Solomon Project Mine Closure Plan

Tenements: M47/1409, M47/1410, M47/1411, M47/1413, M47/1417, M47/1431, M47/1453, M47/1466, M47/1473, M47/1474 and M47/1475

Solomon Project

29 October 2015
SO-PL-EN-0016 Rev 1
## Solomon Project Mine Closure Plan

**SO-PL-EN-0016**

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<td>Brett McGuire</td>
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### Revision History (to be completed for each version retained by Document Control)

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<td>Brett McGuire</td>
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# DMP Checklist for Mine Closure Plans

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**Cover Page, Table of Contents**

| 3  | Does the cover page include;                                                          |        |         |                                                                          |
|    |                                                                             |        |         |                                                                          |
|    | - Project Title                                                                     | Y      |        | Cover Page                                                               |
|    | - Company Name                                                                      | Y      |        | Cover Page                                                               |
|    | - Contact Details (including telephone numbers and email addresses) Document ID and version number | Y      |        | Cover Page; Section 2.1                                                  |
|    | - Date of submission (needs to match the date of this checklist)                    | Y      |        | Cover Page                                                               |

| 4  | Has a Table of Contents been provided?                                                 | Y      |         |                                                                          |

**Scope and Project Summary**

| 5  | Why is the MCP submitted? (as part of a Mining Proposal or a reviewed MCP or to fulfil other legal requirements) | N/A    |         |                                                                          |
|    |                                                                             |        |         |                                                                          |
|    | To accompany the Solomon Iron Ore Project - Sustaining Production PER (2015)         |        |         |                                                                          |

| 6  | Does the project summary include;                                                    |        |         |                                                                          |
|    |                                                                             |        |         |                                                                          |
|    | - Land ownership details;                                                            | Y      |         | Section 2                                                               |
|    | - Location of the project;                                                          | Y      |         |                                                                          |
|    | - Comprehensive site plan(s);                                                       | Y      |         |                                                                          |
|    | - Background information on the history and status of the project.                   | Y      |         |                                                                          |

**Legal Obligations and Commitments**

| 7  | Has a consolidated summary or register of closure obligations and commitments been included? | Y      |         | Section 3                                                               |

**Data Collection and Analysis**

| 8  | Has information relevant to mine closure been collected for each domain or feature (including pre-mining baseline studies, environmental and other data)? | Y      |         | Section 7                                                               |

| 9  | Has a gap analysis been conducted to determine if further information is required in relation to closure of each domain or feature? | Y      |         | Section 8.2                                                             |

**Stakeholder Consultation**

| 10 | Have all stakeholders involved in closure been identified?                           | Y      |         | Section 4                                                               |

| 11 | Has a summary or register of stakeholder consultation been provided, with details as to who has been consulted and the outcomes? | Y      |         | Section 4. Also refer to the Solomon Iron Ore Project Sustaining Production PER (2015) |

