response Plan is to be completed and posted at specific work areas, cribrooms and noticeboards, specifying the steps to be taken and the parties/persons to contact in the event of an emergency.

The Emergency Response Plan shall be tested on a six (6) monthly basis. Records are to be maintained of all site emergencies and results of any emergency practice drills conducted.

2.11.2. Environmental Incident Reporting

All site personnel shall report all environmental incidents immediately to their Supervisor, Environmental or Safety Advisor.

It is the responsibility of the Supervisor to contact the Environmental Advisor to investigate the incident with personnel involved in accordance with procedure G-421 ‘Accident Investigation and Reporting’.

In the event of an environmental incident on site, the Project Manager shall notify the HSEQ Manager NT as soon as practicable. An Accident/Incident Report (G-228) will be completed and forwarded to the HSEQ Manager NT within 24 hours, with further notification as per procedure G-421. Any incidents that have caused environmental harm will also be reported to the DPI representative and NRETAS (Pollution Hotline or the compliance contact person) as soon as practicable. Under the legislation, incidents that have caused or are likely to cause serious or material environmental harm are to be notified, however when in any doubt as to the seriousness of the event, the authorities will be notified in any case.
2.12. Monitoring, Auditing and Review

2.12.1. Inspections/ monitoring

a. Macmahon

Monitoring requirements for the various environmental aspects of this project are outlined in the attached Sub-Plans.

A project specific ‘Environment & Safety Inspection Checklist’ has been developed, Appendix 4. This checklist will be completed by the Environmental & Safety Advisors on a weekly basis. It should be noted that in addition to the weekly checklist, daily visual monitoring is conducted, both by site Supervisors and Environmental & Safety Advisors.

Any corrective actions resulting from inspections will be entered onto the project Action Register and the progress tracked for completion.

b. Department of Planning and Infrastructure

Targeted inspections will be undertaken as required during key process points.

2.12.2. Internal Audits

a. Macmahon

Internal audits are carried out to determine the extent to which the EMP conforms to ISO14001, DPI & legal requirements; to assess the effectiveness of the EMP in the field and to identify opportunities for improvement. Internal audits will be carried out as detailed in procedure G-505 ‘Auditing’.

The HSEQ Manager NT will establish an Internal Audit Plan. An internal audit will be completed within the first three months of start-up and thereafter every 12 months (as a minimum).

The internal audit report will be issued within two weeks of completion of the audit.

Any non-conformance identified during the audit shall be actioned in accordance with procedure G-450 ‘Non-conformance and Corrective Action’. Management personnel responsible for the area shall undertake corrective action on the deficiencies found. Any corrective actions are entered onto the project Action Register and the progress tracked for completion.

b. Department of Planning and Infrastructure audits

Audits of the implementation of the EMP control measures will be conducted every three months during the dry season and monthly during the wet season. The results of the audit will be reported to NRETAS and a copy will be given to the contractor within 1 week of the audit. Any recommendations for corrective actions will be included in this audit report. DPI will also conduct regular site inspections for environmental performance.
External audits can be conducted by a second party (i.e. DPI, NRETAS) or third parties, such as other government departments, or a certification audit by NCS International. Results from any external audits are to be reviewed by the Project Manager, with any necessary corrective actions assigned to project personnel to ensure appropriate and timely closeout. Any corrective actions are entered onto the Project Action Register and the progress tracked for completion.

2.12.4. Project Corrective Action Register

Any environmental non-conformance (e.g. incidents, audit-related non-conformance, inspections etc) will be recorded in the Project Corrective Action Register (“Action Register”). This Register details the non conformance, allocates corrective action required, responsible persons and timeframes by which the action is to be completed, and the actual completion date. Triggers are in place via company audit scheduling and risk reviews to prevent and track any incidence of re-occurrence.

2.12.5. Management Review and Continuous Improvement

The following mechanisms will be implemented to review performance and identify opportunities for improvement:

a. Prestart Meetings

Prestart meetings are held on a daily basis for all project personnel and subcontractors and are based on operational items for the day, such as tasks to be performed that day, any complaints, any incidents, safety and environmental items to be aware of etc. Minutes of these daily meetings are kept and filed. Project personnel and subcontractors have the opportunity to bring up any items of concern for discussion, prior to commencing works for the day.

b. Toolbox Meetings

Toolbox meetings are held on a fortnightly basis, for all staff, employees and subcontractor personnel. Toolbox meetings focus on environmental and safety items relevant for the project during that time, and are used as the main tool to increase awareness in significant environmental and safety issues and to communicate the relevant items contained in the Environmental and Safety Management Plans. Typical items discussed in these toolbox meetings are:

- Any recent incidents & hazard/ near misses, recommendations
- Any complaints received
- Any audit results
- Environmental items such as new procedures or re-enforcement of existing procedures relating to erosion control, handling of hazardous chemicals, weeds, clearing boundaries, management of waste/ recycling, biting insect problems, need to report all incidents and hazard/ near misses etc
• Health issues such as dehydration, stretching exercises, healthy eating, and other company initiatives. Regularly, guest speakers are invited such as an exercise physiologist, doctor, senior Macmahon staff, auditors and others

• Safety items such as safety statistics, new procedures, re-enforcement of existing procedures relating to working at heights, working with and around machinery, manual handling, cardinal rules, use of JSEAs, emergency response etc

• Items discussed in the Safety Committee (the Safety Committee focuses on safety items however environmental items are also discussed)

• Any changes to the project and new works/ tenders

• Any training conducted or planned

• And any items as brought up by anyone in the meeting

Issues raised are recorded, and responsibilities assigned to ensure satisfactory close-out of the issues raised. Minutes of these fortnightly meetings are kept and filed and posted on site notice boards.

c. Monthly Progress Reporting

The Environment & Safety Advisors complete a Project HSEQ Performance Monthly Report (C-170), in liaison with the Project Manager, which is forwarded to the Perth head office via the HSEQ Manager NT. This report covers the preceding month’s HSEQ performance covering the following:

• Workforce number and man-hours worked (including indigenous participation figures)
• Safety Incident Statistics including TRIFR
• Any incidents (safety, plant and/ or environmental)
• Leading indicator descriptions (e.g. number of hazard/ near misses and safe act observations reported, number of toolbox and safety committee meetings held, subcontractor information, number of inspections and audits, training conducted, JSEAs/ procedures developed)
• Drug & alcohol testing results
• Operator training conducted
• Number of audits conducted and/ or planned
• Any complaints
• Any non-conformances
• Waste types and volumes, including recycling
• Energy efficiency opportunities
• Comments by Project Manager
• Other HSEQ Performance / Information for the month (such as training/refresher courses, DPI audit results/feedback, opportunities for improvement, etc)
d. Group Management System Review

In accordance with procedure **G-493 ‘Continual Improvement’**, the Project Manager reviews the management system on a quarterly basis to determine its continuing suitability, adequacy and effectiveness and to assess and identify opportunities for improvement.

Items discussed and reviewed are:

- Any outstanding actions from the previous quarterly risk review
- Any trends resulting from an analysis of incidents and hazard/ near misses over the past quarter
- Safe Act Observations
- Project Risk Register
- Action Register and any items outstanding
- JSEA Register
- Issues discussed at prestart and toolbox meetings
- Any DPI related issues
- Determination of the top 3 high risk activities and actions to be taken in the next quarter to reduce the risks
- Communication and understanding of safety requirements by employees (includes subcontractors). Any negative response to be itemised for action and follow-up.

**e. Senior Management Review**

- Senior Macmahon management regularly visit the project sites for visual inspections and any items identified will be actioned as soon as possible. Apart from inspections, they may also conduct Site Visitor’s Audits.
3. ENVIRONMENTAL MANAGEMENT SUB-PLANS

The following sections address the management of relevant specific environmental issues at the site.

Reference is also made to other Management Plans that have been developed by Macmahon for the project (separate to this EMP), which are relevant:

- Safety Management Plan
- Emergency Response Plan
- Traffic Management Plan
- Quality Management Plan
- Stakeholder Management Plan
- Employee Relationship Management Plan
- Local Industry Participation Plan
- Blasting Management Plan
3.1. EROSION & SEDIMENT CONTROL MANAGEMENT PLAN

3.1.1. Existing Environment/ Current status

The first version of this Erosion & Sediment Control Plan was submitted in March 2009, and formed part of the first version of the EMP. An additional document “Clearing Plan” was submitted after the EMP was assessed by NRETAS, in April 2009. This current Erosion & Sediment Control Plan combines the previous Erosion & Sediment Control Plan and the Clearing Plan, and once approved, the EMP will be updated with the inclusion of the current document.

Also refer to the Notice of Intent, DPI, January 2008, which includes various maps relating to soils and land units.

a. Geology and Soils

With reference to the Darwin SD52-4 1:250 000 Geological Map Series (Department of Mine and Energy, 1987), geology within the project area primarily consists of unconsolidated sand, clayey sand, ferruginous clayey sand, sandy and gravelly soils, pisolitic and mottled laterite, kaloinitic claystone, basal conglomerate, minor bioturbated siltstone, carbonate, sandy claystone and clayey sandstone. Sand, silt and clay and shale and siltstone are present in patches in the area of the project. Laterite and sandstone are noted to occur immediately east of the start of the road extension (Ulman and Nolan Geotechnics Consulting Geotechnical Engineers, 1999).

Generally the area is underlain by the South Alligator Group – carbonaceous and ferruginous shale with chert bands, carbonate, tuff, banded iron formation. In the vicinity of the dam the area is underlain by Bathurst Island Formation – radiolarian and sandy claystone, clayey, quartz, ferruginous and/or glauconitic sandstone and basal conglomerate (Dames and Moore, 1999).

b. Land Units

The site is gently undulating for much of its length with natural gradients of about 2 %. Slopes in the vicinity of Marjorie Street are steeper in the range of 3-7%.

The land units contained in the Tiger Brennan Drive extension site consist of a combination of swampy/marshy ground, lower hill slopes, undulating hill slopes and lower hills. The land units, as defined by the Greater Darwin Area Land Unit Descriptions (GDALUD, DIPE, 2004), to be traversed by the Tiger Brennan Road extension includes:

- Rugged low hills and slopes
  - Short steep slopes and rises; gradient 5 to 15%; shallow gravelly lithosols: Eucalypt Woodland (GDALUD, 1c)
- Undulating rises and side slopes
  - Gentle side slopes; gradient 2 to 5 %; moderately deep gravelly yellow massive earths, minor lithosols: Eucalypt Open Woodland to Woodland (GDALUD, 2b1).
- Gentle side slopes; gradient 2 to 5%; shallow gravely massive earths, minor lithosols: Eucalypt Low Open Woodland to Open Woodland (GDALUD, 2b2).
- Gently undulating upland surface
  - Flat to gently undulating upland surface; gradient 1 to 3%; shallow gravelly lithosols; Eucalypt Open Woodland, minor Woodland (GDALUD, 3d).
- Gently undulating lower slopes
  - Gentle lower slopes; gradient 0.5 to 1.5%; wet season water tables; hardsetting deep mottled yellow massive earths; Mixed species Open Forest, minor woodland (GDALUD, 4d).
- Alluvial plains and drainage lines/minor levees
  - Broad lowland plains; gradient less than 1.5% shallow to moderately deep siliceous sands: Grevillea/Melaleuca Tall Shrubland to Low Open Woodland, minor Open Woodland (GDALUD, 6b).

c. Hydrogeology and Water Resources

Prior to construction, the majority of the proposed Tiger Brennan Drive extension corridor was trafficable during the dry season. (source: Notice of Intent Stage 2, page 28).

Some sections of the site contain swampy/marshy ground that can become boggy during the wet season. The north east section near the Stuart Highway intersection of the road extension is subject to a “severe level of soil waterlogging or inundation for extended periods to moderate to high level of soil waterlogging”, according the Litchfield Planning concepts and Land Use Objectives.

Watercourses and water bodies in the vicinity of the proposed works include (refer Appendix 8):
- Blesers Creek – approximately 2 kilometres south of the existing Tiger Brennan Drive / Berrimah Road intersection.
- Hudson Creek – approximately 1.5 kilometres south of the existing Tivandale Road / Wishart Road intersection. Hudson Creek drains in the East Arm, Darwin Harbour.
- A major creek (tributary to Hudson Creek) that traverses the existing railway approximately 300 metres east of the existing Tivendale Road.
- A creek located approximately 400 metres west of the Tivendale Road / Wishart Road intersection which drains into Hudson Creek.
- Drainage lines and gabion drop structures parallel to the alignment of the existing Wishart Road.
- A swamp at the north-east of the Tiger Brennan Drive / Stuart Highway intersection which is beyond the project boundary
- A seasonally inundated area at the eastern end of the road extension immediately north of the Stuart Highway, north of the CDU Palmerston Campus.
- A dam south of Marjorie Street and north of CDU Palmerston Campus.
- Adjacent watercourses, such as Fairway Waters.
- Sediment ponds at the prison.

Drainage from Berrimah Farm in the area of the development is primarily to Berrimah Road as surface flow in the east and via surface flow to the south and west.
3.1.2. Potential Impacts/ Issues

Removal of vegetation and disturbance of soils during construction exposes underlying soils and can lead to soil loss via wind or water erosion. Wind erosion is possible particularly during the dry season. Water erosion is possible particularly during the wet season. Erosion can lead to loss of topsoil and sub-soils, sedimentation of land and water, and reduced potential for rehabilitation success. Also, increased turbidity in waterways can impact on the health of aquatic flora and fauna. Dust can also be a consequence of clearing activities, possibly resulting in community complaints or dust settling on plant leaves.

Vehicle movement and increased traffic on unsealed areas can cause soil compaction. Soil compaction often results in a reduction in soil permeability, increased surface drainage, and contributes to surface erosion from an increase in water volumes and flows.

It is expected that some soils may be deposited onto roads from truck tyres at the points where road trains and other construction traffic exit the site onto the existing road network.

During the construction of culverts in the Dry Season, the creek/ drainage line (downstream from Ostojic) was dammed. The water being dammed is being released upstream in significant volumes and is turbid. The water from the dam was used for dust suppression on-site, and a portion was pumped into the down stream side of the creek/ drainage line. Every attempt has been made to maintain the base-flows in the drainage lines. This was discussed with the Water Management Branch within NRETAS and construction works are exempt under the Water Act and do not require a Water Extraction Licence.

Drill & blast activities occurred at two locations, and the fill has been reused in the lower lying areas. The two cuts occurred at the hill at Berrimah Farm (July 2009) and the area between Pinelands and Fairway Waters (July – September 2009).

In the water logged areas, the vegetation has been removed, to assist with drying out the soils.

The topsoil has been stripped and stockpiled separately (in windrows), followed by the removal of an underlying 600 mm of waterlogged soils that is not suitable for road subgrade. This has occurred in the months of May to July 2009, moving from west to east along the road alignment. The stockpiled waterlogged soils were dried, and reused and compacted in filling areas such as medians and the Marjorie Street dam.

The higher areas of the alignment (Berrimah Farm and cutting between Pinelands and Fairway Waters) were cleared after the completion of clearing activities in the low lying areas.

Clearing in culvert areas was minimised during the months of April & May 2009.

The following items form part of the requirements in the Erosion and Sediment Control Fact Sheet, as developed by NRETAS.

a. Site layout
b. Vegetation layout
c. Soil properties
d. Drainage and land management

e. Completion

As the project progresses, this Erosion & Sediment Control Plan will be updated as necessary.

a. Site Layout

- **Timing of construction**: the earthworks commenced in April 2009, and the works are expected to finish in the Dry Season of 2010.

- A **locality plan** identifying the development site is included in Appendix 1, and the external catchment area with existing site contours is included in Appendix 9.

- Appendix 10 shows the **final site contours with cut & fill locations** identified.

- **Staging of works**: Clearing and topsoil stripping has been conducted in two stages over the Dry Season 2009. The first clearing has been from Berrimah Road to Tivandale Road and the second stage was from Tivandale Road to the Stuart Highway.

- The **locations of site access points and parking areas, site facilities, access tracks, site storage and stockpile areas** are included in Appendix 8.

- During the wet season, **areas of high risk** are any exposed soil areas, any exposed batters and any exposed culvert outfall areas.

- The drainage layout is detailed in Appendix 8. **Erosion and sediment control measures** will be implemented, refer Appendix 8A for locations and Appendix 8B for typical sections of the various controls that will be used at the project.

- **Proposed grades and batter slopes** are included in Appendix 11.

- Volumes of **trapped sediment** are expected to be low and any trapped sediment will be disposed of on-site and re-used in the works.

- There are no excessive slope gradients at the site or rock outcrops. There are no areas with major existing soil erosion or stream bank erosion.

b. Vegetation Layout

- **General location, nature and condition of existing vegetation**: refer to Sub-Plan 3.6 of this EMP, “Native Vegetation & Significant Flora Species and Clearing Management Plan”. It should be noted that the relevant areas in the road reserve have now been cleared.

- **Location plan of protected trees and bushland, non-disturbance areas and buffer zones**: there are no protected trees on-site, however within the cleared areas, all suitable cycads of the Cycas Armstrongii species have been removed, placed in bags and are being stored and maintained, for use in the future landscaping (approximately 700). Clearing within the road reserve has been minimised to that required for construction purposes. The area to be cleared has been clearly flagged and no vegetation has been disturbed outside of this area, apart from that necessary for turnaround areas, stockpile areas and access roads, with prior approval from DPI. 7.5 metres of clearance has been allowed for access & working areas, beyond the toe of the batters in cut & fill areas. The drainage lines within the road reserve have been cleared, only to what was necessary for the construction of the culverts. This has occurred during
the Dry Season. Watercourses will be protected using erosion & sediment control measures. During construction, sediment fences will be used, and after construction, culverts will be protected with reno matrasses and grouted stone pitching.

- **Rehabilitation**: all disturbed areas will be rehabilitated, and the roadworks include a landscaping plan (refer Appendix 13).

- The **limits of clearing** are the road reserve. However, not the entire road reserve has been cleared, and clearing has been minimised to what is required for the roadworks, stockpiles, parking areas, laydown areas and access roads.

c. **Soil properties**

- **Location and limitations of major soil types**: refer to the first section of this Erosion & Sediment Control Sub-Plan.

- It is unlikely that **Potential Acid Sulfate Soils** (PASS) are present in the project area, according to discussions with NRETA (refer NOI). The project area is located in an area > 8 m AHD, and PASS soils are known to occur in lower lying areas (i.e. 5-6 m AHD, that were inundated by the sea 6,000 years ago)). During the recent excavations on-site, no acid sulfate soils have been encountered.

d. **Drainage and Land Management**

- **Drainage plans** are included in Appendix 8. For further details, also refer to Sub-plan Stormwater Management.

- **Erosion and sediment controls** are inspected at least weekly and more frequently after rainfall events; maintenance and repair will be conducted as required.

e. **Completion**

- **Stabilisation** of all exposed areas will occur after the works have been finalised; temporary erosion controls will be in place during construction. A permanent silt trap will be constructed to trap silt from the interchange during the operational phase of the road (refer to the drainage plans in Appendix 8).

- The landscaping plans that form part of the rehabilitation are included in Appendix 13.

3.1.3. **Objectives of the Erosion and Sediment Control Plan**

- Minimise erosion by implementing appropriate erosion & sediment control measures

- Minimise impacts of sediment runoff on the surrounding environment, such as the two creeks off Hudson Creek and the Fairway Waters Lakes

- In the project area, redirect site drainage and surface runoff where possible and distribute to avoid accelerated soil erosion

3.1.4. **Legal and Other Requirements**

- **Soil Conservation and Land Utilisation Act**

- **Waste Management and Pollution Control Act**

- **Water Act**

3.1.5. **Performance Criteria**
• Implement and maintain appropriate erosion & sediment control measures to reduce sediment running off-site
• No significant increase in turbidity in receiving waterways (such as the two creeks off Hudson Creek and the Fairway Waters Lakes) by monitoring upstream and downstream of the works
• No evidence of significant accelerated erosion as a result of the construction activities
• Rehabilitation of areas disturbed as a result of the construction activities

3.1.6. Management, Monitoring and Corrective actions

Table 5 provides the controls, monitoring and corrective action for the issues identified. Also, there is a standard Macmahon flowchart for erosion control which has been attached.

During design, several measures have been adopted to minimise the risk posed by erosion. These measurements include:
• Energy dissipation and suitable grades to manage water velocities, permeable surfaces to increase infiltration and vegetation to reduce surface flow velocities and stabilise soils.
• Where the road formation is in cut, stormwater from the pavement surface will be contained within a conventional pit and pipe system which will discharge at regular intervals. Roadside cut off drains will intercept stormwater from the cut batters. Low flow concrete inverts 0.6m wide will be constructed in the roadside drains to reduce the risk of erosion in the invert of the drain and minimise potential ponding.
• In areas of fill, water will sheet from the road verge as diffuse runoff from the road formation to the natural surface. Water from the central collection system will discharge via pipe culverts at regular intervals.
• Gabion drop structures will be used to reduce the grade of drains in steep areas. These will act to dissipate energy, slowing flows and minimising erosion. Rock protection (‘Reno mattresses’) will be implemented at all outlets and culvert crossings to reduce potential scour.

Erosion Controls
• Diversion banks will be used where possible instead of diversion drains, to minimise erosion. During the initial stages of the project, diversion drains are more practical due to the initial lack of fill prior to blasting activities.
• The outfall areas from diversion banks/ diversion drains into culverts will be protected with the diverted stormwater flowing into a stabilised area. The stabilised area will consist of geotech material and rocks, with dumped rock check dams downslope where practicable. This will slow the flow and achieve a level spreader of the flow across the dam.
• Median pits will be provided with temporary and permanent erosion protection, consisting of sediment fences and/ or dumped rocks and dumped rock check dams. Where practicable, dumped rock check dams will have a rock apron on the downstream side of the dam (approximately 1 metre).

Batter slopes
• Areas of fill at the Tiger Brennan extension are 1:4 batters
• Areas of cut at the Tiger Brennan extension are 1:2 batters
• Areas of cut and high fill at the interchange are 1:2 batters
• Areas of low fill at the interchange are 1:4 batters
Rehabilitation

- Most areas will be rehabilitated prior to the Wet Season, by applying top soil to batters and seeding where needed (approximately from Berrimah Farm to the Marjorie Street Dam). Parts of the interchange will remain exposed and these areas will be protected by appropriate controls as practicable.
- Grassing of batters: NRETAS prefers this to occur prior to the wet season, using temporary irrigation, to ensure that batters and exposed areas stabilised prior to 30 September.
- Rehabilitation will be progressive, i.e., areas that are no longer needed for access will be rehabilitated as the works progress.
## Table 5– Management of Erosion & Sediment Control - Tiger Brennan Drive Extension Stage 2

<table>
<thead>
<tr>
<th>Actions/ controls</th>
<th>Monitoring/ inspections</th>
<th>Contingencies/ corrective actions</th>
</tr>
</thead>
</table>
| • Install appropriate erosion and sediment control measures along roadworks as required to protect areas from sedimentation.  
  • Regularly maintain erosion and sediment control measures and check function after rainfall events, and regularly remove accumulated sediment from traps for reuse in the project. | • Implement and maintain an erosion & sediment control plan, which will be a map of the project with the locations and types of all erosion controls, including drainage details (Appendix 8).  
  • Monitor the erosion & sediment control measures for effectiveness by:  
    − Daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors  
    − Weekly Environment & Safety Checklist  
    − Inspection of erosion and sediment control structures after storm events | • Improve or maintain the erosion & sediment controls where required. Actions identified in inspections will usually be entered onto the Action Register with a planned date for action, unless the item has been rectified immediately. |
| • Determine any impacts on the surrounding environment                           | • After significant rainfall events, monitor water quality in the two creeks off Hudson Creek and Fairway Waters Lakes and regularly collect water samples for analysis for suspended solids and turbidity and compare with the background levels. (Prior to construction, various samples have been collected analysed in creeks to determine natural background levels). | • If the levels for suspended solids and turbidity are significantly higher compared to the background levels, investigate the main sources for the sediment levels and improve the erosion & sediment controls where required  
  • Also, remove any off-site sediment. |
| • Stockpiles to be kept away from water drainage lines, and stockpiles to be wetted during windy conditions where required. Also, erosion & sediment controls will be implemented around/ downslope of stockpiles, such as silt fences, socks or rocks. | Monitor the erosion & sediment control measures for effectiveness by:  
  • Daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors  
  • Weekly Environment & Safety Checklist | • Improve or maintain the erosion & sediment controls where required. Actions identified in inspections will usually be entered onto the Action Register with a planned date for action, unless the item has been rectified immediately. |
| • Undertake the main clearing activities during the dry season to reduce the potential for accelerated soil erosion from storm event and | Monitor weather conditions and visually monitor site for erosion:  
  • Daily inspections and supervision by supervisors and inspections by | • Where possible, change the activities or increase erosion controls where required |
<p>| Stockpiles to be kept away from water drainage lines, and stockpiles to be wetted during windy conditions where required. Also, erosion &amp; sediment controls will be implemented around/ downslope of stockpiles, such as silt fences, socks or rocks. | | |</p>
<table>
<thead>
<tr>
<th>Actions/ controls</th>
<th>Monitoring/ inspections</th>
<th>Contingencies/ corrective actions</th>
</tr>
</thead>
</table>
| schedule timing of construction activities, to reduce risk of erosion and sedimentation during higher risk periods for flooding. | Environment & Safety Advisors  
  - Weekly Environment & Safety Checklist | In case of any over-clearing, the area of over-clearing will be rehabilitated and the person involved re-instructed or disciplinary action undertaken. Also, DPI will be notified. |
| Vegetation clearing to be undertaken strictly only to the clearing boundaries identified on the design drawings, and clearing boundaries to be clearly marked and flagged in the field. | Monitor cleared areas and flagged areas:  
  - Daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors  
  - Weekly Environment & Safety Checklist | |
| Ensure that all people are aware of potential issues with erosion & sediment control issues (in induction and Toolbox meetings). | Weekly Environment & Safety Checklist  
  - Internal and external audits as per ISO 9001 and 14001 | Regular discussion of erosion & sediment control issues in Toolbox and prestart meetings |
| Rehabilitation of disturbed areas will be undertaken as soon as possible following construction.  
  - Topsoil will be stripped and stockpiled in stabilised piles and reused in rehabilitation. | Weekly Environment & Safety Checklist  
  - Project meetings | Rehabilitation of disturbed areas to be planned with a suitable timeframe. |
| Install surface runoff diversion measures where possible to ensure clean runoff does not pass through construction sites or cause accelerated erosion, particularly in areas of high soil erodibility.  
  - Construct cut-off drains or similar protective measures at the top of cut slopes to prevent scouring and accelerated erosion where possible. Drains to re-direct water from cut face of slope and may be lined with non-erosive material; ends of drains to be flared to disperse water along contour of slope, or protected by rock. | Monitor runoff into disturbed areas and visually monitor site for erosion:  
  - Daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors  
  - Weekly Environment & Safety Checklist | Install additional diversion drains or maintain/improve existing measures as required. |
## Erosion Controls required during the various stages of construction

<table>
<thead>
<tr>
<th>Roadworks general</th>
<th>Culverts (includes creeks/ drainage lines)</th>
<th>Stockpiles</th>
<th>Exposed batters</th>
<th>Exposed Areas on-site</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>Clearing</strong>: finalised in the Dry Season</td>
<td>• <strong>Base slab, apron, wing walls, backfill, install reno matrasses</strong>: all finalised in the Dry Season.</td>
<td><strong>Stockpiled soils:</strong></td>
<td><strong>Rehabilitation of exposed batters:</strong></td>
<td><strong>Rehabilitation of exposed areas:</strong></td>
</tr>
<tr>
<td>• <strong>Culverts</strong>: refer column “culverts”</td>
<td>• <strong>Cut &amp; Fill formation and compact</strong> (includes table drains adjacent road &amp; stormwater pipes in medians, and also includes trim batters):</td>
<td>- Erosion &amp; sediment control measures will be in place prior to the Wet Season (30 September), such as a diversion bank upslope and sediment fence downslope (refer details in Appendix 8 of EMP). Check dams will have a rock apron on the downstream end of the dam (approx 1 metre).</td>
<td>- This will occur prior to the Wet season (30 September), by compacting batters and applying top soil to batters and seeding (and/or mulch) where needed. Grassing of batters will occur prior to wet season (30 September), using temporary irrigation and/or watering by a water truck. Also, where possible, a diversion drain will be constructed on top of the bater.</td>
<td>- This will occur prior to the Wet season (30 September) by applying top soil, mulch, seeding and/or ripping of topsoils where needed. (where works are not in progress i.e. where machinery access is needed)</td>
</tr>
<tr>
<td>• <strong>Cut &amp; Fill formation and compact</strong> (includes table drains adjacent road &amp; stormwater pipes in medians, and also includes trim batters):</td>
<td><strong>Culverts</strong>: refer for details “tail out” to the drainage plans in Appendix 8 of the EMP. Rock check dams will be installed at the end of the disturbed soil area in the outlet drain, refer details in Appendix 8 of EMP. Check dams will have a rock apron on the downstream end of the dam (approx 1 metre).</td>
<td>• <strong>Rehabilitation of creeks and drainage lines</strong>: clean-up excess soil, any cleared vegetation and any other waste. In addition, mulch and/or revegetate as necessary.</td>
<td><strong>Rehabilitation of exposed areas remaining at the Interchange will be protected by various erosion &amp; sediment control measures such as mulch, sediment fences, rock dams as appropriate at that location.</strong></td>
<td><strong>Rehabilitation is progressive, i.e. areas that are no longer needed for access are rehabilitated as the works progress.</strong></td>
</tr>
<tr>
<td>- In the Dry Season, windrows (diversion banks) are in place adjacent to the road formation, noting that down gradient soils and vegetation have not been disturbed. These windrows also clearly delineate no go zones.</td>
<td><strong>Rehabilitation of batters</strong>: refer “exposed” rehabilitation of batters</td>
<td>- In the Wet Season (after 30 September), these windrows/ diversion banks will remain in place until the road formation is sealed and the topsoil windrows are used in the rehabilitation of the batters. By that stage, the culverts will be connected and working. The outfall areas from diversion banks into culverts and from culverts into outfall drains will be protected with reno matrasses. At the end of the outfall drains, a dumped rock check dam will be installed, refer details in Appendix 8 of EMP. Check dam will have a rock apron on the downstream side of the dam (approx 1 metre).</td>
<td><strong>Rehabilitation of exposed areas remaining at the Interchange will be protected by various erosion &amp; sediment control measures such as mulch, sediment fences, rock dams as appropriate at that location.</strong></td>
<td><strong>Rehabilitation is progressive, i.e. areas that are no longer needed for access are rehabilitated as the works progress.</strong></td>
</tr>
<tr>
<td>- Inlet pits for medians (draining medians which is a small catchment area): dumped rock will be used in combination with sediment fences, upstream and downstream where necessary.</td>
<td><strong>Rehabilitation of batters</strong>: refer “exposed” rehabilitation of batters</td>
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<td><strong>Rehabilitation is progressive, i.e. areas that are no longer needed for access are rehabilitated as the works progress.</strong></td>
<td><strong>Rehabilitation is progressive, i.e. areas that are no longer needed for access are rehabilitated as the works progress.</strong></td>
</tr>
</tbody>
</table>
Stabilised site access: where site traffic exits from an unsealed area onto a public road, stabilised site access (at least 15 metres long) and/ or wheel shakers (at least 6 metres long) will be provided in the West Season. Refer details in Appendix 8.
Erosion/Sediment Control Failure Response Flowchart

**Responsibility**

- Macmahon and/or Subcontractor personnel

**Activities**

- Act Safety
- Act quickly
- Get help from your supervisor.

- Temporarily control where the water is going
- Do not let the water flow over:
  - exposed surfaces
  - contaminated soils
  - uncompacted construction areas

- Fix the problem

- Bund the upstream area to prevent further sediment transportation
- Place a small check dam in the immediate area
- Place additional sediment fences or hay bales downstream
- Locate a ‘sediment floating’ in the immediate discharge location within the watercourse

- Maintain weed/decline hygiene certificates and register

- Notify the PEMR if you have not done so already
- Complete an Incident Report Form (SSPEM01) during the shift in which the incident occurred
- PEMR should notify the Client if the off-site discharge is greater than the allowable release, or the erosion has affected the work (as per Client and for environmental licence requirements)

**Reference Documents**

- Incident Report Form (G-228)
- Where required, identify area that may need additional erosion or sediment control
- Order more sediment fences, filter logs, stop log, hay bales, etc
- Install additional bunds, sediment

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**Relevant to:**
- Business Unit: All
- Division(s): All
- Site: All
- Department: All

**Document Owner:** Group Quality & Environment Manager

**Change Control Level:** 1

**Page 1 of 1**
3.2. STORMWATER MANAGEMENT PLAN

3.2.1. Existing Environment/ Current Status

The majority of the proposed Tiger Brennan Drive extension corridor is trafficable during the dry season. Some sections of the site contain swampy/marshy ground that can become boggy during the wet season. The north east section near the Stuart Highway intersection of the road extension is subject to a "severe level of soil waterlogging or inundation for extended periods to moderate to high level of soil waterlogging", according to the Litchfield Planning concepts and Land Use Objectives (source: Notice of Intent Stage 2, page 28).

a. Water bodies

Watercourses and water bodies in the vicinity of the proposed works include (refer Appendix 8A):

- Bleesers Creek – approximately 2 kilometres south of the existing Tiger Brennan Drive / Berrimah Road intersection.
- Hudson Creek – approximately 1.5 kilometres south of the existing Tivendale Road / Wishart Road intersection. Hudson Creek drains in the East Arm, Darwin Harbour.
- A major creek (tributary to Hudson Creek) that traverses the existing railway approximately 300 metres east of the existing Tivendale Road.
- A creek located approximately 400 metres west of the Tivendale Road / Wishart Road intersection which drains into Hudson Creek.
- Drainage lines and gabion drop structures parallel to the alignment of the existing Wishart Road.
- A swamp at the north-east of the Tiger Brennan Drive / Stuart Highway intersection which is beyond the project boundary.
- A seasonally inundated area at the eastern end of the road extension immediately north of the Stuart Highway, north of the CDU Palmerston Campus.
- A dam south of Marjorie Street and north of CDU Palmerston Campus.
- Adjacent watercourses, such as Fairway Waters.
- Sediment ponds at the prison.

b. Drainage

The surface water encountered in the proposed Tiger Brennan Drive extension corridor for the most part flows to the south and the south west with large upstream catchments contributing the majority of peak flows. The majority of water crossing the proposed alignment water flows to the south and crosses the existing railway formation through a series of culverts, ultimately passing into Darwin Harbour via Hudson Creek. Flows to the west cross Berrimah Rd and enter Bleesers Creek. A relatively small portion of the corridor at the proposed Tiger Brennan Drive/ Stuart Highway interchange drains to the North East.

The Stuart Highway acts as a ridge, with surface water north of the Stuart Highway flowing north, and surface water south of the Stuart Highway flowing south.

Water within the seasonally inundated areas north of the Stuart Highway drains slowly via the paperbark forests to the north (retention time between few days to a week). Excess water flowing through the forest reaches a second area that is seasonally inundated and that retains water into the
dry season. There is another seasonally inundated area to the west of the Highway, which drains south-west towards Durack.

Drainage from Berrimah Farm in the area of the development is primarily to Berrimah Road as surface flow in the east and via surface flow to the south and west.

### 3.2.2. Potential Impacts/ Issues

Please note that not all items are addressed fully as the design is currently in progress. The Stormwater Management Plan will be updated when the design has progressed to a final stage.

**Potential for increased flows**

Local runoff from the developed road corridor will be slightly higher than undeveloped flows, due to the sealing of carriageways creating an impervious surface. However, the increase in flow is considered insignificant as the road corridor represents a very small percentage of the entire catchment contributing to flow. Increases in flow due to the proposed works vary between catchments and are typically between 0.1% and 0.7% (table 6).

The anticipated residential, commercial and industrial development of upstream catchments will have a far greater impact on peak flows than the Tiger Brennan Drive extension.

**Potential for flooding**

Culverts under the proposed Tiger Brennan Drive Extension are sized to convey the peak storm water discharge for a 100 year average recurrence interval (ARI) storm event. This peak discharge or flow is referred to as $Q_{100}$. The calculated flow is conservative as it assumes fully developed upstream catchments. While the upstream areas remain undeveloped, it can be expected that peak surface water flows will be less than those used in design.

Preliminary design for the cross drainage of the Tiger Brennan Drive extension includes 8 sets of culverts along the proposed extension, one culvert set on the augmented section of Tivandale Road and one culvert set on the augmented section of Wishart Road. The preliminary location, size, capacity and upstream water level (headwater level) for the designed culvert crossings are presented in table 6.

### Table 6 – Tiger Brennan Drive Extension Stormwater Cross Flows

<table>
<thead>
<tr>
<th>Chainage (m)</th>
<th>Culvert size</th>
<th>Headwater level (mAHD)</th>
<th>Culvert Capacity m$^3$/s</th>
<th>Calculated Flow ($Q_{100}$) m$^3$/s</th>
<th>% Increase in Flow Due to TBD Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>9475</td>
<td>6 cells x 1800x900</td>
<td>13.3</td>
<td>29.74</td>
<td>28.33</td>
<td>0.70%</td>
</tr>
<tr>
<td>10030</td>
<td>1 cell x 1800x900</td>
<td>20.1</td>
<td>5.4</td>
<td>5.03</td>
<td>0.30%</td>
</tr>
<tr>
<td>11085</td>
<td>11 cells x 1800x900</td>
<td>12.5</td>
<td>54.52</td>
<td>52.96</td>
<td>0.12%</td>
</tr>
<tr>
<td>11220</td>
<td>1 cell x 1800x900</td>
<td>11.9</td>
<td>6.58</td>
<td>4.83</td>
<td>0.04%</td>
</tr>
<tr>
<td>11740</td>
<td>3 cells x 1800x900</td>
<td>11.4</td>
<td>14.87</td>
<td>12.91</td>
<td>0.54%</td>
</tr>
<tr>
<td>12295</td>
<td>2 cells x 3000x3000</td>
<td>11.2</td>
<td>65.08</td>
<td>67.25</td>
<td>0.09%</td>
</tr>
<tr>
<td>12860</td>
<td>7 cells x 1800x900</td>
<td>14.1</td>
<td>34.69</td>
<td>32.54</td>
<td>0.33%</td>
</tr>
</tbody>
</table>
Culverts have been located on existing drainage lines and in several cases align with culverts under the existing railway formation. As the railway culverts are also sized for Q₁₀₀, any flood attenuation caused by the Project will be the same as the current effects of the railway formation.

**Inclusion of WSUD principals**

Water Sensitive Urban Design (WSUD) principals aim to minimise negative impacts of urban developments on the natural water cycle of an area and protect aquatic ecosystems. Established WSUD practices in Australia generally originate in the southern states and have been developed for treating stormwater flows from storm events with longer duration and lower intensity than those in the tropical north. As such, many of the approaches used in WSUD may not be appropriate for implementation in the Northern Territory. WSUD principles that are appropriate for the Northern Territory and are incorporated in the design include:

- Protection of existing natural features and ecological processes
- Maintenance of natural flow regimes
- Protection of water quality

The application of these principles to the Tiger Brennan Drive Extension project are outlined below.

**a. Protection of natural features**

The Tiger Brennan Drive extension has been designed to maintain the alignment of existing drainage lines and water courses where possible. Major cross drainage culverts as well as longitudinal drainage outlets are located on existing drainage lines.

Cross drainage culverts along the majority of the proposed road alignment are designed at an appropriately low grade to facilitate the movement of aquatic species.

**b. Measures to maintain flow regimes**

The proposed typical section for the Tiger Brennan Drive extension includes two dual lane carriageways with a vegetated centre median (approx 14m wide). The vegetated median is graded to form a swale which allows for infiltration in periods of low intensity rainfall, and will adequately convey stormwater by open channel flow in periods of higher intensity rainfall. Letterbox pits at regular intervals collect water flowing in the swale and direct it to a conventional piped collection system.

Cross drainage culverts are sized to cater for Q₁₀₀, and designed at appropriate levels so as to continue an approximation of the existing grade of water courses. As such, flows will be catered for with minimal impact to natural flow conditions.

Consideration has been given to a low lying area that is subject to inundation (ephemeral marsh) located to the north of the proposed Stuart Highway interchange. The water level in the area is maintained by an existing disused railway formation to the north. The development will not impact the railway formation or the outlet level and hence the timing and duration of inundation will not be affected. In addition, the recent Hydrogeological Assessment by URS (January 2009), investigating groundwater conditions at the proposed Stuart Highway interchange site where excavations intercept the water table, indicates that the proposed excavation works and subsurface drainage will not adversely impact groundwater levels in the ephemeral marsh. If high permeability sediments are intersected during the construction of the western and eastern overpass excavations, there may be a requirement for the installation of a low-permeability cut-off barrier to limit drawdown extent.

Ponding of water will be prevented on-site where possible, to minimise any mosquito breeding areas.
c. Protection of water Quality

Sediment load poses the greatest risk to water quality. There is the potential for the development to generate greater levels of erosion, and subsequent sediment load in runoff. Several measures have been adopted to minimise the risk posed by erosion. These measurements include energy dissipation and suitable grades to manage water velocities, permeable surfaces to increase infiltration and vegetation to reduce surface flow velocities and stabilise soils.

When the road formation is in cut, stormwater from the pavement surface will be contained within a conventional pit and pipe system which will discharge at regular intervals. Roadside cut off drains will intercept stormwater from the cut batters. Low flow concrete inverts 0.6m wide will be constructed in the roadside drains to reduce the risk of erosion in the invert of the drain and minimise potential ponding.

In areas of fill, water will sheet from the road verge as diffuse runoff from the road formation to the natural surface. Water from the central collection system will discharge via headwalls at regular intervals.

Gabion drop structures will be used to reduce the grade of drains in steep areas. These will act to dissipate energy, slowing flows and minimising erosion. Rock protection (‘Reno mattresses’) will be implemented at all outlets and culvert crossings to reduce potential scour.

During construction, the Erosion & Sediment Control Plan will be in place to minimise impacts on water quality, and the Hazardous Substances Management Plan will be used to control any impacts from the use of hazardous materials and in case of any spills.

3.2.3. Objectives of the Stormwater Management Plan

- No impacts on the downstream environment as a result of the installation of new culverts and drainage
- No increased flooding in the project area or areas upgradient or downgradient of the project area (as a result of construction activities)
- Seasonally inundated areas and seepage areas will be protected through the use of appropriately designed culverts including provision for perennial flows and movement of aquatic animals

3.2.4. Legal and Other Requirements

- Waste Management & Pollution Control Act
- Water Act

3.2.5. Performance Criteria

- No increased flooding downstream
- Minimal impacts on adjacent seasonally inundated areas or seepage areas
3.2.6. Management, Monitoring and Corrective Actions

Table 7 provides the controls, monitoring and corrective action for the stormwater issues identified.

**Table 7 – Management of Stormwater for Tiger Brennan Extension Stage 2**

<table>
<thead>
<tr>
<th>Actions/ controls</th>
<th>Monitoring/ inspections</th>
<th>Contingencies/ corrective actions</th>
</tr>
</thead>
</table>
| • Design culverts under the Tiger Brennan Extension to size to convey the peak storm discharge for a 100 year average recurrent interval, storm event. | • Quality Control Process within the Project, and DPI to issue “permission to use”. | • Amend design where required  
• Correct non-conformances as per the contract |
| • Culverts located on existing drainage lines and in several cases align with culverts under the existing railway formation. | • Quality Control Process within the Project, and DPI to issue “permission to use”. | • Amend design where required  
• Correct non-conformances as per the contract |
| • Apply Water Sensitive Urban Design Principals where possible such as protection of existing natural features and ecological processes, maintenance of natural flow regimes, and protection of water quality.  
• Design is such that the alignment of existing drainage lines and water courses are maintained where possible. Major cross drainage culverts as well as longitudinal drainage outlets are located on existing drainage lines. Cross drainage culverts along the majority of the road alignment are designed at an appropriately low grade to facilitate the movement of aquatic species.  
• Vegetated median is graded to form a swale which allows for infiltration during low rainfall. Letterbox pits collect water in swales during high rainfall. Culverts designed for Q_{100}. Water levels in swamp north of the Hwy will not be impacted.  
• Prevent erosion by energy dissipation and suitable grades to maintain water velocities, permeable surfaces to increase infiltration and vegetation to reduce surface flow velocities and stabilise soils. Roadside cut off drains will intercept stormwater from cut batters; use low flow concrete inverts in roadside drains; in areas of fill, water will sheet from the road verge to the natural surface; use of gabion drop structures in steep areas; and Reno matrasses at all outlets and culvert crossings. | • Quality Control Process within the Project, and DPI to issue “permission to use”. | • Amend design where required  
• Correct non-conformances as per the contract  
• If high permeability sediments are intersected during the construction of the western and eastern overpass excavations, consider installation of a low-permeability cut-off barrier to limit drawdown extent |
| • Prevent ponding on site to prevent mosquito breeding areas. Use of low flow concrete inverts 0.6 m wide in roadside drains to reduce erosion and minimise ponding. | • Quality Control Process within the Project, and DPI to issue “permission to use”. | • Amend design where required  
• Correct non-conformances as per the contract |
| • Stormwater to remain within current catchment area as much as possible | • Design to incorporate permanent drainages structures to ensure this is satisfied  
• Quality Control Process within the Project, and DPI to issue “permission to use”. | • Amend design where required  
• Non-conformances to be corrected, as per the contract |
3.3. HAZARDOUS SUBSTANCES MANAGEMENT PLAN

3.3.1. Existing Environment/ Current Status

Prior to construction, there were various areas of concern at the site (source NOI and Dames and Moore 1999 Site Contamination Assessment). These are areas of illegal dumping in the vicinity of the Marjorie Street dam, and some asbestos and old drums in the Cyprus forest. Also, verbal evidence suggested that the dam, which is to be filled as part of the works, was used for the disposal of old laboratory waste in the past. Gold assay activities were carried out at the lab in the late 1980s and there is the possibility that heavy metals such as lead could have found its way into the dam sediments. The water, soils and sediment in and surrounding the dam was sampled and analysed in 1999 and only low levels of contaminants were detected, and the levels are deemed suitable for road construction purposes. The water in the dam was alkaline (pH around 9).

Additional sampling was undertaken by Macmahon prior to using the water in the dam for construction purposes, in May 2009. Water samples were analysed for a range of heavy metals, pH and alkalinity. Any nutrients or solvents that may have been present are now highly unlikely to remain as these would have broken down after 20 years. The levels for heavy metals were well below ANZECC guidelines, and the pH was within normal range (7.3 – 7.4).