**Final land use(s) and Closure Objectives**

<p>| 12 | Does the MCP include agreed post-mining land use(s), closure objectives and conceptual landform design diagram? | Y      |         | Sections 5 &amp; 9                                                          |</p>
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<td>Does the MCP identify all potential (or pre-existing) environmental legacies, which may restrict the post mining land use (including contaminated sites)?</td>
<td>Y</td>
<td>Sections 7, 8 &amp; 9</td>
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<td>Does the MCP identify all potential issues impacting mine closure objectives and outcomes?</td>
<td>Y</td>
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<td>Does the MCP include proposed management or mitigation options to deal with these issues?</td>
<td>Y</td>
<td>Sections 8, 9 &amp; 10</td>
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<td>Have the process, methodology, and rationale been provided to justify identification and management of the issues?</td>
<td>Y</td>
<td>Sections 8, 9 &amp; 10</td>
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<td>Does the MCP include a set of specific closure criteria and/ or closure performance indicators?</td>
<td>Y</td>
<td>Sections 5 &amp; 10</td>
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<td>18</td>
<td>Does the MCP include costing methodology, assumptions and financial provision to resource closure implementation and monitoring?</td>
<td>Y</td>
<td>Section 11</td>
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<td>19</td>
<td>Does the MCP include a process for regular review of the financial provision?</td>
<td>Y</td>
<td>Section 11</td>
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<td>20</td>
<td>Does the reviewed MCP include a summary of closure implementation strategies and activities for the proposed operations or for the whole site?</td>
<td>Y</td>
<td>Section 8, 9 &amp; 10</td>
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<td>Does the MCP include a closure work program for each domain or feature?</td>
<td>Y</td>
<td>Sections 9</td>
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<td>Have site layout plans been provided to clearly show each type of disturbance?</td>
<td>Y</td>
<td>Figure 3</td>
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<td>Does the MCP contain a schedule of research and trial activities?</td>
<td>Y</td>
<td>Section 8.6</td>
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<td>24</td>
<td>Does the MCP contain a schedule of progressive rehabilitation activities?</td>
<td>Y</td>
<td>Table 13</td>
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<td>25</td>
<td>Does the MCP include details of how unexpected closure (including care and maintenance) will be handled?</td>
<td>Y</td>
<td>Section 9.5</td>
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<td>26</td>
<td>Does the MCP contain a schedule of decommissioning activities?</td>
<td>N</td>
<td>The project is expected to continue for at least another 35 years</td>
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<td>Does the MCP contain a schedule of closure performance monitoring and maintenance activities?</td>
<td>Y</td>
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<td>28</td>
<td>Does the MCP contain a framework, including methodology, quality control and remedial strategy for closure performance monitoring including post-closure monitoring and maintenance?</td>
<td>Y</td>
<td>Section 10</td>
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<td>29</td>
<td>Does the MCP contain a description of management strategies including systems, and processes for the retention of mine records?</td>
<td>Y</td>
<td>Section 12</td>
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Corporate Endorsement:
"I hereby certify that to the best of my knowledge, the information within this Mine Closure Plan and checklist is true and correct and addresses all the requirements of the Guidelines for the Preparation of a Mine Closure Plan approved by the Director General of Mines."

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Position: General Manager, Solomon
Signed: [Signature]
Date: 27 October 2015

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1. SCOPE AND PURPOSE

1.1 Project Background

Fortescue Metals Group Limited (ACN 002594872) (Fortescue) has expanded its iron ore operations in the Pilbara region of Western Australia (WA), through the development of the Solomon iron ore mine (Solomon Project). The Solomon Project, 100% owned by Fortescue, is located within the Hamersley Range approximately 60 kilometres (km) north of Tom Price (Figure 1).

Historically, BHP Ltd (1979 to 1980) and Rio Tinto Iron Ore (under Hamersley Iron, 1977 to 2003) have held tenure in the Solomon region and explored for iron ore. Although reasonable iron intersections were discovered, the majority of the ground was relinquished (Fortescue 2013a). Rio Tinto holds fragmented small-tenure throughout the Solomon Project, predominantly covering isolated valleys prospective for Detrital Iron Deposit (DID) mineralisation. Much of this tenure is still held under the Iron Ore (Hamersley Range) Agreement Act 1963 as AML-004. The Solomon Project does not impinge on these tenements (Fortescue 2013a).

Fortescue began exploration activities at the Solomon Project following an application for tenements in 2003, with active field work (mapping and target generation) commencing in 2006. After the granting of tenements in 2007, the first drilling programme returned exceptional ore grade material and an aggressive drill-out programme commenced. Current exploration activities are focussed on the identification and testing of new targets within the Solomon Project area and infill drilling of prospective areas in order to increase the level of confidence in the resource deposits (Fortescue 2013a).

The Solomon Project was assessed by the Environmental Protection Authority (EPA) under Part IV of the Environmental Protection Act 1986 (EP Act). The Solomon Project was approved by the Minister for Environment; Water on 20 April 2011 (Ministerial Statement 862). The Solomon Project was also referred to the Commonwealth Department of Environment (DoE) (formally the Department of Sustainability, Environment, Water, Population and Communities) for assessment in relation to Matters of National Environmental Significance. Approval for the Solomon Project was issued by the Federal Minister for the Environment on 28 April 2011.

This Mine Closure Plan (MCP) will be submitted to the EPA as a part of the Public Environmental Review document (PER) for assessment under Part IV of the EP Act. This new assessment is for the expansion of the Solomon Project footprint and incorporates expanded mining areas of Firetail, Kings, Queens, Trinity, Zion and new mining areas at Castle Valley and Fredrick; as well as associated infrastructure to support the current and planned developments.
Figure 1: Solomon Mine
Regional Locality

Data Source(s):
* Towns, Roads, Drainage, Landgate
* GOV National Parks, The Department of Parks and Wildlife
* Third Party Rail Alignments, Rio Tinto, BHP, Landgate
* All other Data - FMG sourced.

LEGEND
- **Towns**
- **FMG Rail**
- **BHP Rail**
- **Rio Tinto Rail**
- **Principal Road**
- **Secondary Road**

**Mines**
- FMG
- BHP
- Rio Tinto
- Roy Hill

LOCATION MAP

LOCATION MAP

Requested By: Peter Waters
Drawn By: A/ McGonagle
Revised By: amcgonagle
Approved By: Undraa George

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Coordinate System: GDA 1994 MGA Zone 50
Document Name: SO_MP_EN_0315.001_r0
Size: A3P
Revision: 0
Confidentiality: 1

Date: 21/01/2015
1.2 Purpose of this Plan

Fortescue recognises the importance of mine closure to the successful and environmentally acceptable operation of the Solomon Project, and that mine closure together with excellence in managing environmental responsibilities should be an integral part of mine development and operations. The purpose of the MCP is to provide a strategic planning and implementation framework to guide current and planned operations, in order to facilitate efficient closure of the Solomon Project. Key components of the MCP are:

- identifying aspects relating to decommissioning and closure which may impact on the environment, health and safety, and may be of concern to regulatory agencies;
- providing a basis for consultation with regulators and identified stakeholders regarding the post-mining land uses of the Solomon Project area and agreed completion criteria;
- developing management strategies to be implemented as part of the Solomon Project’s design, construction and operation to minimise impacts and site closure requirements;
- identifying closure costs to establish adequate financial provisions; and
- providing details of the management strategies to be implemented by Fortescue to the appropriate regulatory agencies to confirm completion criteria are met.

Fortescue has previously submitted MCPs for the Solomon Project to accompany Mining Proposals as required under Section 70(0) of the Mining Act 1978 and as per the specific conditions of Ministerial Statement 862 (MS862). The Mining Proposals and MCP revisions have been staged to meet Fortescue’s construction scheduling requirements. This MCP incorporates all elements of the previous MCPs (Table 1) as well as new elements of the Solomon Project (refer Section 2.3 – Overview of Operations).

Table 1: Previous Mine Closure Plans for the Solomon Project

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The MCP is a dynamic document that will continue to be reviewed regularly to consider changes in site conditions, operations, technology, and community expectations. The key purposes for the development of this MCP are to:

- update and supersede previous versions of the Solomon MCP, incorporating the new elements of planned mining activities at the Solomon Project;
- provide updated guidance for Life of Mine (LOM) planning at the Solomon Project;
- meet statutory guidelines; and
- provide project stakeholders (internal and external) with a conceptual understanding of the potential environmental impacts that may arise from mining activities and how Fortescue propose to minimise these impacts during and post mining at Solomon.

This MCP outlines the requirements for the closure and rehabilitation of the Solomon Project, providing a clear plan for both Fortescue and their contractors to implement progressive rehabilitation for the site. The MCP has been developed in accordance with the joint Department of Mines and Petroleum (DMP) / EPA Guidelines for Preparing Mine Closure Plans 2015, as well as Fortescue’s Planning for Closure Standard 100-ST-EN-0001. This MCP also addresses the specific conditions of the Solomon Project approval as set by the State and Federal Governments.

The scope of the Solomon MCP covers the mining and associated activities of the Solomon Project. Rail, camp, power, external transport, port and other external features are not covered in the Solomon MCP (Section 2.3).
2. PROJECT SUMMARY

2.1 Ownership

The Solomon Project is 100% owned by FMG Pilbara Pty Ltd (ACN 106943828) (FMG Pilbara), a wholly owned subsidiary of Fortescue.

The contact details for Fortescue are:

Fortescue Metals Group Ltd,
Level 2,
87 Adelaide Terrace,
East Perth WA 6004

2.2 Tenure

The majority of the Solomon Project is located on unallocated crown land (UCL). The Airport and external borefield at the southern end of the Solomon Project are located on the Hamersley Station Pastoral Lease. The Lower Fortescue Borefield is proposed to be located on the Mt Florence Station Pastoral Lease.

The Solomon Project is largely located within ten Mining Leases issued to FMG Pilbara; refer Table 2. Associated elements of the Solomon Project (e.g. support infrastructure, exploration) are located either within these Mining Leases or associated Exploration and Miscellaneous Leases held by FMG Pilbara as outlined in Figure 2.