Recently, an investigation was conducted into contaminant levels at Berrimah farm and the Darwin prison. Preliminary sampling found that the majority of samples were well below the adopted guidelines for residential use. In three areas (all at Berrimah farm), elevated levels of contaminants were found in surface soils:

1. Elevated levels of copper, chromium and arsenic in an old forestry log treatment yard
2. Chromium at the location of an old hazardous materials storage building
3. Dieldrin in an open drain adjacent to a chemical storage building.

None of these three areas are located in the road reserve. However, there is an area adjacent to Berrimah Road where animal carcasses have been buried; this area may be disturbed during construction of a construction fence. Also, there is anecdotal evidence of a “poison paddock” west of the prison sewage ponds, where left-over chemicals have been dumped, and where cattle may have died; however sampling conducted in May – July 2009 did not find elevated levels of contaminants. An old machinery dump south of the farm buildings, partly located within the road reserve, did not contain elevated levels of contaminants. There was anecdotal information that indicates that explosives may have been buried here; it should be noted however that this is unlikely given that the area is rocky, and this may relate to the dumping of empty gun shells. The use of herbicides to control vegetation around the perimeter fences was also considered, but these were not detected.

Water sampling was conducted in the Darwin Prison sewage ponds and trenches. No viral or infectious disease was found, however it had a high nutrient level which may result in algal blooms in surface waters. The sewage water is dispersed underground through a plantation of trees.

The topography in the area is above 8 m AHD and hence the risk for any Potential Acid Sulfate Soils (PASS) is very low at the site (PASS can be expected below 5-6 m AHD). Also, the NOI states that according to the NT Land Info system and maps, and based upon discussions with NRETAS, there is no potential risk of PASS in the area.
3.3.2. Potential Impacts/Issues

At construction sites, various chemicals are stored and used, such as diesel for plant and machinery, thinners, acids, glues, paints etc. Spillage or incorrect use of any hazardous substances may result in contamination of soils, stormwater, groundwater or Hudson Creek. It may also pose a threat to human health, or impact on flora and fauna.

Any contaminants found in soils could impact on workers or the environment if these soils are disturbed. The further investigation recommended should confirm if contaminants are present in the poison paddock or the machinery dump.

3.3.3. Objectives of Hazardous Substances Management Plan

- No contamination of soils or water
- Remove existing sources of contamination as directed by DPI

3.3.4. Legal and Other Requirements

- Waste Management and Pollution Control Act
- Water Act
- ANZECC Guidelines for Fresh and Marine Water Quality
- AS 1940
- Macmahon procedure G-504 Control of Hazardous Substances
3.3.5. Performance Criteria

- No visible oil or chemical spills in the construction area or storage areas
- No hydrocarbon sheen on any surface water in or around the construction site
- All minor and major spills to be cleaned up
- No remaining existing sources of contamination in the construction area

3.3.6. Management, Monitoring and Corrective Actions

Table 8 provides the controls, monitoring and corrective action for the issues identified.
### Table 8– Management of Hazardous Substances for Tiger Brennan Extension Stage 2

<table>
<thead>
<tr>
<th>Actions/ controls</th>
<th>Monitoring/ inspections</th>
<th>Contingencies/ corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Every chemical on site to have an MSDS and entered onto the Hazardous Substance Register. Store and use every chemical in accordance with the MSDS, in an appropriately bunded area, in accordance with AS1940, and Macmahon procedures G-504. &lt;br&gt;• All containers to be sealed and labelled appropriately. &lt;br&gt;• When using on site, use a drip tray where possible.</td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors &lt;br&gt;• Weekly Environment &amp; Safety Checklist &lt;br&gt;• Internal and external audits as per ISO 14001 and 4801</td>
<td>• Regular discussion of hazardous substances in Toolbox and prestart meetings and the need for every chemical on site to be registered &lt;br&gt;• MSDS to be attached to JSEAs &lt;br&gt;• Stop the job until an MSDS has been obtained.</td>
</tr>
<tr>
<td>• Maintain spill equipment on-site and provide training to appropriate personnel</td>
<td>• Weekly Environment &amp; Safety Checklist &lt;br&gt;• Internal and external audits as per ISO 9001 and 14001</td>
<td>• Organise spill kit training regularly and maintain a training matrix to monitor levels of trained workers</td>
</tr>
<tr>
<td>• Ensure that all staff are aware of potential issues with the use and storage of hazardous substances (in induction and Toolbox meetings)</td>
<td>• Weekly Environment &amp; Safety Checklist &lt;br&gt;• Internal and external audits as per ISO 9001 and 14001</td>
<td>• Regular discussion of hazardous substances in Toolbox and prestart meetings</td>
</tr>
<tr>
<td>• Clean up any spills of chemicals, fuels or other hazardous materials, and remove any contaminated soils as a result of the spill.</td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors &lt;br&gt;• Weekly Environment &amp; Safety Checklist</td>
<td>• Rectify any spills by removing the source and investigate the incident using an incident/accident form &lt;br&gt;• Ensure all wastes such as absorbent materials and contaminated soils are disposed off appropriately &lt;br&gt;• Ensure that spill materials are re-ordered.</td>
</tr>
<tr>
<td>• Regular maintenance and inspections of all machinery to ensure that they are functioning properly.</td>
<td>Operators complete a daily prestart checklist on all plant &lt;br&gt;• Prior to arrival on-site, all plant is inspected by the Macmahon Workshop personnel (including hire plant). Macmahon plant is maintained as per the maintenance schedule.</td>
<td>Machinery is maintained, and if any oil leaks are observed, repairs are undertaken</td>
</tr>
</tbody>
</table>

In the event of a hydrocarbon or chemical spill/leak the Macmahon spill response process is to be adhered to (G-110). All project personnel will be trained in the spill response process and the spill response flowchart will be prominently displayed in key areas such as workshops and spill response equipment areas.
Project Environmental Management Plan
Tiger Brennan Drive Extension Stage 2

Hydrocarbon / Chemical Spill Response Flowchart

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Activities</th>
<th>Reference Documents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macmahon and/or Subcontractor personnel</td>
<td>Close off spill area if there is a safety threat.</td>
<td></td>
</tr>
<tr>
<td>Address Situation</td>
<td>Address the situation to stop the spill/leak if it is safe to do so e.g. pick up leaking drum or isolate leak.</td>
<td></td>
</tr>
<tr>
<td>Contain Spill</td>
<td>Macmahon and/or Subcontractor personnel</td>
<td>Contain Spill using spill response equipment. Earth cells may need to be formed for spill containment using plant in some situations - e.g. large spills near water systems. Call for assistance from nearby personnel/PEMR and further spill containment material (e.g. absorbent rolls) if required.</td>
</tr>
<tr>
<td>Clean-up Spill</td>
<td>Macmahon and/or Subcontractor personnel</td>
<td>Clean up the spill using the response equipment - e.g. pads, pillows, mats. Ensure appropriate PPE wore e.g. gloves. Organise the removal of contaminated Soil as soon as possible to a client approved facility on-site or a licensed facility off-site.</td>
</tr>
<tr>
<td>Report Incident</td>
<td>Macmahon and/or Subcontractor personnel</td>
<td>Notify Supervisors/PEMR as soon as possible if the spill is of a reportable volume. Complete an incident report form, during the shift in which the spill occurred if the spill is greater than 20 litres in volume (note: abide by whichever volume is lower).</td>
</tr>
<tr>
<td>Notify Client</td>
<td>Project Environmental Management Representative or delegate; Macmahon Supervisor</td>
<td>Notify the Client verbally as soon as possible if the spill is of a reportable volume. Submit to the Client a completed incident report within 24 hours.</td>
</tr>
<tr>
<td>Replace Used Spill Equipment</td>
<td>Macmahon and/or Subcontractor personnel</td>
<td>Person whom first identified the spill to organise for replacement of spill response equipment from spill kits.</td>
</tr>
</tbody>
</table>

Incident Report Form (G-226) Environment Incident Details (G-651)
Procedure
Control of Hazardous Substances Procedure
G-504

Relevant to:

Business Unit: All
Division: All
Site: All
Department: All

Document Owner: Group Quality & Environment Manager

Revision Status:

<table>
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<tr>
<th>Revision Date</th>
<th>Section</th>
<th>Page/s</th>
<th>Revision Description</th>
<th>Reviewed By</th>
<th>Approved By</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-Ju-09</td>
<td>All</td>
<td>All</td>
<td>Initial MDL Issue, (revised from MSS PEPC28)</td>
<td>Joshua Moore</td>
<td>Joshua Moore</td>
</tr>
</tbody>
</table>
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1 PURPOSE

To safely receive, handle, store and dispose of hazardous materials or substances. This procedure outlines the basic principles for managing the storage and use of hazardous substances with Macmahon. The overarching principle is to provide a systematic method for identifying and controlling potential chemical hazards in order to minimise the risk of adverse health and safety effects to persons, the environment or equipment.

Note: Dangerous Goods are not dealt with by this procedure. Dangerous Goods present specific chemical or physical dangers particularly for our business in relation to transport and storage e.g. explosives and/or diesel fuel taken to and from and also stored on site.

2 SCOPE

This procedure applies to all Macmahon Projects (Mining and Construction), Warehouses, Workshops and Offices. This procedure applies to all staff, employees, visitors and contractors. It includes activities which include the use, storage or disposal of the substances.

3 RESPONSIBILITIES

Group Quality & Environment Manager

The Group Quality & Environment Manager is responsible for:

- ensuring the currency, relevancy and accuracy of content contained within this procedure; and
- ensuring waste data is collected to address legal and other reporting requirements e.g. EEO Act; NGER Act.

4 DEFINITIONS AND ABBREVIATIONS

- **NGER Act**: National Greenhouse Energy Reporting Act 2007
- **Hazardous Substance**: Under the National Model Regulations for the Control of Workplace Hazardous Substances (National Occupational Health and Safety Commission: 10005 (1995)) a hazardous substance means a substance which:
  
  (i) is listed on the List of Designated Hazardous Substances (NOHSC: 10005); or
  
  (ii) has been classified as a Hazardous Substance by the manufacturer or importer in accordance with the Approved Criteria for Classifying Hazardous Substances (NOHSC 1008).

Employees can check if a substance is classified as Hazardous by going to the NOHSC database to search.

- **MSDS**: Material Safety Data Sheet
- **NICNAS**: National Industrial Chemicals Notification and Assessment Scheme
5 PROCEDURE

5.1 Purchase Hazardous Substances

Where such materials or substances are required on site, the person initiating the Purchase Requisition is responsible to obtain a Material Safety Data Sheet (MSDS) for the material or substance. The MSDS should be consulted before the material is purchased.

ChemWatch on the Macmahon Intranet (MacHome) may be used to obtain MSDSs. Hazardous Substances Information System (HSIS) is an internet resource that allows you to find information on substances that have been classified in accordance with the Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004) and/or have National Exposure Standards declared under the NOHSC Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003(1995)].

If chemicals are imported a check that the substance is on the NICNAS database must be undertaken. Any hazardous substance used/stored in Australia must appear on the NICNAS database. It is the duty of the person importing the substance to check this database and notify NICNAS if it not present.

5.2 Material Safety Data Sheets (MSDS)

The MSDS for each substance must be included in the MSDS Register. It must be readily accessible and available in the immediate vicinity at all times. Suppliers are required to review and update MSDS’s every five years. See the MSDS section in the information sheet chemical risk assessments.

5.3 Labelling

All labels must meet minimum standards including for decanted substances. Mandatory information includes:
- product name;
- risk;
- contact details for supplier;
- emergency information (at a glance); and
- hazard warning word/dangerous goods class and symbol (e.g. flammable).

5.4 Labelling of Enclosed Systems

Hazardous substance contained in an enclosed system (such as a pipe or piping system or a process or reactor vessel) need to be identified and labelled. Suitable means of identification include colour coding (AS1319 'Safety Signs for the Occupational Environment') and labelling AS1345 ‘Identification of the Contents of Piping, Conduits and Ducts’.

5.5 Risk Assessments

Risk Assessments must be completed for all tasks (projects/activities etc.) involving the use of workplace substances.
5.6 Storage

All materials or substances are to be clearly and correctly labelled and stored in accordance with the MSDS directions and applicable State and Territory legislation.

Storage quantities should be kept to a minimum to cater for demand but avoid excessive storage for long periods. Adequate storage facilities must be provided for all chemicals.

5.6.1 General
Drums shall not be stacked more than two (2) high if they are greater than 60L capacity.
Only one (1) drum of more than 60 L capacity should be kept in a horizontal (decanting) position at any time.

Only closed packages, or those fitted with a tap, should be stored in the cabinet.

5.6.2 Storage in Storage Cabinets
The maximum capacity of any cabinet is 850L.
Each cabinet must be marked with:
- the name and address of the manufacturer/distributor;
- the maximum storage capacity;
- a Class 3 dangerous goods label with sides of at least 250 mm nominal length; and
- a sign bearing the words 'No smoking. No ignition sources within 3m' in lettering at least 50mm high.

All signs and markings shall be clearly visible when the cabinet doors are closed.

5.6.3 Cabinet location:
Cabinets having a capacity greater than 250L must not be installed in commercial or accommodation buildings.

Cabinets having a capacity greater than 250L must not be placed nearer than 3m to any wall that is common with another room, unless that wall is constructed of concrete or masonry to ceiling height of 3 m above the top of the cabinet (whichever is less) and 3 m to either side of the cabinet.

The aggregate capacity of cabinets must not be greater than (i) 850 L per 250m² on a ground floor area, or (ii) 250 L per 250m² on other floors.

Each aggregate quantity given above must be separated by at least 10m.

A storage cabinet may be used for outdoor storage, provided that adequate protection against weather, corrosion and traffic damage is provided.

5.6.4 Storage in Freight (Sea) Containers
The following applies to the storage of flammable/combustible liquids in freight containers:
Control of Hazardous Substances Procedure

- A freight container shall not be used as both a workshop and storage area for flammable/combustible liquids.
- Before the freight container is used as a store, the floorboards shall be inspected for any significant contamination from previous spills or leaks.
- There shall be a passage of at least 800mm wide inside the freight container, which must be clearly marked (e.g. yellow lines painted on the floor).
- No electrical equipment shall be installed inside the freight container unless it is suitably flame-proofed.
- No point within the freight container shall be more than 6m from it's exit door.
- Each door of the freight container shall be able to be opened from the inside of the freight container.

5.7 Decanting

Decanting of materials or substances from their original container to another container is not permitted unless the other container is clearly labelled - identifying the material or substance - and safety and emergency information.

5.8 Maintain Inventory of Materials or Substances stored

An inventory of hazardous materials or substances is to be established and maintained using the Hazardous Substance Register (G-483). On the register, indicate which substances are dangerous goods. Record their dangerous goods class, packing group and UN number. Note: The MSDS provides this information.

The register must be kept up to date so new substances must be added to the register when they arrive and those that have been disposed of, removed.

5.9 Equipment

All equipment used in conjunction with hazardous substances must be inspected and maintained in accordance with the manufacturer’s instructions and relevant Australian Standards – refer to Plant Safety procedure for further detail. SWP’s need to be written, published and communicated (and maintained on a document control register). For some equipment which requires an established level of competence to operate, the competency requirements must be documented and an authorisation process established.

5.10 Disposal

Substances are to be disposed of in accordance with site Waste Management Procedure(s). It is essential that reactive substances are not disposed of in general waste bins/containers and that flammable materials are not exposed to potential ignition sources during disposal.

5.11 Emergency Response Plan

A register of potential emergency situations must be developed. The control measures such as:
- spill kits.
- Personal Protective Equipment (PPE).
Control of Hazardous Substances Procedure

5.12 Record Keeping

The following records are required to be maintained for work with workplace substances:
- risk assessments (in a controlled register);
- training records;
- procedures or work instructions (in a controlled register);
- chemicals register and MSDS's;
- any related records such as air monitoring/health surveillance records.

6 SAFETY AND ENVIRONMENT

Prior to procuring, storing, handling, transporting or disposing of a hazardous substance please ensure you have checked the product MSDS.

7 ATTACHMENTS, REFERENCES AND RELATED DOCUMENTS

7.1 Attachments

Not Relevant

7.2 References and Related Documents

Hazardous Substance Register (G-283)
AS 1319, Safety Signs for the Occupational Environment
AS 1345 Identification of the Contents of Piping, Conduits and Ducts
AS: 4332 Storage and Handling of gases in cylinders
AS: 1940 Storage and Handling of Flammable and Combustible Liquids
AS: 4326 Storage and Handling of Oxidising Agents
AS: 2714 Storage and handling of Organic Peroxides
AS: 4452 Storage and handling of Toxic Substances
AS: 3780 Storage and Handling of Corrosive Substances
National Model Regulations for the Control of Workplace Hazardous Substances [NOHSC:1005(1994)];
National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)];
Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(2004)]; and
Hazardous Substances Information System (http://hsis.ascc.gov.au/)
3.4. NOISE MANAGEMENT PLAN

3.4.1. Existing Environment/ Current Status

Noise sources in the vicinity of the proposed extension include:

- Traffic along Tiger Brennan Drive, Berrimah Road, Wishart Road, Stuart Highway and Roystonea Avenue
- Trains along the Darwin to Alice Spring railway
- Noise from aircraft flying over the area
- General and rural industrial activities

3.4.2. Potential Impacts/ Issues

During construction there is a potential for noise pollution generated from construction machinery such as trucks, excavators, compactors, blasting and vehicles using the road.

a. Residents

Residents closest to the road include residents of Durack between Ch 14 and Ch 15 kilometres along the proposed extension and approximately 500 metres south, and residents of Kormilda College at Ch 9 km along the proposed extension and 500 metres north.

Both are potential sensitive receptors for noise, however they are not expected to be significantly impacted by the Stage 2 proposal. Both residential areas have a significant separation from the road development, approximately 500 m distance.

DPI noted in their NOI for Stage 2 that a noise assessment was undertaken for the area in 1995, which included impacts from the Tiger Brennan extension on the residents of the new suburb of Durack. The assessment stated:

“At its current location Tiger Brennan Drive should be too far form the northern site boundary to cause any appreciable adverse noise impacts at the closest future houses within the development.”

These parameters are still applicable to the current proposal. In addition to these findings, noise will be further mitigated as the highway has been moved further away than what was studied (300m to 500m). Also, the new road adjacent to Durack is located in a cutting which is an average of 4.5 m deep. This low position in the landscape means that a majority of traffic noise is reflected upwards to the atmosphere, not outwards towards residential areas. On these findings noise in Durack is not expected to be an impact.

Translocating the study findings for noise receptors at greater than 500m distance to the Kormilda location at Tiger Brennan Drive (ch 9km), would lead to a reasonable expectation that there will be a non-significant traffic noise impact there also. It should be noted that existing road noise and industrial/commercial uses around Kormilda College are closer than the proposed extension to Tiger Brennan Drive. This project is not expected to contribute to noise around Kormilda College but may reduce direct noise from heavy vehicles currently accessing the East Arm Port passed the front boundary.
b. **Construction Workers**

In case of excessive noise, for example when in or around heavy machinery or when using power tools, there is an occupational risk of hearing loss.

c. **Local Fauna**

Noisy activities can also impact on local fauna, such as breeding or nesting birds or other animals.

### 3.4.3. Objectives of Noise Management Plan

- Minimise noise nuisance to adjacent residents
- No impacts on hearing of workers
- Any abandoned young or injured animals to be relocated and cared for as necessary
- Minimal noise complaints during construction activities.

### 3.4.4. Legal and Other Requirements

- *Waste Management and Pollution Control Act*
- *AS 2436*

### 3.4.5. Performance Criteria

- Complaints register to be maintained, and all registered complaints to be responded to within 48 hours. All complaints to be recorded on a Complaints Form.

### 3.4.6. Management, Monitoring and Corrective Actions

Table 9 provides the controls, monitoring and corrective action for the issues identified.
### Table 9– Management of Noise Issues for Tiger Brennan Extension Stage 2

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
</table>
| • Notify the general public of road works and potential for noise generation by construction works and/or road trains | • Weekly Environment & Safety Checklist  
• Monitor & action upon complaints                                     | • Respond to all registered complaints within 48 hours.                          |
| • Standard hours of work are Monday to Saturday 6.30 am to 6 pm (with machine start-up after 7 am), and other times as agreed to by DPI | • Weekly Environment & Safety Checklist  
• Monitor & action upon complaints                                     | • Change the activities where possible (i.e. if required, plan less noisy activities for night works, any night works in less sensitive areas further away from any residents, use less noisy machinery etc)  
• Amend hours as necessary if possible                                   |
| • Set up an 1800 number and e-mail address for complaints and enquiries. | • Weekly Environment & Safety Checklist  
• Internal and external audits as per ISO 9001 and 14001  
• In case of ongoing noise issues, noise monitoring can be undertaken in consultation with NRETAS. | • Respond to all registered complaints within 48 hours.                          |
| • Regular maintenance of all machinery to ensure that exhaust systems/ mufflers on plant are functional | • Operators complete a daily prestart checklist on all plant  
• Prior to arrival on-site, all plant is inspected by the Macmahon Workshop in Winnellie (incl hire plant) | • Machinery is maintained, and if malfunctioning, is replaced or serviced        |
| • Ensure that all staff are aware of potential noise issues and controls (in induction and Toolbox meetings) | • Weekly Environment & Safety Checklist  
• Internal and external audits as per ISO 9001 and 14001 | • If noise becomes an issue, ensure that noise becomes a primary discussion point in Toolbox & prestart meetings |
| • Hearing protection to be made available to and worn by workers conducting noisy activities. | • Daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors  
• Weekly Environment & Safety Checklist | • Ongoing discussions regarding the importance of hearing protection in prestart & toolbox meetings  
• Disciplinary action for repeat offenders                                 |
| • Any fauna impacted by the roadworks and unable to move away from the works area, to be relocated, based upon advice by Parks & Wildlife officers (e.g. breeding or nesting pairs, abandoned young or injured animals). | • Daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors  
• Weekly Environment & Safety Checklist | • Contact Parks & Wildlife for advice 8995 5008  
• Contact Wildlife Rescue if animal needs looking after (subcontractors to Parks & Wildlife, 0409 090 840) |
| • Permanent noise to adjacent residential areas near the interchange     | • Monitor complaints                                                          | • New works are far enough away that they should not impact on residents.  
• Utilise the cut option for the interchange to deflect majority of traffic noise upwards rather than outwards to residents. |
3.5. AIR QUALITY MANAGEMENT PLAN

3.5.1. Existing Environment/ Current Status

Currently, the project site is mostly vegetated and not used for commercial purposes. Part of the area is used for grazing purposes by Berrimah farm, and there are various bush tracks in the remainder of the site. In its current state, dust and other air quality issues are not considered an issue (apart from possible bush fires).

3.5.2. Potential Impacts/ Issues

During construction, the following sources can impact on air quality:

- dust resulting from:
  - plant & vehicles using unsealed access roads
  - plant conducting earthworks
  - vegetation clearing activities, including stripping of topsoil
  - wind moving over stockpiles
  - loading, hauling and unloading activities
  - dragging soils onto adjacent roads
- Exhaust emissions from machinery, vehicles and generators will enter the atmosphere.
- Potential for fire/ smoke

a. Residents

Dust can result in a serious nuisance and loss of amenity for residents living in the vicinity of the site, especially during windy conditions. Examples of ‘nuisance’ include dust deposition on surfaces (laundry, inside and outside houses) and noticeable health effects for asthma sufferers. Severe dust clouds can cause reduced visibility, increasing the risk for traffic accidents for by-passing motorists.

b. Construction Workers

Dust can also impact on workers, and include respiratory issues (asthma), nuisance dust in cars/ offices, reduced visibility during operating machinery etc.

c. Local Flora

Dust can settle on the leaves of sensitive native plants and cause impact on plant health and in severe cases, could cause plants to die.
3.5.3. Objectives of Air Quality Management Plan

- Minimal dust nuisance for adjacent residents
- Minimal dust complaints during construction activities
- Minimal dust clouds on adjacent roads
- No health & safety impacts on workers
- Minimal impacts on plant health

3.5.4. Legal and Other Requirements

- *Waste Management and Pollution Control Act*

3.5.5. Performance Criteria

- A complaints register to be maintained, and all registered complaints to be responded to within 48 hours. All complaints are to be recorded on a Complaints Form.

3.5.6. Management, Monitoring and Corrective Actions

Table 10 provides the controls, monitoring and corrective action for the issues identified.

**Table 10– Management of Air Quality issues for Tiger Brennan Extension Stage 2**

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notify the general public of road works so they are aware of the works</td>
<td>Weekly Environment &amp; Safety Checklist</td>
<td>Respond to all registered complaints within 48 hours.</td>
</tr>
<tr>
<td>Set up an 1800 number and e-mail address for complaints and enquiries.</td>
<td>Weekly Environment &amp; Safety Checklist</td>
<td>Respond to all registered complaints within 48 hours.</td>
</tr>
<tr>
<td>Use a water truck for dust suppression on all areas that can cause dust within the project area, such as access roads, earthworks areas, and stockpiles. Also, control of speed on-site to minimise dust.</td>
<td>Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors. The water truck is called by any of the workers on the 2way radio in case of dusty areas. Weekly Environment &amp; Safety Checklist.</td>
<td>Use of water truck. Introduce and enforce a suitable speed limit for the work site.</td>
</tr>
<tr>
<td>Clean up sediment that has been dragged onto public roads as a result of the roadworks.</td>
<td>Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors. The water truck is called by any of the workers on the 2way radio in case of dusty areas. Weekly Environment &amp; Safety Checklist.</td>
<td>Use of water truck. Introduce and enforce a suitable speed limit for the work site.</td>
</tr>
<tr>
<td>The extent of clearing will be agreed, surveyed and pegged / flagged prior to being conducted. Cleared vegetation will be mulched and reused in rehabilitation of disturbed areas (mulch stockpiles less than 2 m)</td>
<td>Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors. Weekly Environment &amp; Safety Checklist.</td>
<td>In case of any over-clearing, the area of over-clearing will be rehabilitated and the person involved re-instructed or disciplinary action undertaken.</td>
</tr>
<tr>
<td>Ensure that all staff are aware of potential dust issues and controls</td>
<td>Weekly Environment &amp; Safety Checklist</td>
<td>If dust becomes an issue, ensure that dust becomes a</td>
</tr>
<tr>
<td>Controls</td>
<td>Monitoring</td>
<td>Corrective actions</td>
</tr>
<tr>
<td>----------</td>
<td>------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>(in induction and Toolbox meetings)</td>
<td>• Internal and external audits as per ISO 9001 and 14001</td>
<td>primary discussion point in Toolbox &amp; prestart meetings</td>
</tr>
</tbody>
</table>
| • Regular maintenance of all machinery to ensure that exhaust systems/ mufflers on plant are functional | • Operators complete a daily prestart checklist on all plant  
• Prior to arrival on-site, all plant is inspected by the Macmahon Workshop in Winnellie (including hire plant). Macmahon plant is maintained as per maintenance schedule. | • Machinery is maintained, and if malfunctioning or if excessive smoke is observed, repairs to be undertaken. |
| • No fires to be lit on-site  
• Adhere to DPI "Recycling Following Clearing" policy which does not allow burning of cleared vegetation. | • Daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors  
• Weekly Environment & Safety Checklist | • Immediately put out any fires if safe to do so (by fire trained personnel) and contact 000  
• Conduct an investigation and complete an accident form  
• Notify DPI and NRETAS  
• The person involved to be re-instructed/ take disciplinary action  
• Cover this in the induction and fire to be a regular topic in toolbox meetings |
| • Minimise dust from the use of haul trucks | • Daily inspections and supervision by supervisors & inspections by Environment & Safety Advisors  
• Weekly Environment & Safety Checklist | • Use dust minimisation measures such as wet the load or cover the load (on a public road, loads > 12 tonnes must be covered). |
3.6. NATIVE VEGETATION & SIGNIFICANT FLORA SPECIES AND CLEARING MANAGEMENT PLAN

3.6.1. Existing Environment/ Current Status

a. Flora

The EPBC database suggests that there is no threatened ecological community or threatened plant species in the proposal area (a copy of the EPBC database results is provided in the NOI for Stage 2 in Appendix C).

The Northern Territory Herbarium database provides records of 278 plant species in the area. Introduced plants constitute 24% (66 species) of the total suggesting that the area has experienced significant disturbance.

The Herbarium records for the area do not contain a record of any species listed as threatened under the EPBC Act. *Cycas armstrongii* is the area’s only species listed as threatened in the NT (it is vulnerable to extinction). This species remains relatively common in the region and is listed because it is poorly conserved in parks and reserves, and vulnerable to land clearing for urban expansion, farming and forestry.

![Cycas armstrongii](image)

b. Remnant Vegetation

Approximately one third of the proposed corridor length supports open woodland. Common species are *Eucalyptus tetrodonta* (Darwin stringybark) and *Eucalyptus miniata* (Woollybutt). Less frequent are *Alstonia spp.*, and *Terminalia spp.*, *Pandanus spiralis* (screw palm) persist in lower lying areas. There is a dense forest associated with the riparian (creek) habitat at Ch 12km, featuring dense stands of paperbark, *Melaleuca leucadendra* (also known as weeping tea tree or white paperbark) and *M. dealbata*. Vegetation around the dam consists of *Melaleuca argentea* and *dealbata* and some *Acacia spp.*
Eucalyptus tetrodonta (stringybark)

Eucalyptus miniata (woollybutt)

Pandanus spiralis (screw palm)

Melaleuca leucadendra (weeping tea tree or white paperbark)
c. Remnant forestry plantation

A remnant forest plantation is located approximately 13.5 km along the proposed extension. The plantation is composed mainly of cypress Calytrix intratropica. A few mahogany Khaya senegalensis, are situated nearest to Tivendale Road. The plantation is neglected; however some harvesting has been carried out. Fires are known to damage the plantation in spite of fire breaks.

3.6.2. Potential Impacts/ Issues

Clearing of vegetation is required for the construction of the road. Other areas where clearing will be required are access roads, turn around areas, stockpile and laydown areas, offices etc.

Clearing of vegetation and surface soils will expose soils to the potential effects of water and wind erosion. Impacts include the potential for increased erosion, turbidity and sedimentation in watercourses and the generation of dust. Also, clearing will destroy native habitat, can displace fauna and can introduce weeds into the area.

The proposal is unlikely to have a significant impact on any species of flora or ecological community listed as threatened under the EPBC Act or the TPCW Act. There is no threatened ecological community in the proposed development area. The species cycas armstrongii is vulnerable however remains relatively common in the area.

3.6.3. Objectives

- Minimise the area to be cleared (outside clearing areas required for construction)
- Minimise clearing near creeks, drainage lines, wetlands or seepage zones

3.6.4. Legal and Other Requirements

- Waste Management and Pollution Control Act
- Land Clearing Guidelines

3.6.5. Performance Criteria

- Native vegetation outside the works areas to remain in a healthy undisturbed state
- No clearing outside of flagged clearing limits
- Mulching of cleared vegetation for later re-use during rehabilitation within the project
- Rehabilitation of disturbed areas after clearing
- Use of native species in the landscaping design
- No introduction of new weed species (refer Sub-Plan 3.7)
- Minimal dust nuisance outside of the project area
- Manage erosion issues after clearing
### 3.6.6. Management, Monitoring and Corrective Actions

Table 11 provides the controls, monitoring and corrective action for the issues identified.

#### Table 11– Management of Native Species & Significant Flora Species and Land Clearing for Tiger Brennan Extension Stage 2

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The extent of clearing will be agreed with the Principal’s Representative, surveyed and pegged / flagged prior to being conducted.</td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td>• In case of any over-clearing, the area of over-clearing will be rehabilitated and the person involved re-instructed or disciplinary action undertaken.</td>
</tr>
<tr>
<td>• The clearing area will be minimised as much as possible, especially in sensitive areas such as near the two creeks off Hudson Creek</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Extend no go zones around retained trees if showing signs of impact</td>
</tr>
<tr>
<td>• Comply with NT Land Clearing Guidelines</td>
<td>• Check any vegetation cleared against the flagged boundaries</td>
<td>• Re-instruct people if cycas armstrongii has been discarded, increase watering of the replanted species if required.</td>
</tr>
<tr>
<td>• Cleared vegetation will be mulched and reused in rehabilitation of disturbed areas. Native species will be used for rehabilitation and landscaping. Mulch to be a maximum size of 100 mm, do not stockpile material for later mulching, grass or weeds not be mulched but buried.</td>
<td>• Check creek banks for vehicle damage</td>
<td></td>
</tr>
<tr>
<td>• Rehabilitate or stabilise disturbed areas. Spread mulch to a thickness of 50 mm. Remove all excess fill, rubble &amp; debris. Detours to be removed and rehabilitated.</td>
<td>• Inspect rehabilitated areas and mulch stockpiles.</td>
<td></td>
</tr>
<tr>
<td>• Any suitable cycas armstrongii to be cleared to be carefully excavated for replanting within the project site or investigate donating to local landcare group or other local group for no commercial gain. If they are donated to groups who will make a commercial gain, then they will need a commercial permit to sell the cycads. Replanted species to be watered during establishment period. Cover in induction and prepare an information poster for workers for easy identification of this species.</td>
<td>• Rehabilitated areas to be checked throughout the defect liability period.</td>
<td></td>
</tr>
<tr>
<td>• No driving of vehicles or machinery on areas outside the allowable clearing areas</td>
<td>• Look for any cleared cycas armstrongii and inspect health of replanted species</td>
<td></td>
</tr>
<tr>
<td>• All new plant and machinery to be checked for weeds and seeds and cleaned if necessary, and a Weed &amp; seed certificate to be provided</td>
<td>• All new plant and machinery is checked by the workshop prior to arrival on-site</td>
<td>• Ensure that the plant or machinery is cleaned</td>
</tr>
<tr>
<td></td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td>• Re-instruct personnel</td>
</tr>
<tr>
<td></td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Cover in induction and regular topic in Toolbox meetings</td>
</tr>
</tbody>
</table>

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### Controls
- In case of excessive dust, a water truck will be used for dust suppression.
- Introduce a suitable speed limit for access roads on-site
- Identify the access roads to be used and ensure this is covered in the induction and Toolbox/ prestart meetings

### Monitoring
- Daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors
- Also, the water truck can be made available to treat areas to reduce dust issues.
- Weekly Environment & Safety Checklist

### Corrective actions
- Use of water truck
- Introduce and enforce a suitable speed limit for the work site

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
</table>
| • In case of excessive dust, a water truck will be used for dust suppression.  
  • Introduce a suitable speed limit for access roads on-site  
  • Identify the access roads to be used and ensure this is covered in the induction and Toolbox/ prestart meetings | • Daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors  
  • Also, the water truck can be made available to treat areas to reduce dust issues.  
  • Weekly Environment & Safety Checklist | • Use of water truck  
  • Introduce and enforce a suitable speed limit for the work site |

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Maintain vegetation during defects period of 12 weeks</td>
<td>• Monitor plant health on a monthly basis</td>
<td>• Rehabilitate areas which may have died or become unhealthy</td>
</tr>
</tbody>
</table>
3.7. WEED MANAGEMENT PLAN

3.7.1. Existing Environment/ Current Status

Information in the NOI details that moderate infestations of **Mission Grass** (*Pennisetum polystachyon*) and **Gamba Grass** (*Andropogon gayanus*), are evident alongside the railway line.

Perennial Mission Grass is a category B/C declared weed under the *NT Weeds Act*, and Gamba Grass is a category A/C declared weed.

A Category A weed means that all reasonable efforts must be made to eradicated this plant from the NT, and a Category B Weeds means that the growth and spread is to be controlled. A Category C means that the weed is not to be introduced to the NT.

A more detailed weed survey was undertaken in January 2009 by the Weed Management Branch, which is attached on the following page.

Weeds found were:
- **Flannel Weed** (*Sida cordifolia, declared weed class B and C*)
- **Gamba Grass** (*Andropogon gayanus, likely to be declared in the future*)
- **Guinea Grass** (*Panicum maximum*)
- **Hyptis** (*Hyptis suavelolens*)
- **Mimosa** (*Mimosa Pigra*)
- **Mission Grass Perennial** (*Pennisetum Polystachion*)
- **Mission Grass** spp
- **Sicklepod** (*Senna obtusifolia*)
- **Spinyhead Sida** (*Sida acuta*)

Photos of these weed species are shown on the following pages.
3.7.2. Potential Impacts/Issues

Construction machinery and vehicles have the potential to introduce and spread weeds adjacent to the proposed road extension. Also, weeds can be introduced to the site with imported fill, topsoil, gravel or other materials. During clearing activities, weeds can be spread if the cleared vegetation or soils are pushed into adjacent bushland.

Weeds are undesirable as they compete with native plants and may replace the habitats and food resources of native animals. Weeds may also inhibit regeneration of native species, impact on natural ecosystems and biodiversity, and can change the fire characteristics of an area.

3.7.3. Objectives of Weed Management Plan

- No introduction of new weeds
- Minimise the spread of existing weed populations as a result of construction activities
- Ensure that site personnel are able to identify the current weeds on-site and other common weeds

3.7.4. Legal and Other Requirements

- Weed Management Act and Regulations
- Gazetted List of Declared Weeds

3.7.5. Performance Criteria

- No new weeds found on-site
- No new populations of weeds found on-site (as a result of construction activities)
### 3.7.6. Management, Monitoring and Corrective Actions

Table 12 provides the controls, monitoring and corrective action for the issues identified.

**Table 12– Management of Weeds for Tiger Brennan Extension Stage 2**

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ensure that all personnel (including subcontractors) are aware of the</td>
<td>• Daily inspections and supervision by supervisors and inspections by</td>
<td>• Re-visit the topic of weed management and ID of weeds on a regular basis in</td>
</tr>
<tr>
<td>weed hygiene requirements. Include in the site induction a section on</td>
<td>Environment &amp; Safety Advisors</td>
<td>Toolbox meetings</td>
</tr>
<tr>
<td>weed &amp; seed hygiene and measures that workers need to take to reduce</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Liaise with NRETAS Weeds Management Branch (8999 2230) regarding any new or</td>
</tr>
<tr>
<td>the potential for the spread of weed seed.</td>
<td>• Check for new weeds or new weed infestations</td>
<td>unidentified weeds</td>
</tr>
<tr>
<td>• Conduct identification training for relevant site personnel for weeds</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Liaise with DPI regarding treatment required for new weeds or new infestations.</td>
</tr>
<tr>
<td>occurring on-site and within local region prior to any clearing or soil</td>
<td>• Random check of equipment</td>
<td></td>
</tr>
<tr>
<td>removal and provide weeds ID posters.</td>
<td>• Internal and external audits under ISO 14001</td>
<td></td>
</tr>
<tr>
<td>• Immediately report any new infestations of declared weeds found on-</td>
<td>• Ensure that all personnel is aware of the requirement for all new plant</td>
<td></td>
</tr>
<tr>
<td>site to DPI and NRETAS.</td>
<td>• Mark weed infestations and discuss with site personnel in prestart</td>
<td>&amp; equipment to be inspected</td>
</tr>
<tr>
<td>• Provide a Weed Declaration form for all new plant and equipment</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Clean the equipment</td>
</tr>
<tr>
<td>arriving on-site, stating that they have been cleaned, before being</td>
<td>• DPI audits and inspections</td>
<td></td>
</tr>
<tr>
<td>brought to the construction site. Any plant that has been exposed to</td>
<td>• If using herbicides, check for MSDS and JSEA, that personnel is trained</td>
<td></td>
</tr>
<tr>
<td>noxious weeds on-site is also to be cleaned of weeds &amp; seeds.</td>
<td>or use specialist subcontractors (no treatment during rain)</td>
<td></td>
</tr>
<tr>
<td>• Ensure significant weed infestations of declared and environmental</td>
<td>• Check that the treatment has been effective</td>
<td></td>
</tr>
<tr>
<td>weeds are clearly marked and traffic excluded from these areas – fence</td>
<td>• Go back to treat the area if necessary</td>
<td></td>
</tr>
<tr>
<td>if necessary, prior to construction.</td>
<td>• Liaise with DPI/ NRETAS</td>
<td></td>
</tr>
<tr>
<td>• Treat known areas of weeds in the area to be disturbed, prior to</td>
<td>• Topsoil that is contaminated with weeds, seeds or stockpiled weeds to</td>
<td></td>
</tr>
<tr>
<td>construction activities.</td>
<td>be quarantined with visible barriers with a notice; then treat</td>
<td></td>
</tr>
<tr>
<td>• During construction, avoid or treat known areas of weeds to prevent</td>
<td>appropriately.</td>
<td></td>
</tr>
<tr>
<td>spread throughout the project site.</td>
<td>• No weeds to be disposed off in a weed-free area.</td>
<td></td>
</tr>
<tr>
<td>• Treat any new infestations of declared weeds that have been</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Liaise with NRETAS Weeds Management Branch (8999 2230) regarding the most</td>
</tr>
<tr>
<td>introduced to the site as a result of construction activities.</td>
<td>• Go back to treat the area if necessary</td>
<td>appropriate treatment.</td>
</tr>
<tr>
<td>• Topsoil that is contaminated with weeds, seeds or stockpiled weeds</td>
<td>• Liaise with NRETAS Weeds Management Branch (8999 2230) regarding the</td>
<td>• Investigate the material and remove to an appropriate area with sign if required</td>
</tr>
<tr>
<td>to be quarantined with visible barriers with a notice; then treat</td>
<td>most appropriate treatment.</td>
<td>(for treatment)</td>
</tr>
<tr>
<td>appropriately.</td>
<td>• Wash machinery that</td>
<td></td>
</tr>
</tbody>
</table>
The following standard Macmahon weed procedure also applies to all Macmahon and subcontractor personnel.
3.8. CONSERVATION OF SIGNIFICANT FAUNA SPECIES MANAGEMENT PLAN
3.8.1. Existing Environment/ Current Status

The NOI includes a search of the EPBC database, which indicates that seven threatened species and 27 migratory species may occur within the proposed area. A copy of the EPBC database results is provided in Appendix C of the NOI.

Table 13 lists the species and their likelihood of occurrence in the proposal area.

The NOI also details that the Parks and Wildlife Commission’s Fauna Atlas contains 3,961 records from within 2 km of the proposed highway. This includes records of 281 species of terrestrial vertebrate. None of these species is listed as threatened under the EPBC Act, although there is one record of the Australian Bustard and one of *Varanus panoptes*. Both the latter species are listed as vulnerable to extinction under the TPWC Act. The habitat is likely to be marginal for the Australian Bustard, particularly given the proposed highway’s close proximity to industrial, transport and urban infrastructure and disturbed state. *V. panoptes* is likely to exist in the area. The major threat to the conservation status of this species is the cane toad. The fate of any population of this species in the development area is dependent on its future interaction with cane toads. This will not be altered by the proposed development.

The Fauna Atlas has records of 62 species of migrant bird. The majority of these are birds of prey, migrant shore birds and ducks that are relatively common regionally. The habitat of the development area either does not provide significant areas of appropriate habitat for these species, or the habitat is absent. The area is not known to maintain significant populations of these species (e.g. Chatto 2003).

The proposal is not likely to introduce feral animals.

Summarising, the main fauna of interest is included in photos below which will be included in ID posters for personnel:

![Northern Quoll](image1)
*Northern Quoll*
(endangered)
Small quoll, the size of a small cat

![Yellow spotted monitor](image2)
*Yellow spotted monitor*
*Varanus panoptes* (vulnerable to extinct)
Heavy-built terrestrial monitor, up to 1.4 m
**Water Mouse, False Water Rat** (vulnerable)
Small, native rodent to 100mm in length. Characteristic hunched body shape, small eyes, broad snout and small rounded ears. The fur is very silky and water-resistant.

**Australian Bustard**
(vulnerable to extinct)
Large ground bird, 0.8 – 1.2 m tall

**Red Goshawk**
(vulnerable)
Large bird of pray, total body length of 45-58cm

**Gouldian Finch**
(endoangered)
spectacularly coloured grassfinch
Partridge Pigeon  
(vulnerable)  
Medium sized ground dwelling pigeon

Barn Swallow  
(migratory)  
Most widespread species of swallow, occasional migrant to NT

Whimbrel  
(migratory)  
medium-sized curlew
<table>
<thead>
<tr>
<th>Species</th>
<th>EPBC Act</th>
<th>TPWC Act</th>
<th>Discussion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIRDS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Goshawk (<em>Erythrotriorchis radiatus</em>)</td>
<td>V</td>
<td>V</td>
<td>The Red Goshawk forages in open eucalypt woodland, often along the edges of rainforest or mangrove, or riparian forest margins. They nest in unusually tall trees (compared to surrounding woodlands), usually in close vicinity to water. Nest pairs are sensitive to disturbance.</td>
</tr>
<tr>
<td>Gouldian Finch (<em>Erythrura gouldiae</em>)</td>
<td>E</td>
<td>E</td>
<td>The Gouldian Finch was once distributed throughout the tropical savannas of northern Australia. The species is now restricted to isolated areas mostly within the NT and the Kimberley. The finches are known to occupy two different habitats. Nesting occurs in <em>E. brevifolia</em> or <em>E. tintinnans</em> woodlands on rocky hills where they feed largely on the seed of <em>Sorghum</em>. During the wet season they move from the hills into lowlands drainage systems and feed on seed of perennial grasses. There are no rocky hills or any of the preferred nesting tree species present in the development site. The Gouldian Finch has not been recorded from the Darwin region for some considerable time.</td>
</tr>
<tr>
<td>Partridge Pigeon (<em>Geophaps smithii smithii</em>)</td>
<td>V</td>
<td>V</td>
<td>The Partridge Pigeon is a ground dwelling granivore known to occur across the Top End of the NT and the Kimberley. This species has declined or disappeared from much of the lower rainfall parts of its range over the last century. It occurs in eucalypt woodlands and nests in dense assemblages of grasses. There is one record from an area of rocky outcrops approximately 9 kilometres south east of Noonamah south of Darwin.</td>
</tr>
<tr>
<td>Melville Cicadabird (<em>Coracina tenuirostris melvillensis</em>)</td>
<td>M</td>
<td>-</td>
<td>This subspecies of the Cicadabird is confined to the Melville islands.</td>
</tr>
<tr>
<td>White-bellied Sea-Eagle (<em>Haliaeetus leucogaster</em>)</td>
<td>M</td>
<td>-</td>
<td>This species is common throughout Top End coastal and freshwater habitats. This is reflected in a relatively large number of records from the Darwin region.</td>
</tr>
<tr>
<td>Barn Swallow (<em>Hirundo rustica</em>)</td>
<td>M</td>
<td>-</td>
<td>The barn swallow is an occasional migrant to the Top End and has not been recorded from the immediate Darwin area.</td>
</tr>
<tr>
<td>Rainbow Bee-eater (<em>Merops ornatus</em>)</td>
<td>M</td>
<td>-</td>
<td>The rainbow bee-eater is an abundant migrant that is very broadly distributed across the Top End and much of the Northern Territory.</td>
</tr>
<tr>
<td>Derby White-Browed Robin (<em>Poecilodryas superciliosa cerviniventris</em>)</td>
<td>M</td>
<td>-</td>
<td>The only record of this species from the Darwin region was taken from Workshop Jungle, Fogg Dam.</td>
</tr>
<tr>
<td>Roufous Fantail (<em>Rhipidura dryas</em>)</td>
<td>M</td>
<td>-</td>
<td>This is a monsoon rainforest species</td>
</tr>
<tr>
<td><strong>Migratory Wetland Species - Birds</strong></td>
<td>M</td>
<td>-</td>
<td>The natural vegetation of the development site does not provide habitat appropriate to migratory wetland/shorebirds other than the species such as the Whimbrel that may feed in pastures on Berrimah Farm. The area is not recorded as a major habitat for migrant shore birds (Chatto 2003).</td>
</tr>
</tbody>
</table>
### Mammals

**Northern Quoll** (*Dasyurus hallucatus*)

EPBC Act: E
TPWC Act: CE

- Rocky habitats and open eucalypt forests are the preferred habitats although a wide range of habitats is used. The Northern Quoll has been recorded from the Darwin area in recent times.
- There is no shortage of habitat for the Northern Quoll and this highly mobile species is unlikely to be impacted by the development.

**Water Mouse, False Water Rat** (*Xeromys myoides*)

EPBC Act: V
TPWC Act: DD

- Species or species habitat likely to occur within the area

### Other

**Saltwater Crocodile** (*Crocodylus porosus*)

EPBC Act: M
TPWC Act: -

- The proposed development site does not provide appropriate habitat for saltwater crocodiles.

**Marine Species**

EPBC Act: M
TPWC Act: -

- The development may provide seasonal feeding habitat (but not breeding habitat) for small numbers of magpie geese, great egrets, and cattle egrets. White-bellied sea-eagles and the fork-tailed swift may overfly the area, but in doing so would be no more disturbed by the proposed development than it is by the existing developments.
- There is little likelihood of the other species (Freshwater crocodile, Common Sandpiper, Ruddy Turnstone, Sanderling, Great Knot, Large Sand Plover, Oriental Plover, Oriental Pratincole, Black-tailed Godwit, and Grey Plover) occurring in the area.

### 3.8.2 Potential Impacts/Issues

The proposal is unlikely to have a significant impact on any species of flora or fauna, or ecological community listed as threatened under the EPBC Act or the TPCW Act. There is no threatened ecological community in the proposed development area.

In general, construction activities can impact on native animals by introducing threats such as fire, introduction of feral animals (for example cane toads), clearing activities, introduction of weeds and degradation of natural habitat, changing in water quality or surface water levels.

### 3.8.3 Objectives of Significant Fauna Species Management Plan

- Minimise any impacts on fauna species
- Protect critical habitat or nests where possible (or relocate animals where needed)

### 3.8.4 Legal and Other Requirements

- *Territory Parks and Wildlife Conservation Act*
3.8.5. Performance Criteria

- No impacts on any threatened fauna species
- No injured animals as a result of construction activities

3.8.6. Management, Monitoring and Corrective Actions

Table 14 provides the controls, monitoring and corrective action for the issues identified.

**Table 14– Management of Significant Fauna Species for Tiger Brennan Extension Stage 2**

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fauna issues and specific requirements to be covered in the induction</td>
<td>• Regular discussions with field personnel on-site regarding fauna</td>
<td>• Discuss regularly in Toolbox meetings, and ensure that feedback is given in the</td>
</tr>
<tr>
<td>and regular topic of toolbox meetings</td>
<td>observed</td>
<td>daily prestart meetings of any threatened species found, progress of injured</td>
</tr>
<tr>
<td>• Fauna ID poster to be developed and placed in cribsrooms and offices</td>
<td>• Daily inspections and supervision by supervisors and inspections by</td>
<td>animals etc</td>
</tr>
<tr>
<td>• All personnel to report sightings to the Environment or Safety Advisor</td>
<td>Environment &amp; Safety Advisors</td>
<td></td>
</tr>
<tr>
<td>• Any sightings of threatened species to be passed on to NRETAS for</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td></td>
</tr>
<tr>
<td>inclusion in their database.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No pets allowed on-site, and no feeding of animals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Any fauna impacted by the roadworks and unable to move away from the</td>
<td>• Daily inspections/ supervision by supervisors and inspections by</td>
<td>• Contact Parks &amp; Wildlife for advice re relocation 8995 5008</td>
</tr>
<tr>
<td>works area, to be relocated, based upon advice by Parks &amp; Wildlife</td>
<td>Environment &amp; Safety Advisors, checking for any sightings of injured or</td>
<td>• For collection of an injured animal, contact Wildlife rescue 0409 090 840</td>
</tr>
<tr>
<td>officers (e.g. breeding or nesting pairs, abandoned young or injured</td>
<td>trapped animals</td>
<td>(subcontractors to Parks &amp; Wildlife).</td>
</tr>
<tr>
<td>animals). Protect from disturbance until officers arrive.</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• When an injured animal is found, minimise noise, handling &amp; stress, ensure the</td>
</tr>
<tr>
<td>• All personnel to report injured animals to the Environment or Safety</td>
<td></td>
<td>animal actually needs rescuing, do not offer food (especially not milk!), move</td>
</tr>
<tr>
<td>Advisor</td>
<td></td>
<td>road kill at least 10m off the road, check dead kangaroo and possum pouches for</td>
</tr>
<tr>
<td></td>
<td></td>
<td>joeys, remember your safety always comes first!</td>
</tr>
<tr>
<td>• Environmental Advisor to survey for nests and the presence of animals</td>
<td>• Regular discussions with field personnel on-site regarding fauna</td>
<td>• Contact Parks &amp; Wildlife for advice 8995 5008</td>
</tr>
<tr>
<td>prior to commencing construction and seek advice from NRETAS or Parks &amp;</td>
<td>observed</td>
<td>• Discuss regularly in Toolbox meetings, and ensure that feedback is given in the</td>
</tr>
<tr>
<td>Wildlife in case specific species or nesting sites are found</td>
<td>• Daily inspections/ supervision by supervisors and inspections by</td>
<td>daily prestart meetings of any threatened species found, progress of injured</td>
</tr>
<tr>
<td></td>
<td>Environment &amp; Safety Advisors</td>
<td>animals etc</td>
</tr>
<tr>
<td></td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td></td>
</tr>
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<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
### Project Environmental Management Plan

**Tiger Brennan Extension Stage 2**

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• In case any snakes or crocodiles are sighted, do not touch and if they need relocating, contact snake hotline on 1800 453 210, and crocodiles 8999 4691 or 0419 822 859.</td>
<td>• Daily inspections/ supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td>• Discuss regularly in Toolbox meetings.</td>
</tr>
</tbody>
</table>
3.9.  PEST ANIMALS MANAGEMENT PLAN

3.9.1. Existing Environment/ Current Status

Berrimah Farm is a grazing area for cattle and buffalo. The livestock graze paddocks at various times of the year.

Cane toads are established in the area, feral cats and dogs can occur in the area and feral pigs have roamed the area as indicated by old wallows and ‘rooting’ evident in low lying areas. Rub marks are noticeable on the lower trunks of some paperbark trees.

Additional recorded exotic species include the Flower-pot Blind Snake, the Asian House Gecko and Black Rat.

3.9.2. Potential Impacts/ Issues

The proposal is not likely to introduce additional numbers of feral animals. During construction, Macmahon aims to reduce the presence of feral animals where possible.

Cane toads can exist in many different habitats but must have water available to breed. During the Dry Season, toads remain inactive in shallow burrows under the ground, or in clusters under logs, rocks or sheets of iron, etc. They are mainly nocturnal. Cane toads can also survive for periods in sea water. Toads are prolific breeders compared to native frogs. They can breed twice a year and lay 10-20,000 eggs each breeding. Their eggs can hatch in 2 days and look different to frog’s eggs as they are laid in thin strands of clear jelly.

The main threat from cane toads is from poisoning predators that eat them. Even the tadpoles are poisonous so the range of possible victims includes fish, crocodiles, snakes, goannas, quolls and egrets. In parts of Queensland, populations of some of these animals were dramatically reduced when cane toads arrived, although it seems that most eventually recover. Cane toad eggs should be removed from pools of water and placed in the sun to dry out.

The native marble frog can be mistaken for cane toads and many are killed this way.

Cane Toad Marble Frog Image of cane toad eggs showing the strings of eggs. Most native species lay clumps of eggs.
Feral cats are a serious threat to biodiversity conservation in Australia. Predation by feral cats is listed as a key threatening process under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. Feral cats can potentially impact upon native fauna in three ways: through direct predation, through competition and/or through disease.

Strong evidence suggests that feral cats have played a significant role in the demise and extinction of native fauna, particularly in central Australia. Cat vectored diseases can be transmitted to native animals and to humans. Broad scale control of feral cats has proved problematic.

Feral pigs are large omnivorous mammals with powerful bodies and coarse hairy coats. Their thick necks, wedge-shaped heads and mobile snouts are used in feeding to uproot the ground and find prey or plant material.

Feral pigs require water daily and for this reason are generally located close to a permanent water source. Predation, habitat destruction, competition and disease transmission by feral pigs is listed as a key threatening process under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. Feral pigs are particularly destructive to the natural environment because they engage in ‘rooting’ behaviour to locate food. This rooting disrupts the seed bank, disturbs surface vegetation, alters soil composition, increases the growth of weeds, disperses the seeds of exotic plants, and destroys habitat utilised by native species. In addition, pigs are omnivorous, meaning that they eat a wide and varied diet including small animals and invertebrates. This reduces the availability of food for native species. Their rooting behaviour also increases soil erosion and increases siltation of rivers. Trampling and predation of eggs by feral pigs has also had significant impacts on native turtle species both overseas and in Australia. This damage is also likely to extend to the eggs and young of some bird species.

In addition, feral pigs are capable of transmitting diseases including brucellosis, pseudorabies, leptospirosis, foot-and-mouth disease and Japanese encephalitis and the fungus Phytophthora cinnamomi. There are a number of management strategies that may be implemented to control feral pigs, including baited trapping, fencing, poisoning with 1080, and on larger properties by mustering or aerial culling.

The term ‘wild dog’ applies to two sub-species of canid: the dingo, the feral domestic dog, as well as hybrids of the two. Dingoes have inhabited Australia for about 4000 years, long enough to become a functional part of the natural ecological system as a top order predator. In view of their ecological importance, dingoes are regarded under Northern Territory legislation as ‘native wildlife’. This status affords the dingo full legal protection, making it an offence to possess, interfere with, or kill dingoes unless authorised to do so under the Territory Parks and Wildlife Conservation Act 2006.

There are a number of negative or undesirable impacts associated with dingoes and other wild dogs. They are known predators of livestock, can be a menace to people, and they can have an impact on the survival of remnant populations of endangered fauna. Wild dogs are also implicated in the spread of disease such as hydatidosis in cattle and sheep, and heartworm and parvovirus in pet domestic dogs.

Although there are few benefits associated with feral domestic dogs and hybrids, there are several advantages in maintaining wild populations of pure bred dingoes in the Northern Territory. Firstly, dingoes have become an important part of the natural ecological system in Australia as a top order predator. They eat a diverse range of species and they are known to keep several native species under control that could otherwise be pests such as kangaroos and wallabies. They also prey upon introduced pest species such as rabbits, foxes and feral cats which helps to keep their numbers in check. Secondly, the dingo is a highly social animal. Although they are usually seen alone, most
individuals belong to discrete packs that occupy and defend distinct territories year round. They usually only come together as a pack during the breeding season to mate and rear pups. Packs have highly developed male and female hierarchies and breeding is usually only successful between the dominant pair. Subordinate pack members are actively prevented from breeding by the dominant pair. This pack structure can be broken down under intensive baiting regimes, which allows successful breeding between subordinate pairs and a greater population growth rate. A lack of pack structure also means that territories are not being adequately defended which allows the spread of feral and hybrid dogs. Hybrids can breed twice a year, there are no social restrictions to breeding like there is in the dingo, and they are poorer predators than pure bred dingoes and tend to prey more heavily on livestock. Thirdly, the dingo is classified as protected wildlife under the TPWC Act, in recognition of its ecological importance. Cross-breeding with domestic dogs represents a significant threat to the long-term persistence of pure bred dingoes in Australia. Unlike populations of dingoes in southern regions, the genetic integrity of dingoes in the Northern Territory remains intact, affording them significant conservation value. It is thought that over 90% of Northern Territory wild dogs are pure bred dingoes, with hybrid and feral domestic dogs occurring mainly in the vicinity of human habitation.

Management strategies include poison-baiting, trapping, exclusion fencing and shooting. Within town boundaries, control of wild dogs is the responsibility of the relevant council or landholder.

3.9.3. Objectives of Pest Animals Management Plan

- No introduction of new feral/ pest animals
- Minimise the presence of feral/ pest animals where possible (i.e. where possible use cane toad traps, cat traps, report wild dog sightings to City Council and reduce breeding opportunities for black rats by good housekeeping practices)

3.9.4. Legal and Other Requirements

*Territory Parks and Wildlife Conservation Act*

3.9.5. Performance Criteria

- No significant increase in the populations of feral animals that can be directly contributed to the construction works.
- Numbers of feral animals (cane toads and feral cats) caught

3.9.6. Management, Monitoring and Corrective Actions

Table 15 provides the controls, monitoring and corrective action for the issues identified.
### Table 15 – Management of Pest Species for Tiger Brennan Extension Stage 2

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pest species to be covered in the induction and to be a regular topic of toolbox meetings</td>
<td>• Regular discussions with field personnel on-site regarding pest species observed</td>
<td>• Discuss regularly in Toolbox meetings, and ensure that feedback is given in the daily prestart meetings of increase in pest species or new species to look out for.</td>
</tr>
<tr>
<td>• Pest species ID poster to be developed and placed in cribrooms and offices</td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td></td>
</tr>
<tr>
<td>• All personnel to report sightings to the Environment or Safety Advisor</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td></td>
</tr>
<tr>
<td>• In case of increased numbers in pest species, notify DPI and contact NRETAS for advice.</td>
<td>• Regular discussions with field personnel on-site regarding pest species observed</td>
<td>• Contact NRETAS for advice, and corrective action to be implemented if the project is contributing or if the problem is impacting on the project.</td>
</tr>
<tr>
<td>• Regular discussions with field personnel on-site regarding pest species observed</td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td></td>
</tr>
<tr>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td></td>
</tr>
<tr>
<td>• Aim to reduce pest species by good housekeeping and reducing breeding opportunities for the black rat, and by placing cane toad traps and a cat trap if feral cats are observed. Contact Darwin or Palmerston City Council to catch any wild dogs if they become a nuisance. Ensure that bins containing food scraps have vermin proof lids and all bins are regularly cleared and cleaned.</td>
<td>• Regular discussions with field personnel on-site regarding pest species observed</td>
<td>• Take any trapped feral cats to the RSPCA, and place trapped cane toads in a freezer, to be disposed of appropriately.</td>
</tr>
<tr>
<td>• In case of increased numbers in pest species, notify DPI and contact NRETAS for advice.</td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td></td>
</tr>
<tr>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td></td>
</tr>
<tr>
<td>• In case of increased numbers in pest species, notify DPI and contact NRETAS for advice.</td>
<td>• Regular discussions with field personnel on-site regarding pest species observed</td>
<td></td>
</tr>
<tr>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td></td>
</tr>
<tr>
<td>• In case of increased numbers in pest species, notify DPI and contact NRETAS for advice.</td>
<td>• Regular discussions with field personnel on-site regarding pest species observed</td>
<td></td>
</tr>
</tbody>
</table>
3.10. WASTE MANAGEMENT PLAN

3.10.1. Existing Environment/ Current Status

General roadside litter is present in the road reserves of Berrimah Road and Stuart Highway.

There are areas where illegal dumping of waste has occurred. In the vicinity of the Marjorie Street dam, waste includes old car bodies, white goods, corrugated iron, some unidentified plant equipment and drums. Imported fill was located immediately north of the dam. The fill comprised admixed asphalt, hard rubbish, concrete drums, and other building rubble and debris.

In the cypress forest site, a pile of rubbish is mixed with fill (15 m x 5 m area). It includes old bottles, pieces of asbestos, metal drums and tins.

Fill material was also identified along a number of access tracks and the fill is likely to be from earthworks during track construction and/or potential illegal dumping of uncontrolled fill material.

The nearest waste disposal site is Shoal Bay Waste Management Facility operated by the Darwin City Council.

3.10.2. Potential Impacts/ Issues

Waste likely to be generated during construction of the road extension will primarily consist of green waste from clearing of vegetation. Surplus construction materials are also likely to be generated, such as concrete, wood, scrap steel, off cuts, packaging waste, empty containers etc. Office waste will also be generated and food scraps/ empty food packaging, and sceptic waste.

If waste is not managed appropriately, potential impacts include: soil or water contamination, waste of energy and/or resources, attraction of pest species, reduced visual amenity, unpleasant odours, human health risk, creation of fire hazards and adverse effects on flora and fauna.

Cigarette butts will also be generated; they are very unsightly, take many years to break down, can kill wildlife, wash into the environment when it rains, and can cause fire.

3.10.3. Objectives of Waste Management Plan

- To reuse and recycle waste where possible
- Good housekeeping practices
- Food waste to be contained on-site appropriately and not accessible by animals
- All waste as a result of the construction activities to be removed at completion of the contract; with any existing or dumped waste, liaise with DPI regarding disposal.
- Prevent any environmental harm as a result of the disposal of waste
3.10.4. Legal and Other Requirements

- Waste management & Pollution Control Act
- Public Health Act
- NT Code of Practice for small on-site sewage and sullage treatment systems and disposal or reuse of sewage systems.

3.10.5. Performance Criteria

- Good housekeeping practices, site, offices and laydown areas neat & tidy, no waste laying around, no littered cigarette butts
- No waste remaining on-site at completion of the contract
- No visible pollution as a result of waste storage

3.10.6. Management, Monitoring and Corrective Actions

Table 16 provides the controls, monitoring and corrective action for the issues identified.

During the roadworks, there are opportunities to minimise waste by implementing waste management principles including:

- Avoidance: the generation of green waste and spoil will be limited to the construction footprint with other limited areas for access roads, turnaround areas, stockpile & laydown areas and offices.
- Reuse: cleared vegetation will be mulched and reused onsite, topsoil and soils will be stockpiles and reused in rehabilitation, landscaping, and as fill where required.
- Recycling: items suitable for recycling are paper, cardboard and other office waste, most empty plastic and glass drink containers, scrap metal. Vehicle and plant maintenance is conducted by the Macmahon workshop in Winnellie, and any used fuel filters, waste oil etc is collected by the workshop for recycling.
- Disposal: disposal of waste should be considered after all other waste management options have been evaluated.

The standard Macmahon Waste Management Procedure has been attached with details of all waste streams and disposal methods.
Table 16– Management of Waste at Tiger Brennan Extension Stage 2

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Prior to commencement of construction works, contaminated soil, if any, and asbestos will be removed and disposed in accordance with Australian Standards and guidelines.</td>
<td>• Inspection of the project area for any dumped waste, fill, asbestos etc</td>
<td>• Re-inspect the areas for remaining waste</td>
</tr>
<tr>
<td></td>
<td>• Ongoing daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td>• Conduct additional soil testing if required</td>
</tr>
<tr>
<td></td>
<td>• Ongoing weekly Environment &amp; Safety Checklist</td>
<td>• Dispose of waste/ contaminate soils to Shoal Bay Waste Disposal site</td>
</tr>
<tr>
<td></td>
<td>• Re-inspect the areas for remaining waste</td>
<td>• For any special waste such as contaminated soils/ asbestos, prior approval to be obtained from Darwin City Council and prior notification required to Shoal Bay Waste Disposal site for special deep burial.</td>
</tr>
<tr>
<td>• Comply with the attached waste management procedure</td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td>• Discuss waste management and cigarette butts regularly in Toolbox meetings, with waste streams and their appropriate disposal method</td>
</tr>
<tr>
<td>• Reuse onsite all suitable waste products such as mulch and soils</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Place signs on recycling bins</td>
</tr>
<tr>
<td>• Recycle all suitable waste such as glass, paper, cardboard, aluminium cans, scrap metal, ink cartridges etc</td>
<td></td>
<td>• Amend waste management practices as required</td>
</tr>
<tr>
<td>• Remove all waste regularly, only to approved waste contractors or approved landfill (no fires to be lit on-site).</td>
<td>• Provide butt bins.</td>
<td>• Remind people to use bins</td>
</tr>
<tr>
<td>• Ensure that bins containing food scraps have vermin proof lids and all bins are regularly cleared and cleaned.</td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td>• Discuss waste management regularly in Toolbox meetings, with waste streams and their appropriate disposal method</td>
</tr>
<tr>
<td></td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td>• Clean-up as required</td>
</tr>
<tr>
<td>• Ensure that any sceptic waste is regularly emptied and disposed off by an approved licensed contractor</td>
<td></td>
<td>• Order for approved licensed contractor to dispose off sceptic waste</td>
</tr>
<tr>
<td>• Any major repairs or maintenance is managed by the Macmahon workshop.</td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td>• Only in emergency situations will major repairs will conducted on-site.</td>
</tr>
<tr>
<td>• The service truck to be equipped with spill equipment</td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td></td>
</tr>
<tr>
<td>• All hazardous wastes to be stored and handled in accordance with Sub-Plan 3 “hazardous waste management plan”.</td>
<td>• Daily inspections and supervision by supervisors and inspections by Environment &amp; Safety Advisors</td>
<td>• Discuss hazardous waste management regularly in Toolbox meetings</td>
</tr>
<tr>
<td></td>
<td>• Weekly Environment &amp; Safety Checklist</td>
<td></td>
</tr>
</tbody>
</table>
## Controls
- Leave the site in a clean and tidy state on completion of the works.
- Daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors
- Weekly Environment & Safety Checklist
- Clean-up as required

## Monitoring
- Macmahon will establish and maintain no-go zones where asbestos has been detected.
- Removal of asbestos materials will be under the supervision of a licensed asbestos removalist, ensuring to follow appropriate JSEAs and that all necessary PPE is worn.
- In the event that additional asbestos is found onsite, construction works will immediately stop, and the area watered down and fenced off. Macmahon will notify DPI and engage a licensed contractor to advise on appropriate management.

## Corrective actions
- Stop the job, and engage an licensed asbestos removalist
- Keep people away from the area (place fencing & signs, and discuss in pre-start meeting)
Procedure
Waste Management
G-500

Relevant to:

Business Unit: All
Division: All
Site: All
Department: All

Document Owner: Group Quality & Environment Manager

Revision Status:

<table>
<thead>
<tr>
<th>Revision Date</th>
<th>Section</th>
<th>Pages</th>
<th>Revision Description</th>
<th>Reviewed By</th>
<th>Approved By</th>
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<tr>
<td>18-May-09</td>
<td>All</td>
<td>All</td>
<td>Initial MSL Issue (revised from MBS PEPC34)</td>
<td>Eve Lancaster</td>
<td></td>
</tr>
<tr>
<td>29-May-09</td>
<td>All</td>
<td>All</td>
<td>Inclusion of Joshua Moore’s comments</td>
<td>Eve Lancaster Joshua Moore</td>
<td>Peter Sheedy</td>
</tr>
</tbody>
</table>


# Waste Management Procedure

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Waste Management Procedure

1 PURPOSE

The purpose of this procedure is to minimise environmental impacts associated with waste generation and ensure compliance with applicable legal and other requirements.

2 SCOPE

The purpose of this procedure is to minimise environmental impacts associated with waste generation and ensure compliance with applicable legal and other requirements.

3 RESPONSIBILITIES

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsible for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Quality &amp; Environment Manager</td>
<td>Ensuring the currency, relevancy and accuracy of content contained within this procedure.</td>
</tr>
<tr>
<td></td>
<td>Ensuring waste data is collected to address legal and other reporting requirements e.g. EEO Act, NGER Act.</td>
</tr>
<tr>
<td>Business Unit Quality &amp; Environment Manager / Coordinator</td>
<td>Developing Waste Management Procedures specific to address applicable State legal and other requirements;</td>
</tr>
<tr>
<td></td>
<td>Providing advice for project training and awareness programs; and</td>
</tr>
<tr>
<td></td>
<td>Informing Office Managers, Project Managers and Project Environmental Management Representatives of</td>
</tr>
<tr>
<td></td>
<td>any changes to legal and other requirements pertaining to the management of waste.</td>
</tr>
<tr>
<td>Project Manager / Office Manager</td>
<td>Ensuring adequate resources are provided for the implementation of this procedure;</td>
</tr>
<tr>
<td></td>
<td>Ensuring training is provided to improve awareness of environmental issues and responsibilities;</td>
</tr>
<tr>
<td></td>
<td>Incorporating the requirements of this procedure in project planning;</td>
</tr>
<tr>
<td></td>
<td>Ensuring project operations are performed in accordance with legal and other requirements; and</td>
</tr>
<tr>
<td></td>
<td>Reviewing the effectiveness of the system for continual improvement.</td>
</tr>
<tr>
<td>Design Manager</td>
<td>Ensuring environmental considerations are incorporated into the design process.</td>
</tr>
<tr>
<td>Project Environmental Management Representative</td>
<td>Determining waste streams and incorporating these into the PEMP prior to Project mobilisation.</td>
</tr>
<tr>
<td></td>
<td>Communicating, monitoring, reporting the elements of this procedure to all relevant Project personnel;</td>
</tr>
<tr>
<td></td>
<td>Ordering appropriate number and types of waste and recycling bins to implement project requirements;</td>
</tr>
<tr>
<td></td>
<td>Consulting with the Client to ensure site specific</td>
</tr>
</tbody>
</table>
Waste Management Procedure

recycling requirements are addressed; and
- Maintaining waste collection and disposal records.

All Employees and Sub-contractors

Responsible for:
- Adhering to the requirements contained within this procedure and reporting accidents, incidents and non-conformances.

4 DEFINITIONS AND ABBREVIATIONS

EEO Act
Energy Efficiency Opportunity Act

NGER Act
National Greenhouse Energy Reporting Act 2007

Recycle
Using a product again for the same or different purpose which may require further manufacturing.

Recycle
Using a product again for the same or different purpose which may require further manufacturing.

Reduce
Prevention or elimination of waste products

Reuse
Using a product again for the same or different purpose without further manufacture.

PEMP
Project Environmental Management Plan

Waste
Any material, solid, liquid, gas or vapour which is not used in the production of a commercial product or provision of service, or which is not itself an intended commercial product, or which is unwanted, unusable or surplus.

Waste Management
Control and administration of activities involving waste. These activities include waste prevention, elimination, reduction, recycling, treatment and disposal (in order of preference) and also generation, handling, storage and transportation of waste.

5 PROCEDURE

5.1 Legal Requirements

- Each State and Territory regulates the transportation and disposal of wastes that may cause environmental or health risks. It does so through the application of their Environmental Protection Regulations. These Regulations generally provide for the licensing of Carriers, Drivers and Vehicles involved in the transportation of certain waste on public roads.

- It is a requirement of Macmahon to engage only licensed waste contractors to transport and dispose of regulated wastes and to maintain waste collection and disposal records as required by respective State or Territory legal requirements.
5.2 Waste Hierarchy

The Waste Hierarchy is a list of approaches to managing waste, arranged in order of preference. Below is a common graphical representation of the Hierarchy, with the least preferred option for managing waste, disposal, located at the bottom and the most preferred option, avoidance and disposal, located at the top.

![Waste Hierarchy Diagram]

Figure 1 – Waste Hierarchy (source http://www.wastenet.net.au/information/hierarchy)

5.2.1 Waste Avoidance & Minimisation

Waste minimisation is aimed at reducing the production of waste through education and improved production process rather than aiming to increase technology to improve treatment of waste.

Waste Avoidance and Minimisation maybe achieved through taking the following steps:

- Buying goods in bulk;
- Reconsidering superfluous purchases;
- Purchasing products in materials/packaging that is readily recycled;
- Using alternatives, e.g. landscaping that creates mulched gardens in place of lawns; and
- Using of composting and vermiculture practices
- Changing in product design to reduce materials consumption;
- Using crates instead of pallets to avoid the need for shrink wrap;
- Incorporating Eco-Design technology into production processes;
- Adopting Cleaner Production practices that ensure avoidance through efficiency measures; and
- Conducting regular audits and monitoring of waste reduction/resource recovery practices.

Macmahon shall avoid and minimise the use of waste initially through implementing the requirements of SSPC33 – Purchasing and Procurement Procedure.

5.2.2 Reuse

Reuse can be defined as recovering value from a discarded item without reprocessing or remanufacture (Waste Management Board, 2004).
5.2.3 Recycling
Recycling occurs when materials from waste streams are broken down into raw materials and reprocessed either into the same product (closed loop) or a new product (open loop). The term covers a wide range of activities required to turn used materials into new products. These activities include collection, sorting, reprocessing and manufacture (Waste Management Board, 2004).

5.2.4 Resource Recovery
Resource Recovery involves turning discarded materials into some kind of useful resource by chemically transforming those materials, typically into either energy or compost.

5.2.6 Disposal
Disposal is still the most common final destination for many types of waste. The methods of disposing of waste range from the very basic to the elaborate. However, there are still two main categories of disposal, namely burial (landfilling) or burning (incineration).

5.3 General Requirements
- Waste streams for all Office and Project activities shall be determined and documented.
- Disposal locations, contact and licence details for each waste stream shall be documented.
- Records detailing waste type, volumes, disposal location and waste ‘tracking’ information shall be maintained.
- Sufficient waste receptacles shall be provided for the appropriate segregation of waste types generated e.g. (skips, wheelie bins, cages etc).
- Littering is to be avoided at all times and work and office areas are to be kept clean and tidy.
- Disposable cups are prohibited at all Macmahon Office and Projects.
- Where necessary properly constructed cigarette containers e.g. Smokers Ceasefire (not open trays or tins) shall be provided at all Macmahon Offices and Projects.
- Offices and Project are encouraged to provide ButtsOut canisters for personnel use.

5.4 Training & Awareness
- Waste management measures adopted shall be communicated to all Office and/or Project personnel. This may occur through, but is not limited to, the Office and Project Specific induction process, toolbox meetings and/or notice boards.

6 SAFETY AND ENVIRONMENT
Prior to procuring, storing, handling, transporting or disposing of wastes please ensure you have checked the product MSDS.

7 ATTACHMENTS, REFERENCES AND RELATED DOCUMENTS

7.1 Attachments
Not Relevant
Waste Management Procedure

7.2 References and Related Documents

Tool Box Topic – Waste (G-501)
Tool Box Topic – Office Paper Waste (G-502)
Tool Box Topic - Toner Cartridges
Tool Box Topic – Recycling Plastics (G-503)
PEPC35 - Hydrocarbon Management Procedure
Control of Hazardous Substances Procedure (G-504)
SSPC33 – Purchasing and Procurement Procedure.
<table>
<thead>
<tr>
<th>Waste Stream</th>
<th>N/A (tick)</th>
<th>Disposal Method</th>
<th>Disposal Route</th>
<th>Waste contractor name / Licence № (where applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Oil (via Winnellie workshop)</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 1000 L per month Name: Veolia (Collex) or Waste Solutions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used Parts Washer (via Winnellie workshop)</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 20 L per month Name: Quick Clean</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scrap Steel</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 12 m3 Name: Sims Metal or NT Metal Recyclers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used Oil &amp; Fuel Filters (via Winnellie workshop)</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 50 L per month Name: Cleanaway (Wastemaster)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oily rags</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 1 m³ per 6 months Name: Veolia (Collex) - they treat it and then dump it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used Tyres</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 0.5 m³ (truck tyres) Name: Shoal Bay Waste Disposal Site (vehicle tyres are replaced and remain with subcontractor “Arnos tyres”)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used Batteries</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 1 or 2 per month Name: Sims Metal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 240 l per week Name: Cleanaway (Wastemaster)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Used 205 litre Drums</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 20 Name: Veolia (Collex)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contaminated Soil</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>To be determined. Likely to be reused on-site if suitable or taken to Shoal Bay Waste Disposal Site</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oily water from Washdown</td>
<td>N/A</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 20 L per month Name: Macmahon Service truck takes it to the workshop, final disposal via contractor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Waste</td>
<td>X</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 3 m³ per week Name: Cleanaway (Wastemaster)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleared Vegetation</td>
<td>X</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: tbc Name: mulched and reused on-site in rehabilitation works</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Septic waste</td>
<td>X</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: 9 m³ Name: Waste Solutions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete Waste</td>
<td>X</td>
<td>Dumped</td>
<td>On-site</td>
<td>Estimated Qty: tbc m³ Name: Shoal Bay Waste Disposal Site</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-used</td>
<td>Waste contractor</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recycled</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.11. BITING INSECTS MANAGEMENT PLAN

3.11.1. Existing Environment/ Current Status

Mosquitoes are the most likely pest and disease vector species to occur in the general work area. The two species of mosquitoes likely to be in abundance in the area are vectors for viruses that infect people. Pooling and ponding of storm water may lead to the establishment of new breeding sites. Receptacles that hold water can allow for out of season breeding of mosquitoes, especially in the laydown areas. Midges or sandflies also occur in the project area.

3.11.2. Potential Impacts/ Issues

Mosquitoes can carry diseases which can affect the workers and adjacent residents. Midges or sandflies don’t carry diseases however their bites can be very irritating to some people and can become infected and painful.

3.11.3. Objectives of Biting Insects Management Plan

- Reduce the opportunity for mosquitoes to breed, especially in the Dry season.
- Maintain natural drainage patterns where possible.

3.11.4. Legal and Other Requirements

- Public Health Act
- Workplace Health and Safety Act 2007

3.11.5. Performance Criteria

- No observable increase in mosquito numbers
- No new areas on-site where ponding of stormwater occurs for more than 5 days. Any existing ponding areas to be graded where possible.
- Detention periods for erosion & sediment controls less than 5 days following rain

3.11.6. Management, Monitoring and Corrective Actions

Table 17 provides the controls, monitoring and corrective action for the issues identified.
Table 17– Management of Biting Insects for Tiger Brennan Extension Stage 2

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
</table>
| • Advise workers of the potential risk of mosquito borne diseases during the induction and provide relevant brochures/ posters from the Medical Entomology Branch in crib areas, outlining types of diseases and how to protect yourself. | • Daily inspections and supervision by supervisors and Environment & Safety Advisors  
• Weekly Environment & Safety Checklist                                  | • Regular ongoing discussion of biting insects in prestart and Toolbox meetings  
• Contact Medical entomology for advice in case of increased numbers of biting insects. |
| • Supply insect repellent to minimise risk to workers from biting insects. Encourage workers to wear long sleeved shirts and long pants. | • Weekly Environment & Safety Checklist                                    |                                                                                  |
| • Workers to notify supervisors/ Environment or Safety Advisor of any increased numbers in biting insects. | • Daily inspections and supervision by supervisors and Environment & Safety Advisors  
• Weekly Environment & Safety Checklist                                  |                                                                                  |
| • Ensure that areas on-site are free draining following rehabilitation and do not hold water for a period greater than 5 days after rain. This includes ponded areas and erosion & sediment control measures and retention basins. | • Daily inspections and supervision by supervisors and Environment & Safety Advisors  
• Weekly Environment & Safety Checklist                                  | • Grade or fill ponded areas where possible  
• Empty water holding containers  
• Ponded water will be treated with biological larvicide where required (as recommended by Medical Entomology, such as “NoMoz”). |
| • Manage open containers and receptacles to avoid holding water.         | • Daily inspections and supervision by supervisors and Environment & Safety Advisors  
• Weekly Environment & Safety Checklist                                  |                                                                                  |
| • Treat equipment that has been used in Queensland to remove the possibility of introducing Ochlerotatus (Aedes) mosquito species. | • Daily inspections and supervision by supervisors and Environment & Safety Advisors  
• Weekly Environment & Safety Checklist                                  | • Additional treatment may be required                                      |
| • Grade or fill ponded areas where possible  
• Empty water holding containers  
• Ponded water will be treated with biological larvicide where required (as recommended by Medical Entomology, such as “NoMoz”). | • Additional treatment may be required                                      |                                                                                  |
3.12. FIRE MANAGEMENT PLAN

3.12.1. Existing Environment/ Current Status

Bushfires are part of the Australian environment. In the Dry season, the Darwin area is frequented by bush fires, and NT Fire & Rescue Service may at times back burn these areas. The site therefore may be impacted by back burning to surrounding areas.

3.12.2. Potential Impacts/ Issues

Typical causes of fire are:
- Fuel or oil in contact with turbos on mobile equipment
- Exhausts without spark arrestors
- Hot exhausts coming into contact with dry grasses
- Sparks from welders/grinders
- Tyre Fires on mobile equipment
- Discarded cigarettes
- Spontaneous combustion in mulch stockpiles
- Lightning during storms
- Arson

Fires can cause injury or damage to people, property, animals or natural habitat. Fires are the main source for greenhouse gases in NT.

3.12.3. Objectives of Fire Management Plan

- Aim to prevent all fires on-site
- If a fire occurs, all personnel to be aware of the procedures to be followed
- Have appropriate fire fighting equipment available on site

3.12.4. Legal and Other Requirements

- Fire and Emergency Act
- DPI Policy “Recycling Following Clearing”

3.12.5. Performance Criteria

- No accidental fires within the construction area.
- No injuries to humans or animals as a result of fire.
- No damage to natural habitat or property due to fire

3.12.6. Management, Monitoring and Corrective Actions

Table 18 provides the controls, monitoring and corrective action for the issues identified.
## Table 18– Management of Fire for Tiger Brennan Extension Stage 2

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
</table>
| • Use a licensed service provider to assess appropriate locations for and install appropriate types of fire fighting equipment & extinguishers, to be serviced every 6 months. An appropriately marked tag is to be secured to the equipment, with records kept on-site.  
• A minimum of two fire extinguishers shall be located adjacent to any fuel dispensing location or fuel storage depot. Signs depicting “No Smoking or Naked Flame” and “Flammable Liquid” shall be displayed adjacent to the storage  
• Flammable liquids and materials shall be stored in appropriate areas in accordance with AS1940, AS2430.3 and relevant MSDS. Chemicals and fuels to be segregated. Any spills to be cleaned up.  
• Upon mobilisation, a site plan will be developed detailing the location of all fire fighting equipment, fire hydrants, fire hoses etc.  
• A fully operational water truck will be available on-site.  

• Induction and toolbox meetings to cover various ignition risks (such as cigarettes) and employees to be trained every 12 months in fire awareness, prevention, and the use of PPE and extinguishing agents, and a training matrix maintained.  

• Spark arrestors are fitted to earthmoving equipment.  
• Pre-start checks are conducted prior to using any plant or equipment, including the inspection of any fire extinguishers.  
• All major earthmoving plant shall be fitted with fire suppression systems to the engine compartments and be equipped with appropriate hand held fire extinguishers. Light vehicles to be equipped with hand held fire extinguishers and first aid kits.  

• Job Safety and Environment Analysis, which considers risks such as fire, are conducted for all activities and are discussed with employees performing the task. The JSEA to be present on-site with the job. Fire fighting equipment to be made available where required in the JSEA. The requirement for JSEAs is discussed regularly in Toolbox and Prestart meetings, and is covered in the induction.  
• All hot works that can generate sparks require a Hot Work permit. This permit  

| • Inspection of the project area prior to commencing work  
• Ongoing daily inspections and supervision by supervisors and inspections by Environment & Safety Advisors  
• Ongoing weekly Environment & Safety Checklist  
• Scheduled inspection, testing & tagging carried out by licensed service provider  
• Internal and external environmental and safety audits  

• Order and install additional fire fighting equipment or signs if required  
• Ensure service records are maintained  
• If the fire fighting equipment needs servicing (i.e. is faulty, empty or out of date), notify the subcontractor immediately and organise maintenance  

| • Weekly Environment & Safety Checklist  
• Monitor and maintain training matrix  

• The Macmahon workshops inspect all equipment prior to it being used on-site  
• Ongoing maintenance as recommended in the equipment manuals  
• Any defect as identified in the daily machinery pre-start checks is planned in by the workshop for repair.  
• The Weekly Environment & Safety Checklist addresses fire extinguishers in vehicles and equipment  

• Re-address fire in Toolbox or pre-start meeting  
• Organise for fire training when required.  

| • Contact workshop immediately for any urgent maintenance  
• If required, organise for additional fire extinguishers (the workshop keeps several spares)  

| • Employees not to commence works without the relevant JSEA.  
• Ongoing daily inspections/ supervision by supervisors and inspections by Environment & Safety Advisors  
• Ongoing weekly Environment & Safety Checklist  

| • Stop the works and obtain the JSEA or prepare a new JSEA. Ensure all controls in the JSEA are implemented.  
• Stop the works and obtain a Hot works permit from the supervisor or engineer, or implement actions as stated in the permit.  

| • Stop the works and obtain the JSEA or prepare a new JSEA. Ensure all controls in the JSEA are implemented.  
• Stop the works and obtain a Hot works permit from the supervisor or engineer, or implement actions as stated in the permit.  

| • Stop the works and obtain the JSEA or prepare a new JSEA. Ensure all controls in the JSEA are implemented.  
• Stop the works and obtain a Hot works permit from the supervisor or engineer, or implement actions as stated in the permit.
## Controls

| Includes a risk assessment to ensure that sparks cannot ignite surrounding areas, by clear ground fuel away or wet down area before hot work. |
| Monitoring |
| Corrective actions |
| Internal and external environmental and safety audits |
| Daily inspections/ supervision by supervisors and inspections by Environment & Safety Advisors |
| Weekly Environment & Safety Checklist |
| Internal and external environmental and safety audits |
| Cut/ slash vegetation/ fire breaks as required |
| Clean up areas on-site as required |
| Reinforce the issue of fire hazards regularly in Toolbox meetings. |

| Vegetation in the project area is managed to minimise fire risk. |
| Prevent bush fires off-site from spreading onto construction site. Consider fire breaks around compounds, crib areas etc, clearing any existing fire breaks or creating new fire breaks as required. |
| Maintain good housekeeping practices |
| No open fires are permitted on-site, cleared vegetation not to be burnt. |
| Provide cigarette butt bins and appropriate signage for smoking areas |
| Daily inspections/ supervision by supervisors and inspections by Environment & Safety Advisors |
| Weekly Environment & Safety Checklist |
| Internal and external environmental and safety audits |
| Discuss suitable refuelling areas with workshop personnel/ service truck operators |

| When practicable, refuel vehicles and machinery in hardstand area rather than in vegetated areas. |
| Daily inspections/ supervision by supervisors and inspections by Environment & Safety Advisors |
| Weekly Environment & Safety Checklist |
| Monitor current fire danger |
| Daily inspections/ supervision by supervisors and inspections by Environment & Safety Advisors |
| Weekly Environment & Safety Checklist |
| Evidence of liaison with NT Fire & Rescue. |
| Implement any advice given by NT Fire & Rescue. |
| Stop hot works where required. |

| During periods of extreme fire danger, maintain regular contact with NT Fire & Rescue. |
| During days of very high and extreme fire danger, implement additional measures to prevent bush fires, such as wetting down or no hot work to happen on these days except for in designated hot work area. |
| Daily inspections/ supervision by supervisors and inspections by Environment & Safety Advisors |
| Weekly Environment & Safety Checklist |
| Evidence of liaison with NT Fire & Rescue. |
| Implement all recommendations from the accident report |
| Notify additional parties as required |
| Re-order supplies as required |
| DPI to monitor off-site impacts |

| In the event of a fire or explosion, the procedures outlined in the Emergency Response Plan will be implemented immediately. It is the responsibility of all people on-site to report all fires immediately to a supervisor. This will be covered in the induction. |
| In the case of an emergency, the police/fire emergency services and senior Macmahon staff will be notified immediately. |
| DPI will be notified in the event of a fire or explosion as soon as practicable. |
| After a fire, an incident investigation to be conducted and recorded on an accident form. If any materials have been used such as spill absorbent and fire extinguishers, Environment or Safety Advisor to re-order supplies. |
| Incident to be investigated and the accident report to be completed correctly. |
| Weekly Environment & Safety Checklist (addressed any accidents, checks fire extinguishers and emergency response equipment) |
| Internal and external environmental and safety audits |
| Implement all recommendations from the accident report |
| Notify additional parties as required |
| Re-order supplies as required |
| DPI to monitor off-site impacts |
Basic rules for fighting fires

- Always approach a fire from the upwind side to avoid gases produced by the fire.
- Attack small fires immediately with what is at hand, e.g. sand, water (non electrical fires) or an extinguisher.
- Check regularly to ensure you have a retreat path open to you should you require it.
- If you find you cannot extinguish the fire, do not place yourself or others in danger and retreat from the fire. *Preservation of life must be your prime objective!*  

Emergency procedure

- Upon discovery of a fire on-site with threat to life, or equipment destruction potential, the emergency procedure should be used. Refer to the Emergency Response Plan for more details. Laminated flipcharts will be placed in vehicles and cribrooms, summarising emergencies and actions required.
- Use the 2-way radio and call “EMERGENCY-EMERGENCY-EMERGENCY”. (the radio channel will be determined upon commencement of works and will be communicated during the induction).

**STATE CLEARLY:**

- Your name,
- Where you are,
- What type of fire,
- What assistance you require.

If you do not receive a response, contact should be made personally, or by telephone, to a supervisor at the site office who can initiate the assistance required.

√ If the fire is in the engine compartment of heavy earthmoving equipment, shut down the engine and activate the fire suppression system.

√ Ascertain if you are able to fight the fire safely with an extinguisher or other means. If not, move to a safe position and wait for assistance.

✗ DO NOT attempt to fight a tyre fire on heavy earthmoving equipment under any circumstance – follow the tyre fire procedure and contact your supervisor.

✗ DO NOT attempt to fight burning explosives or a fire in an explosives vehicle. Evacuate the area.

**REMEMBER!**

- The first minutes after the discovery of a fire are critical.
- Do not panic – your prompt action could save lives.
- Notify the supervisor and make sure your communication is as clear and concise as possible.
- When the appropriate action has been taken to control the fire, the Project Manager must be notified and an Incident report completed.
3.13. ABORIGINAL AND CULTURAL HERITAGE PROTECTION MANAGEMENT PLAN

3.13.1. Existing Environment/ Current Status

a. Native Title

DPI conducted a search of the following online registers:

- National Native Title Register (NNTT)— which contains determinations of native title where native title does and does not exist in a particular area of land or waters;
- Register of Native Title Claims – which contains claimant applications that have passed the Registration Test and those applications filed before 30/09/1998 that are still undergoing the Registration Test; and
- Register of Indigenous Land Use Agreements (ILUAs) – which contains ILUAs that have been accepted for registration.

There are no native title issues in the project area.

b. Aboriginal Sacred Sites

The Aboriginal Areas Protection Authority (AAPA) manages a register of sacred sites in the NT. These are categorised as either Registered Sacred Sites or Recorded Sacred Sites. Registered Sacred Sites are those which the Aboriginal custodians have requested the AAPA to protect, and as a result have been documented and evaluated by the AAPA before entry into the Register of Sacred Sites as per the Northern Territory Aboriginal Sacred Sites Act 1989. Sites listed as Recorded Sacred Sites are those that have been indicated to be of significance in Aboriginal tradition, but have not yet been evaluated or placed on the Register of Sacred Sites. Disturbance of any Recorded Sacred Site is an offence under the Northern Territory Aboriginal Sacred Sites Act 1989.

A search of the Sacred Sites Register was first conducted on behalf of DPI in 1998. An Authority Certificate and map were issued in 1998 and indicated the absence of any known sacred sites. In September 2008, an updated Authority Certificate and map were issued (attached).

There is a risk that a sacred site previously unknown to the AAPA could be identified after the Register Inspection, the granting of an Authority Certificate and the commencement of works, in which case works would have to cease at the risk of breaching the offence provisions of the Northern Territory Aboriginal Sacred Sites Act 1989.

DPI advised that a search of the Australian Heritage Database (including the World Heritage list, the Commonwealth Heritage List, the National Heritage List and the Register of National Estate) did not indicate any items on heritage significance that are located in close proximity to the proposed road extension. No items in the vicinity of the proposed works are listed under the NT Heritage register.

It should be noted that in the past, animals have been buried at Berrimah farm and bones could be found during earthworks that may be mistaken for human remains.
3.13.2. Potential Impacts/ Issues

The proposed road extension will not impact on known, natural, cultural, Aboriginal and non-indigenous heritage items or places. However, during construction, excavation and disturbance to soils, there is potential to expose or damage unknown heritage items or sub-surface artefacts and/or skeletal material (animal or human).

There is a potential for artefacts to be found, especially near watercourses which may have been frequented by Aboriginal people in the past.

Heritage sites are protected by legislation, also when they are not listed. Failure to comply with the legislation may result in:

- Regulatory fines
- Loss of heritage
- Stakeholder issues
- Damage to heritage structures/ areas

3.13.3. Objectives of Aboriginal and Cultural Heritage Protection Management

- No damage to culturally important sites
- No damage to historic artefacts and sites, including any possible bones

3.13.4. Legal and Other Requirements

- Heritage Conservation Act
- Aboriginal Sacred Sites Act

3.13.5. Performance Criteria

- All Aboriginal or European heritage items found are reported
- No disturbance of any Sacred Sites, or any other historic artefacts
- All conditions of the AAPA certificates are met
- No removal of artefacts without a Permit to Disturb being obtained from the NT Minister for Heritage

3.13.6. Management, Monitoring and Corrective Actions

Table 19 provides the controls, monitoring and corrective action for the issues identified.
### Table 19– Management of Aboriginal and Cultural Heritage Issues for Tiger Brennan Extension

<table>
<thead>
<tr>
<th>Controls</th>
<th>Monitoring</th>
<th>Corrective actions</th>
</tr>
</thead>
</table>
| • Site-specific inductions and toolbox meetings will cover:               | • Daily inspections/supervision by supervisors and inspections by Environment & Safety Advisors  
• The location of heritage, historical and sacred sites                   | • Discuss the item regularly in Toolbox meetings                                |
| • The need to report any findings to supervisory staff                    | • Weekly Environment & Safety Checklist                                   | • Replace map as required                                                        |
| • The conditions of the AAPA certificate                                  | • Regular discussion in the field with workers                              |                                                                                  |
| • A map indicating Sacred Sites and no go areas will be displayed in crib and lunch areas. |                                                                             |                                                                                  |
| • In the event of any potential significant archaeological find or any skeletal remains that are potentially human, immediately stop works in the vicinity of the remains. |                                                                             |                                                                                  |
| • Contact Macmahon senior management, and DPI.                           |                                                                             |                                                                                  |
| • Fence off the area.                                                    |                                                                             |                                                                                  |
| • DPI to advise NRETAS and engage a suitably qualified archaeologist to identify the origin of the remains. |                                                                             |                                                                                  |
| • Works in the vicinity of the remains will not recommence until approval is given by the relevant authorities or DPI. |                                                                             |                                                                                  |
| • If damage to a heritage listed or sacred site does occur, an incident report will be completed and the Company will liaise with DPI and relevant authorities on how best to remediate the damage caused |                                                                             |                                                                                  |
| • In case of any archaeological find (Aboriginal or non-indigenous), contact the AAPA on 8982 4227 / 0488 130 685 or NRETA (Heritage) on 8999 5036. |                                                                             |                                                                                  |
| • In case that any possible human skeletal remains are found, contact the AAPA on 8982 4227 / 0488 130 685 (The AAPA have a memorandum of understanding with the police/ Coroners office that the AAPA will investigate in the first instance). |                                                                             |                                                                                  |
| • These phone numbers will be made available for easy access by supervisory staff. |                                                                             |                                                                                  |
ABORIGINAL AREAS PROTECTION AUTHORITY

AUTHORITY CERTIFICATE

Issued in accordance with Section 22 of the Northern Territory Aboriginal Sacred Sites Act 1989

REFERENCE: D89/199; 90/310 (Doc: 62743) C2008/174

APPLICANT: Department of Planning and Infrastructure Engineering Services
PO Box 61
PALMERSTON NT 0831

SUBJECT LAND: A corridor of land including existing and proposed road reserves associated with the Tiger Brennan Drive, as shown on the map which is annexure 'A' hereto.

PROPOSED WORK OR USE: All pre-construction and construction activities, associated road building and ongoing maintenance including: investigation for access to and extraction of road building materials (gravels), survey, roadworks, bore sinking, turn arounds, drainage works, culverts, floodways, campailes, use of existing bores and dams, haul roads, car parks, boat ramps, detours and all other associated roadworks. Haul roads and access roads are to be 10 metres in width.

CONDITIONS:

1. The applicant shall ensure that the conditions of this Certificate are included in any subsequent contract or tender documents for the works or use described herein.

2. The applicant shall ensure any agent, contractor or employee is aware of the conditions of this Certificate and the obligations of all persons (who enter on, or carry out works or use land on which there is a sacred site) under Part IV of the Northern Territory Aboriginal Sacred Sites Act 1989.

3. This Certificate shall lapse and be null and void if the works in question or the proposed use is not commenced within 24 months of this Certificate.

4. The applicant shall ensure any agent, contractor or employee is aware of the content of section 40(1) of the Northern Territory Aboriginal Sacred Sites Act 1989 which provides that this Certificate does not negate the need for consent, approval or permission for the subject works or use of the land which may be required under another statute.

5. No entry and no works are allowed within Restricted Works Area 1 associated with registered sacred site 5073-16, as shown on the map, which is Annexure 'A' hereto.

The COMMON SEAL of the ABORIGINAL AREAS PROTECTION AUTHORITY was hereto affixed on the 5th day of September 2008

DR BEN SCAMBARY
Chief Executive Officer
Management of Unrecorded Aboriginal Sites or Artefacts

**Flowchart**

- **Responsibility**: Macmahon and/or Subcontractor personnel
  - Stop any work or activity in order to not disturb or damage such site or artefacts.
  - Ensure that no employee in the vicinity is aware of the discovery to prevent disturbance or damages.
  - Immediately advise your supervisor of the discovery.

- **Activities**
  - Ensure that no employee in any way damages or disturbs the items found.
  - Advise the Project Manager of the existence and location of site and artefacts.

- **Reference Documents**
  - Advise clients Project Representative of the location of the discovery.
  - Ensure the area of the find is signposted or closed-off.
  - Await written advice from client Project Manager before accessing or proceeding with further work in the area.

- **Responsibility**: Macmahon Project Manager
  - Advise Macmahon Project Manager in writing of significance of discovery, any actions to be taken and authority to proceed or otherwise.

- **Activities**
  - Obtain written advice from client Project Manager.
  - Abide by any instruction given.
  - File written advice in Project records management system.

- **Responsibility**: Supervisor
  - Communicate discovery and secure site.

- **Responsibility**: Client Project Manager
  - Assess discovery and communicate results.

- **Responsibility**: Macmahon Project Manager
  - Act upon Authorised Representative instructions.

---

**Relevant to:**
- Business Unit: All
- Division(s): All
- Site: All
- Department: All

**Document Owner:** Group Quality & Environment Manager
**Change Control:** Level 1

**Page 1 of 1**
APPENDIX 1

SITE PLAN
APPENDIX 2

PROJECT ORGANISATION CHART
APPENDIX 3

ENVIRONMENTAL RISK REGISTER
This Risk Register is an overview document for the Macmahon Environmental Management System (EMS). The Legal and Other Requirements shown are examples of legislation, regulations, guidelines etc that might apply. Projects should consult their relevant state Legal Register and Commonwealth Legal Register both accessible from the Macmahon Document Library.

This Risk Register is to be used as a reference for all projects when determining and evaluating risks associated with a particular site, activity or project. It must be taken into account when evaluating risks the sensitivity, either real or perceived, of the surrounding environment and local and wider community expectations. For example, the location of a spill may be more important than the volume spilled and lead to a higher consequence rating, as will the toxicity of a chemical should it impact the marine environment, a catchment area, a drain or a watercourse. For guidance on the assessment and ranking of risk associated with hazards and activities refer to G-426 Hazard Identification, Assessment and Control Guideline.

Where contractual or legislative requirements dictate a different Risk Matrix documentary evidence must be produced to support this.

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Insignificant</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
<th>Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost Certain</td>
<td>M (11)</td>
<td>H (16)</td>
<td>H (20)</td>
<td>VH (23)</td>
<td>VH (25)</td>
</tr>
<tr>
<td>Likely</td>
<td>M (7)</td>
<td>M (12)</td>
<td>H (17)</td>
<td>H (21)</td>
<td>VH (24)</td>
</tr>
<tr>
<td>Possible</td>
<td>L (4)</td>
<td>M (8)</td>
<td>M (13)</td>
<td>H (18)</td>
<td>H (22)</td>
</tr>
<tr>
<td>Unlikely</td>
<td>L (2)</td>
<td>L (5)</td>
<td>M (9)</td>
<td>M (14)</td>
<td>H (19)</td>
</tr>
<tr>
<td>Rare</td>
<td>L (1)</td>
<td>L (3)</td>
<td>L (6)</td>
<td>M (10)</td>
<td>H (15)</td>
</tr>
</tbody>
</table>

**Hierarchy of Control**
- Elimination
- Substitution
- Engineering
- Administration
- PPE

A hazard is anything that has the potential to cause harm or damage.

### Risk Score = Consequence vs Likelihood

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Insignificant</th>
<th>Minor</th>
<th>Moderate</th>
<th>Major</th>
<th>Critical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost Certain</td>
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<td>L (3)</td>
<td>L (6)</td>
<td>M (10)</td>
<td>H (15)</td>
</tr>
</tbody>
</table>

**Unacceptable:** Immediate action required to manage the risk.

**Issue:** Action required to manage the risk.

**Monitor:** Action advisable if cost beneficial.

**Tolerable:** Manage using routine procedures.

When applying the Hierarchy of Control to reduce a risk, it is essential to recognise that ‘administrative’ measures do not mitigate ‘consequence’. Good practice therefore requires implementation, where possible, of a higher rank control.
<table>
<thead>
<tr>
<th>Environmental Hazard/Aspect</th>
<th>Legal or Other Requirement</th>
<th>Risk/ Impact</th>
<th>Impact Analysis</th>
<th>Inherent Risk Level</th>
<th>Objectives &amp; Targets</th>
<th>Treatment Option/ Additional Controls (including responsibility)</th>
<th>Control Measures</th>
<th>Monitoring</th>
<th>Level of Residual Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Erosion &amp; Sediment Control</td>
<td>Soil Conservation and Land Utilisation Act</td>
<td>Likely</td>
<td>Moderate</td>
<td>H</td>
<td>As per Sub-Plan 3.1. Main items include: Minimise erosion, and minimise sediment runoff on the surrounding environment.</td>
<td>As per Sub-Plan 3.1. Main items include: Implement &amp; maintain appropriate erosion &amp; sediment control measures. Project manager (or delegate) to ensure:</td>
<td>Environmental &amp; Safety Advisors to:</td>
<td></td>
<td>M(13)</td>
</tr>
<tr>
<td>Environmental Hazard/Aspect</td>
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<td>Level of Residual Risk</td>
<td></td>
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</tr>
<tr>
<td>2. Stormwater</td>
<td>• Waste Management and Pollution Control Act</td>
<td>• Changes to natural drainage lines</td>
<td>Unlikely</td>
<td>Major</td>
<td>As per Sub-Plan 3.2. Main items include: No impacts on the downstream environment, no increased flooding, protection of sensitive areas.</td>
<td>Project manager (or delegate) to ensure: Design items such as culverts to Q100, culverts on existing drainage lines, swales, low flow concrete inverts in roadside drains, gabion structures and Reno Mattresses</td>
<td>M (10)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Water Act</td>
<td>• Increased flooding potential</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Increased erosion potential</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Hazardous Substances</td>
<td>• Waste Management and Pollution Control Act</td>
<td>• Potential contamination of soils, water</td>
<td>Unlikely</td>
<td>Moderate</td>
<td>As per Sub-Plan 3.3. Main items include: No contamination of soils or water</td>
<td>Project manager (or delegate) to ensure: All chemicals to have MSDS, maintain MSDS Register</td>
<td>M (9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Water Act</td>
<td>• Threat to humans, fauna &amp; flora</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• ANZECC Guidelines for Fresh and Marine Water Quality</td>
<td></td>
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<tr>
<td></td>
<td>• AS 1940</td>
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</tr>
<tr>
<td></td>
<td>• Macmahon procedure G-504 Control of Hazardous Substances</td>
<td></td>
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</table>

Relevant to:
Business Unit: Construction
Division(s): NT
Site: Tiger Brennan Drive
Department: Environment

Document Owner: Project Manager
Change Control: Level 4

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<table>
<thead>
<tr>
<th>Environmental Hazard/Aspect</th>
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<th>Control Measures</th>
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<th>Level of Residual Risk</th>
</tr>
</thead>
</table>
| 4. Noise                    | • Waste Management and Pollution Control Act  
• AS 2436                      | • Noise nuisance to adjacent residents  
• Potential OHS risk for workers  
• Potential impacts on fauna | Moderate Possible M | As per Sub-Plan 3.4. Main items include:  
No noise nuisance to surrounding residents, no impacts on workers' hearing.  
Project manager (or delegate) to ensure:  
- Notification to general public of works  
- Standard hours of work  
- 1800 number for complaints/enquiries  
- Regular maintenance of machinery on-site  
- All personnel to be aware of the relevant issues  
- Hearing protection available  
- Relocation of fauna where required | As per Sub-Plan 3.4. Main items include:  
Environmental & Safety Advisors to conduct:  
- Daily visual inspections  
- Weekly inspection checklists  
- Audits (by other parties)  
- Noise monitoring if required  
- Daily prestart checklist for machinery (operators) | M (9) |
| 5. Air Quality & Dust       | • Waste Management and Pollution Control Act | • Daily visual inspections  
• Weekly inspection checklists  
• Dust nuisance to adjacent residents  
• Potential OHS risk for workers  
• Potential impacts on plant health | Moderate Possible M | As per Sub-Plan 3.5. Main items include:  
Minimal dust nuisance for residents and road users and minimal impacts on plant health.  
Project manager (or delegate) to ensure:  
- Notification to general public of works  
- 1800 number for complaints/enquiries  
- Water truck available on-site | As per Sub-Plan 3.5. Main items include:  
Environmental & Safety Advisors to conduct:  
- Daily visual inspections  
- Weekly inspection checklists  
- Audits (by other parties)  
- Noise monitoring if required | M (9) |
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<th>Treatment Option/ Additional Controls (including responsibility)</th>
<th>Level of Residual Risk</th>
</tr>
</thead>
</table>
| 6. Native Vegetation & Clearing | • Waste Management and Pollution Control Act  
• Land Clearing Guidelines | Possible Major H | As per Sub-Plan 3.6. Main items include minimise the area to be cleared and minimise clearing around creeks. | As per Sub-Plan 3.6. Main items include:  
Project manager (or delegate) to ensure:  
• Clearing boundaries to be flagged  
• Minimise areas to be cleared  
• Mulch cleared vegetation  
• Rehabilitate disturbed areas  
• Replant suitable cleared cycads  
• No driving of machinery outside clearing area  
• All machinery to be cleaned prior to arrival on-site for weeds, Weed certificate required  
• All personnel to be aware of the relevant issues | M (10) |

Control Measures Monitoring

• Regular maintenance of machinery on-site  
• All personnel to be aware of the relevant issues  
• Cleared vegetation to be mulched and reused in rehab of disturbed areas ASAP  
• No fires to be lit on-site

• Daily prestart checklist for machinery (operators)

• Project manager (or delegate) to ensure:
  - Clearing boundaries to be flagged
  - Minimise areas to be cleared
  - Mulch cleared vegetation
  - Rehabilitate disturbed areas
  - Replant suitable cleared cycads
  - No driving of machinery outside clearing area
  - All machinery to be cleaned prior to arrival on-site for weeds, Weed certificate required
  - All personnel to be aware of the relevant issues

• Environmental & Safety Advisors to conduct:
  - Daily visual inspections
  - Weekly inspection checklists
  - Audits (by other parties)
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</thead>
</table>
| **7. Weeds**                | • Weed Management Act and Regulations  
|                             | • Gazetted List of Declared Weeds | Possible | Major | H | As per Sub-Plan 3.7. Main items include:  
Environmental & Safety Advisors to ensure:  
• All personnel to be aware of Weed hygiene requirements and Weed Declaration form  
• Weed ID posters and awareness sessions are available  
• Report new infestations  
• Treat known areas of weeds  
• Fill with weeds to be kept separate & treated | Use water truck for dust suppression  
Speed limit  
Only authorised access roads to be used | M (10) |
| **8. Fauna Species**        | • Territory Parks and Wildlife Conservation Act  
|                             | • Impacts on threatened species  
|                             | • Destruction of native habitat | Possible | Major | H | As per Sub-Plan 3.8. Main items include:  
Environmental & Safety Advisors to ensure:  
• All personnel to be aware of fauna issues | As per Sub-Plan 3.7. Main items include:  
Environmental & Safety Advisors to ensure:  
• Daily visual inspections  
• Weekly inspection checklists  
• Audits (by other parties) | M (10) |
# Risk Register - Environmental

**Environmental Hazard/Aspect**: Legal or Other Requirement

<table>
<thead>
<tr>
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<th>Treatment Option/ Additional Controls (including responsibility)</th>
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</tr>
</thead>
</table>
| **9. Pests**                | • Territory Parks and Wildlife Conservation Act  
|                            | • Impacts on native fauna  
|                            | • Nuisance to adjacent residents/ personnel | Possible | Major | H | **As per Sub-Plan 3.9. Main items include:** no introduction of new feral/ pest animals, minimise the presence of feral/ pest animals where possible | **As per Sub-Plan 3.9. Main items include:**  
|                            |                            |            |                     |                      | Environmental & Safety Advisors to ensure:  
|                            |                            |            |                     |                      | • All personnel to be aware of pest issues  
|                            |                            |            |                     |                      | • Sightings to be reported  
|                            |                            |            |                     |                      | • Pest ID poster  
|                            |                            |            |                     |                      | • Good housekeeping practices  
|                            |                            |            |                     |                      | • No feeding of any animals  
|                            |                            |            |                     |                      | • Relocation of fauna as required  
|                            |                            |            |                     |                      | • Cane toad traps, contact council for cats/ dogs | **checklists**  
|                            |                            |            |                     |                      | **Audits**  
|                            |                            |            |                     |                      | Liaise with NRETAS as required | **M (10)** |

*This form is referenced by the following documents:  
PPPC05 Health, Safety & Environmental Risk Management Procedure*
## Tiger Brennan Drive
### Risk Register - Environmental

**Revision Date:** 26/11/2009

**This form is referenced by the following documents:**
PPPC05 Health, Safety & Environmental Risk Management Procedure

<table>
<thead>
<tr>
<th>Environmental Hazard/Aspect</th>
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<th>Treatment Option/ Additional Controls (including responsibility)</th>
<th>Level of Residual Risk</th>
</tr>
</thead>
</table>
| 10. Waste                   | Waste management & Pollution Control Act  
Public Health Act  
NT Code of Practice for small on-site sewage and sullage treatment systems and disposal or reuse of sewage systems | Possible      | Moderate    | M                                                | As per Sub-Plan 3.10. Main items include to reuse and recycle waste where possible, good housekeeping practices | As per Sub-Plan 3.10. Main items include:  
Project manager (or delegate) to ensure:  
- Remove existing contaminated soils and asbestos as directed  
- All personnel to be aware of waste issues  
- Recycle where possible and promote recycling (posters and discussions)  
- Good housekeeping practices | As per Sub-Plan 3.10. Main items include:  
Environmental & Safety Advisors to ensure:  
- Daily visual inspections  
- Weekly inspection checklists  
- Audits | M (9) |
| 11. Biting Insects          | Public Health Act  
Workplace Health and Safety Act 2007 | Possible      | Moderate    | M                                                | As per Sub-Plan 3.11. Main items include: reduce the opportunity for mosquitoes to breed, especially in the Dry season, maintain natural drainage patterns where possible | As per Sub-Plan 3.11. Main items include:  
Environmental & Safety Advisors to ensure:  
- All personnel to be aware of the health issues with biting insects  
- Provide personnel with posters/ brochures from Medical Entomology  
- Minimise mosquito breeding sites, prevent ponding on site | As per Sub-Plan 3.11. Main items include:  
Environmental & Safety Advisors to:  
- Conduct daily visual inspections  
- Complete Weekly inspection checklists | M (13) |
<table>
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<tr>
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<th>Control Measures</th>
<th>Monitoring</th>
</tr>
</thead>
</table>
| 12. Fire                    | • Fire and Emergency Act  | • Injury to personnel/ residents  
• Impacts on native flora & fauna, and natural habitat/ biodiversity  
• Property damage  | Unlikely  
• Critical  
• H  |  |  | As per Sub-Plan 3.12. Main items include: aim to prevent all fires on-site; if a fire occurs, all personnel to be aware of the procedures to be followed; and have appropriate fire fighting equipment available on site.  
Project manager (or delegate) to ensure:  
• All personnel to be aware of fire issues and emergency response procedures  
• Appropriate fire fighting equipment on site  
• Appropriate storage of hydrocarbons and chemicals  
• Refer Emergency Response Plan  
• Fit spark arrestors to machinery  
• Hot Work Permits  
• No fires on site  | As per Sub-Plan 3.12. Main items include: Environmental & Safety Advisors to:  
• Conduct daily visual inspections  
• Complete Weekly inspection checklists  |  |  |
| 13. Heritage Sites          | • Heritage Conservation Act  
• Aboriginal Sacred Sites Act  | • Impacts on Sacred Sites  
• Potential impacts on aboriginal artefacts/ bones or European heritage items if found during construction  | Unlikely  
• Critical  
• H  |  |  | As per Sub-Plan 3.13. Main items include: no damage to culturally important sites, no damage to historic artefacts and sites.  
Project manager (or delegate) to ensure:  
• All personnel to be aware of heritage issues  
• Cover no go zones in induction and need to report any heritage items/ bones  | As per Sub-Plan 3.13. Main items include: Environmental & Safety Advisors to:  
• Conduct daily visual inspections  
• Complete Weekly inspection checklists  |  |  |
## Risk Register - Environmental

### Environmental Hazard/Aspect

<table>
<thead>
<tr>
<th>Environmental Hazard/Aspect</th>
<th>Legal or Other Requirement</th>
<th>Risk/Impact</th>
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<th>Objectives &amp; Targets</th>
<th>Treatment Option/Additional Controls (including responsibility)</th>
<th>Level of Residual Risk</th>
</tr>
</thead>
</table>
| 14. Changes in legislation  | ASZNZS ISO 14001:2004     | Potential non-compliance with legislation resulting in unauthorised adverse environmental effects (environmental harm), significant cost penalties and a loss of reputation. | Unlikely Moderate Moderate | Comply with legal and statutory requirements. | Project Manager to:  
- Understand and ensure compliance with relevant environmental legislation.  
HSEQ Manager NT to:  
- Complete an internal audit to assess compliance. | Moderate |
| 15. Risk Register           | ASZNZS ISO 14001:2004     | May result in unauthorised adverse environmental effects (environmental harm), significant cost penalties and a loss of reputation. | Unlikely Moderate Moderate | Customer input and acceptance of Risk Register (Environmental). | Project Manager to:  
- Issue Risk Register (Environmental) for Customer approval.  
Project Manager to:  
- Liaise with Customer to obtain approval. | Low |
| 16. Environmental awareness| ASZNZS ISO 14001:2004     | Personnel unaware of key environmental site issues hence increased risk of incident/breach of licence resulting in environmental harm. | Possible Moderate High | Access to Project Plan and Procedures and display Environmental Policy. Induction of all Macmahon and Subcontractor personnel, covering all relevant environmental issues. | Project Manager to:  
- Issue Project Environmental Management Plan & Environmental Policy to site.  
Environment & safety Advisors to:  
- prepare a generic site environmental induction (to meet DPI and Macmahon requirements) covering key environmental issues such as:  
  - Environmental Policy  
  - Environmental Plan and procedures. | Low |

---

**Relevant to:**
- Business Unit: Construction
- Division(s): NT
- Site: Tiger Brennan Drive
- Department: Environment

**Document Owner:** Project Manager  
**Change Control:** Level 4  
**Page:** 10 of 12
# Tiger Brennan Drive
## Risk Register - Environmental

**Revision Date:** 26/11/2009

This form is referenced by the following documents:
- PPPC05 Health, Safety & Environmental Risk Management Procedure

<table>
<thead>
<tr>
<th>Environmental Hazard/Aspect</th>
<th>Legal or Other Requirement</th>
<th>Risk/Impact</th>
<th>Impact Analysis Likelihood (L) &amp; Consequence (C)</th>
<th>Inherent Risk Level</th>
<th>Objectives &amp; Targets</th>
<th>Treatment Option/ Additional Controls (including responsibility)</th>
<th>Level of Residual Risk</th>
</tr>
</thead>
</table>
| 17. Greenhouse gases        | Discharge Of Ozone-depleting Substances and Greenhouse Gases to the atmosphere | Discharge of ozone-depleting substances to atmosphere may contribute to the depletion of the ozone layer and hence adversely affect natural ecosystem processes. | Possible | Minor | Moderate | Comply with legal and statutory requirements.  
Comply with EMP and Macmahon policies & procedures.  
Use only substances found on Chemwatch system. | Project Manager/ Workshop Superintendent (or delegate) to:  
- Only licensed persons to handle refrigerants and refrigerant systems;  
- All cylinders must be safety capped whilst in storage;  
- All cylinders must be within Test Date;  
- All equipment must be in good working order with records of maintenance retained;  
- Leak tests on gas bottles must be conducted minimum quarterly and recorded in a register; | Environment & Safety Advisors to:  
- Maintain register of Material Safety Data Sheets (MSDS) and copies MSDS of records.  
- Conduct weekly inspections, using the Checklist in appendix 4, to assess compliance of the storage area. | Low  
L = Unlikely  
C = Minor |

- Commonwealth Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995  
- NT Waste Management & Pollution Control Act

---

**Additional Controls**:
- Environmental Risk Register  
- Dust control  
- Hydrocarbon management  
- Clearing and disturbance  
- Fuel and oil leaks/spills  
- Aboriginal Heritage  
- No person allowed to work/travel unsupervised on site without first completing an induction.

**Monitoring**:
- Environment & Safety Advisors to:  
  - Maintain register of Material Safety Data Sheets (MSDS) and copies MSDS of records.  
  - Conduct weekly inspections, using the Checklist in appendix 4, to assess compliance of the storage area.
<table>
<thead>
<tr>
<th>Environmental Hazard/Aspect</th>
<th>Legal or Other Requirement</th>
<th>Risk/ Impact</th>
<th>Impact Analysis Likelihood (L) &amp; Consequence (C)</th>
<th>Inherent Risk Level</th>
<th>Objectives &amp; Targets</th>
<th>Treatment Option/ Additional Controls (including responsibility)</th>
<th>Level of Residual Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>C</td>
<td></td>
<td>• All cylinders must be stored securely within a designated area;</td>
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<td></td>
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<td></td>
<td>• Preventative maintenance on plant and equipment is conducted to ensure greenhouse gases are not emitted; and</td>
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<td></td>
<td>• Provide Greenhouse based records to the HSEQ Manager NT monthly (e.g. diesel usage).</td>
<td></td>
</tr>
</tbody>
</table>

Control Measures  Monitoring
APPENDIX 4

WEEKLY ENVIRONMENTAL & SAFETY CHECKLIST
## Inspections to be completed

<table>
<thead>
<tr>
<th>Inspections to be completed</th>
<th>N/A</th>
<th>YES</th>
<th>NO</th>
<th>Comments</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Safety &amp; Work Activity</strong></td>
<td></td>
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</tr>
<tr>
<td>Inspect job sites (for additional space see last page):</td>
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</tr>
<tr>
<td>- Is all relevant info on site (JSEA, start card, MSDS, permits for excavation, confined spaces, etc)?</td>
<td></td>
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<tr>
<td>- All workers on the job signed on start card &amp; JSEA?</td>
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<tr>
<td>- Do you consider that the JSEA adequately covers relevant safety &amp; environmental issues?</td>
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<tr>
<td>- Safety documentation reviewed by Safety Advisor?</td>
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<tr>
<td>- Is the JSEA followed at the site &amp; PPE worn?</td>
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<tr>
<td>Is the general level of housekeeping safe &amp; adequate (hand tools put away when not in use, no litter, safe access around the site without trip/ slip hazards, chemicals stored safely)?</td>
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<tr>
<td>Is the speed limit adhered to by all traffic on-site?</td>
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<tr>
<td>Are seat belts &amp; PPE worn?</td>
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<tr>
<td>Are spotters used where necessary (i.e. where the operator cannot see what he’s doing) and is this working effectively?</td>
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<tr>
<td>Are people standing at a safe distance from machinery, moving parts etc?</td>
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<tr>
<td>Any unauthorised people on the site?</td>
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<tr>
<td>Manual handling appropriate? (heavy or awkward items lifted properly, correct tools used, work in awkward positions, any improvements needed eg using IT, job rotation etc)?</td>
<td></td>
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</tr>
<tr>
<td>Fitness for work/ heat stress appropriate? (Any signs of fatigue, alcohol/ drugs, extreme weather conditions as lightning, rain, hot, anyone working alone in a dangerous location i.e. excavation?)</td>
<td></td>
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<tr>
<td>Sufficient water available?</td>
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</tr>
<tr>
<td><strong>Macmahon Business System: procedures &amp; policies</strong></td>
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<tr>
<td>On notice boards:</td>
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<tr>
<td>- Environmental and Safety &amp; Health Policies?</td>
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<tr>
<td>- Latest Safety Committee Meeting minutes?</td>
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<tr>
<td>- Latest Toolbox Meeting minutes?</td>
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<tr>
<td>Accident Register up-to-date and issues investigated?</td>
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<tr>
<td>Action Register up-to-date and items actioned?</td>
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<tr>
<td>Any recent complaints from the community?</td>
<td></td>
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<tr>
<td>Complaints Register up-to-date, issues investigated, NTG notified?</td>
<td></td>
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<tr>
<td><strong>Air Quality &amp; Dust</strong></td>
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<tr>
<td>Is dust suppressed satisfactorily (on-site and surrounding roads)?</td>
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<tr>
<td>Is a water truck available on-site?</td>
<td></td>
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<tr>
<td>Adequate control on exit points from site onto public roads to minimise spread of dust/ muds?</td>
<td></td>
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<tr>
<td>Any evidence of tree stress due to dust emissions?</td>
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<tr>
<td>Any machines emitting excessive smoke or noise?</td>
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<tr>
<td>No evidence of fires?</td>
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<tr>
<td><strong>Community/ complaints</strong></td>
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<tr>
<td>Has notification been given to the general public of roadwork’s and potential for nuisance?</td>
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<tr>
<td>If works are conducted outside of the standard working hours of 6.30 am – 6 pm, has DPI agreed in writing?</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

## Relevant to:
- **Document Owner:** Project Safety Advisor
- **Business Unit:** Construction
- **Division(s):** NT
- **Site:** Tiger Brennan Drive
- **Department:** HSEQ
- **Change Control:** Level 4
<table>
<thead>
<tr>
<th>Inspections to be completed</th>
<th>N/A</th>
<th>YES</th>
<th>NO</th>
<th>Comments</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are generators and all portable power tools and equipment supplied at 240V, protected by RCDs? Any welders fitted with VRD?</td>
<td></td>
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<tr>
<td>Are electrical hand tools in good condition &amp; tagged?</td>
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<tr>
<td>Portable lights and extension leads in good condition &amp; tagged?</td>
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<tr>
<td>Is quarterly electrical testing and tagging carried out of all electrical equipment used at the site?</td>
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<tr>
<td>Is electrical hand testing and tagging carried out of all electrical equipment used at the site?</td>
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<tr>
<td>Emergency Preparedness</td>
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<tr>
<td>Are emergency drills conducted every 6 months?</td>
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<tr>
<td>Are employees trained in fire fighting and any other relevant emergency response functions (12 monthly)?</td>
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<tr>
<td>Appropriate fire extinguishers present, tagged &amp; within test date (every 6 months)?</td>
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<tr>
<td>All fire fighting equipment and spill kits unobstructed?</td>
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<tr>
<td>Fire extinguishers on mobile equipment and Macmahon vehicles?</td>
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<tr>
<td>Spill response equipment readily accessible on site?</td>
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<tr>
<td>Spill response equipment stocked?</td>
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<tr>
<td>Flipcharts for emergency situations available in prominent locations?</td>
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<tr>
<td>Site plan with emergency response and fire fighting equipment available in prominent locations?</td>
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<tr>
<td>Excavations</td>
<td></td>
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<tr>
<td>Have all underground services been located &amp; marked?</td>
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<tr>
<td>If an excavation is &gt;1.5 m, are the walls boxed or benched?</td>
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<tr>
<td>Is there safe access &amp; egress, i.e. by ladder of suitable length?</td>
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<tr>
<td>Barriers in place to stop people falling in the excavation?</td>
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<tr>
<td>Machines and heavy equipment at a safe distance to the excavation to prevent the walls caving in?</td>
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<tr>
<td>Any signs of cracking, soils falling in etc?</td>
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<tr>
<td>If an excavation or confined spaces permit is needed, is it on-site with the job?</td>
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<tr>
<td>First Aid</td>
<td></td>
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<tr>
<td>Adequate first aid boxes onsite and stocked properly?</td>
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<tr>
<td>Are first aid kits checked 6-monthly by St Johns?</td>
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<tr>
<td>Do all eye wash stations operate correctly?</td>
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<tr>
<td>Eye wash stations and first aid boxes unobstructed?</td>
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<tr>
<td>Are first aiders present at the site?</td>
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<tr>
<td>List present at the workplace of current first aiders?</td>
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<tr>
<td>Falsework/ Formwork</td>
<td></td>
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</tr>
<tr>
<td>JSEA in place &amp; does it cover prevention of falls?</td>
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</tr>
<tr>
<td>Formwork erected safely from steps or proper platforms?</td>
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<tr>
<td>Bases &amp; ground conditions adequate for the loads?</td>
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<tr>
<td>All reinforcing bars and star pickets fitted with caps?</td>
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<tr>
<td>Timbers and shutters in good condition?</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Flora &amp; Fauna</td>
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</tr>
</tbody>
</table>
All areas to be cleared identified by flagging or other?  □ □ □
No clearing outside of designated areas?  □ □ □
Any visible impacts on adjacent vegetation or creeks?  □ □ □
Any signs of new weed infestations/ weeds spreading (check stockpiles, cleared areas, adjacent land)?  □ □ □
Cleared vegetation mulched & reused in the rehab of disturbed areas, as per the EMP, table 10?  □ □ □

<table>
<thead>
<tr>
<th>Inspections to be completed</th>
<th>N/A</th>
<th>YES</th>
<th>NO</th>
<th>Comments</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imported materials clean (i.e. no weeds)?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are posters available in lunch areas for ID of weeds, significant fauna and pests, and information on protection from mosquitoes?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td></td>
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</tr>
<tr>
<td>Has all plant on-site a current Weed Declaration and is the Weed Declaration Register up to date?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any disturbance as a result of driving outside of designated areas?</td>
<td>□</td>
<td>□</td>
<td>□</td>
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</tr>
<tr>
<td>Any unusual or significant animals observed at the site or any unusual animal behaviour (birds, stray dogs, injured wildlife, cane toads)?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any signs of cane toads, feral cats or other feral animals?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any signs of vermin or opportunities to breed?</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td></td>
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</tr>
<tr>
<td>Signs of mosquitoes/ biting midges or breeding areas (low areas, or containers holding water for &gt; 5 days)?</td>
<td>□</td>
<td>□</td>
<td>□</td>
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</tr>
</tbody>
</table>

**Guarding for Machinery**

Are all moving parts on machinery that could cause a risk of injury to persons, screened or guarded to prevent contact?  □ □ □
Are all guards secure and in good repair?  □ □ □

**Heights**

Suitable fall arrest equipment & attached to anchor point?  □ □ □
Workers trained & competent in using fall arrest systems?  □ □ □

**Hydrocarbon management & service truck**

Stored properly
- Drums >60L not stacked more than 2 high?  □ □ □
- Only 1 drum >60L stored in decanting position?  □ □ □
- All containers have lids fastened?  □ □ □
- All chemicals/ oils in trays or on tray pallets?  □ □ □
- Is chemical storage adequately ventilated?  □ □ □
Material Safety Data Sheets available for materials used, in MSDS Folder and also on the job site when using chemicals?  □ □ □
Ask staff that are using chemicals if they know where the MSDS is and what to do in emergency situation?  □ □ □
Hazardous Chemicals/ MSDS Register up to date?  □ □ □
Hazardous materials stored or handled outside designated areas?  □ □ □
All hydrocarbons/ chemicals being handled, stored in drip trays?  □ □ □
Are chemical containers clearly labelled, appropriate type and disposed of properly after use?  □ □ □
Any evidence of oil or chemical spills at the site? If so have these been cleaned up?  □ □ □
All bunding and floors of storage areas intact?  □ □ □
Any visible soil or water contamination evident?  □ □ □
Is any maintenance conducted safely as per the JSEA?  □ □ □
Are drip trays used when servicing vehicles/machinery?  □ □ □
| Hoses in good condition (note fractures, breaks, worn areas)? |  |  |  |
| Do dispensing points on service truck have appropriate means of containing leaks/spills? |  |  |  |
| Isolation valves installed, operational and in good condition? |  |  |  |
| Emergency shut-off switches accessible and easily identifiable? |  |  |  |

**Inspections to be completed**

<table>
<thead>
<tr>
<th>N/A</th>
<th>YES</th>
<th>NO</th>
<th>Comments</th>
<th>Corrective action</th>
</tr>
</thead>
</table>

**Ladders**

- Ladders in good condition, properly placed for access & egress?
- Are all ladders on firm, level ground?
- Ladders secured at the top, or if not possible, at the bottom, weighted or footed to prevent slipping?
- Do ladders rise at least 1 m above their landing place or highest rungs used?
- If not, are there adequate hand holds?
- Are approved non-conductive ladders used when carrying out work on live electrical equipment?

**Laydown area**

- Is the level of housekeeping acceptable (litter, separation of materials and waste materials)?
- Any hazardous chemicals laying around?

**Lifting gear/ Crane**

- Lifting chains, rings, hooks & tags in good condition?
- Do all lifting chain hooks have safety catches?
- Crane has a current NT Worksafe Certificate (design registration and current inspection)?
- Copy of the crane operator licence on-site?
- All chains tagged and within date (12 months)?

**Maintenance**

- Are pre-starts being completed?
- Are oil leaks, engine exhaust smoke and excessive noise emissions addressed in pre-start checks?

**Noise**

- Any unreasonable noise impacts (onsite/offsite) in your opinion? (Note that NT legislation does not have noise limits in dB but considers "noise nuisance")
- Is hearing protection worn correctly (where required)?

**Plant**

- Is plant being driven safely and within speed limits?
- Are seat belts worn?
- Are vehicles securely and safely loaded?
- Reverse beepers working?
- Has mobile plant been fitted with roll-over protection or fall-on protective structures?
- Flashing light operating on all plant & vehicles?

**Pressure equipment/ Welding**

- Welders fitted with VRD?
- Hoses and hose connections in good condition?
- Are safety clips used on couplings?
- Are oxy/acetylene cylinders in use properly secured?
- Cylinders stored separate, secured upright 3 m apart?
- Are cylinders tagged and within date of inspection?
- Are hazcam signs in place ("Acetylene", "Flammable Gas", "Oxygen", "Oxidising Gas")?
| Fire extinguishers in place where there is a fire risk? | ☐ ☐ ☐ |
| Are flashback arrestors in place? | ☐ ☐ ☐ |
| Is a welding screen in place where necessary? | ☐ ☐ ☐ |

**Protected Areas**

| Is fencing in good condition around protected areas such as special vegetation or archaeological finds? | ☐ ☐ ☐ |
| Has any archaeological item been found or disturbed? Where necessary, has AAPA been notified? | ☐ ☐ ☐ |

**Inspections to be completed**

<table>
<thead>
<tr>
<th>N/A</th>
<th>YES</th>
<th>NO</th>
<th>Comments</th>
<th>Corrective action</th>
</tr>
</thead>
</table>

**Safe Access/ Signs**

| Arrangements in place for visitors/ new workers? | ☐ ☐ ☐ |
| Can everyone reach their place of work safely, i.e. are there safe roads, passageways, ladders etc? | ☐ ☐ ☐ |
| Are all walkways level and free from obstructions? | ☐ ☐ ☐ |
| Is protection provided to prevent falls? | ☐ ☐ ☐ |
| Is the work site tidy and are materials stored safely? | ☐ ☐ ☐ |
| Are project signs clearly posted at entry and exit point (i.e. "Macmahon construction site", "no entry")? | ☐ ☐ ☐ |
| Assembly/muster area clearly identified? | ☐ ☐ ☐ |

**Sediment/ Erosion Issues**

| Is all sediment laden stormwater leaving the site treated by controls such as sediment fences, filter socks in road drains, rock lined channels, vegetation, dams etc where applicable? | ☐ ☐ ☐ |
| Are these controls maintained properly (i.e. is sediment building up to the extent that the controls are not effective, can sediment or turbid water by-pass the controls in place)? | ☐ ☐ ☐ |
| Any off-site sediment observed (exit roads, stormwater drains, turbid water entering drains or harbour etc)? | ☐ ☐ ☐ |
| Road and stormwater drains free of accumulated silt? | ☐ ☐ ☐ |

**Sub-contractor involvement**

| For one of the sub-contractor activities, complete a stop restart card. Review the JSEA together and ask the sub-contractor to identify any hazards in the work area. | ☐ ☐ ☐ |
| Sub-contractor company: | ☐ ☐ ☐ |
| Name sub-contractor: | ☐ ☐ ☐ |
| Signature: | ☐ ☐ ☐ |
| Date: | ☐ ☐ ☐ |

**Traffic Control**

| Pavement width adequate for traffic volumes & types? | ☐ ☐ ☐ |
| Safe access & egress of construction traffic onto public road? | ☐ ☐ ☐ |
| Is work site adequately barricaded/ fenced off from the public? | ☐ ☐ ☐ |
| Walkways free of loose materials and other hazards? | ☐ ☐ ☐ |
| Are traffic signs clearly indicating the traffic flow, both pedestrian and vehicles? This includes detours. | ☐ ☐ ☐ |
| Are traffic controllers directing traffic safely and clearly (i.e. no ambiguous directions)? | ☐ ☐ ☐ |
| Are traffic controllers wearing high visibility vests that are clean, not damaged and secured? | ☐ ☐ ☐ |
| Are public vehicles stopped for an excessive time? | ☐ ☐ ☐ |
## Waste Management

<table>
<thead>
<tr>
<th>Question</th>
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<th>YES</th>
<th>NO</th>
<th>Comments</th>
<th>Corrective action</th>
</tr>
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<tbody>
<tr>
<td>Are offices, toilets and crib room clean &amp; tidy?</td>
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<tr>
<td>Are roads &amp; site free of litter, food scraps, cans, cigarette butts?</td>
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<tr>
<td>Is the workshop area free of litter?</td>
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<td>Is the volume of the bins sufficient or are they overflowing?</td>
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<tr>
<td>No odour nuisance from wastes?</td>
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<tr>
<td>Lids closed and vermin-proof?</td>
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</table>

### Inspections to be completed

- Are the following designated waste bins used correctly:
  - general waste
  - recycling bins
  - hydrocarbon contaminated materials
  - scrap steel (skip bins)

- Any waste tyres or batteries at the site (tyres to be removed to approved landfill, and batteries to be taken by metal recycler).
- Any asbestos or illegal/ contaminated fill observed?

### Water Quality

- Any signs of oil spills or unusual colours/ stains in waters or soils?
- Washdown pad clean of muds and silts?
- Oil/water separator system maintained & good condition?
- Biodegradable solvents used?
- Any leaks in taps/water lines?

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### General Comments/ Observations:

*Any obvious safe or unsafe issues observed, or any environmental issues (positive or negative)?* Anything else?

---

### Recommendations

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**Relevant to:**
- Business Unit: Construction
- Division(s): NT
- Site: Tiger Brennan Drive
- Department: HSEQ

**Document Owner:** Project Safety Advisor

**Change Control:** Level 4

**Page 6 of 8**
Person completing the inspection

(print name)  (signature)

Safety Office:

(Checked actions & entered onto Action/ CAR Register)

(print name)  (signature)
### ADDITIONAL ROOM FOR ANY NOTES

#### CHECKING JOB SITES:

<table>
<thead>
<tr>
<th>Date</th>
<th>Job location</th>
<th>JSEA kept with job</th>
<th>Relevant info on site</th>
<th>Staff signed on</th>
<th>JSEA appropriate</th>
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<td>EXAMPLE</td>
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<tr>
<td>19 Jan 09</td>
<td>Stormwater pit # 3</td>
<td>In truck</td>
<td>Excavation Permit √</td>
<td>√</td>
<td>yes</td>
<td>3 sub-contractors, all inducted and wearing PPE.</td>
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APPENDIX 5

ACTIVITY PLANNER FOR ENVIRONMENTAL INSPECTIONS
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<thead>
<tr>
<th>ACTIVITY DESCRIPTION</th>
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