Table 2: Mining Lease details

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Figure 2
Solomon Project

LEGEND
- Fortescue Mines and Prospects
- Pilbara Pastoral Leases (Excluding Easements)
- Solomon Infrastructure - Existing
- Proposed Indicative Mine and Rail Footprint
- Fortescue Managed Tenements

Data Source(s):
Pastoral Leases; Landgate, 2012

Requested By: Peter Waters
Drawn By: Bridget Ralebala
Revised By: Bralebala
Approved By: Undraa George
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FMG accepts no liability and gives no representation or warranty, express or implied, as to the information provided including its accuracy, completeness, merchantability or fitness for purpose.
2.3 Overview of Operations

In excess of two billion tonnes (Bt) of mineralisation have been identified at the Solomon Project. Fortescue anticipates that ore production will reach up to 80 million tonnes per annum (Mtpa) over the estimated 35 year LOM from 2016. The LOM is regularly reviewed based on Fortescue’s business priorities, resource availability and market demand.

The Solomon Project (Figure 3) comprises the following activities:

- exploration activities throughout the Solomon Project;
- current and planned mining activities at Firetail, Kings, Queens, Trinity, Zion, Castle Valley and Fredrick locations;
- associated in-pit and external waste rock dumps (WRDs);
- ore processing facilities, feed stockpiles and tailing storage facilities (TSFs); and
- mine support infrastructure including workshops, offices, conveyors, haul roads, borefields and fire exclusion zones (note these elements are not included in the Solomon Project MCP).

Mining of the Solomon Project will be through conventional open pit methods of drill and blast, load and haul. After onsite processing, iron ore produced is transported via rail to Port Hedland for export.
2.4 Major Mine Components

The mine and infrastructure elements of the Solomon Project have been categorised into domains, and where appropriate, sub-domains (Table 3) for which individual tasks can be defined. The major closure domains identified for the Solomon Project currently comprise:

- active and planned pits;
- in-pit and external WRDs; and
- valley fill and in-pit tailings storage.

As operations continue to expand in accordance with the mine plan, operational areas associated with the three domains listed above will increase.

Due to the extended life of the Solomon Project, these landform features will comprise the majority of ongoing environmental work (e.g. progressive rehabilitation and monitoring) during operations. Other project elements (e.g. accommodation village, support infrastructure) will continue to be utilised throughout the life of the project as well as during final rehabilitation and the post-closure monitoring and maintenance period. These project elements are not subject to progressive rehabilitation and are not considered in this MCP. Such elements will be addressed in a decommissioning plan to be developed at least three years prior to the planned completion of operations.

**Table 3: Closure domains and major mine components of the Solomon Project MCP**

<table>
<thead>
<tr>
<th>No.</th>
<th>Domain</th>
<th>Sub-domain</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Waste Rock Dumps (WRDs)</td>
<td>WRD surface</td>
<td>WRD surface</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WRD slopes</td>
<td>WRD slopes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WRD surrounds</td>
<td>Cleared areas/roads</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All areas</td>
<td>All areas</td>
</tr>
<tr>
<td>2</td>
<td>Mine Voids</td>
<td>Pit floor and backfill</td>
<td>Pit floor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pit walls</td>
<td>Pit walls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pit surrounds</td>
<td>Cleared areas/roads</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All areas</td>
<td>All areas</td>
</tr>
<tr>
<td>3</td>
<td>Tailings Storage Facilities (TSFs)</td>
<td>Tailings surface</td>
<td>Final surface of TSFs after deposition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Embankment</td>
<td>Embankment/slopes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pipeline</td>
<td>Tailings distribution pipeline and spigots</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TSF surrounds</td>
<td>Cleared areas, roads, in-pit tailings storage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Closure Material Stockpile</td>
<td>Closure Material Stockpile</td>
</tr>
</tbody>
</table>
3. **CLOSURE OBLIGATIONS AND COMMITMENTS**

Closure obligations and commitments occur at two levels:

- **Generic obligations and commitments**, typically set by legislation and best-practice guidelines, are developed to promote environment stewardship within industry.

- **Site or activity-specific obligations and commitments**. These are generally set by individual regulatory agencies to ensure environmental compliance and that all activities are undertaken in an environmentally sound manner.

Closure obligations and commitments pertinent to the Solomon Project are provided below.

### 3.1 Legislative Requirements, Conditions and Commitments

#### 3.1.1 Land Access Agreement

Fortescue has negotiated a Land Access Agreement (LAA) with the Wintawari Guruma which was signed on 15 December 2009.

#### 3.1.2 Environmental Protection Act 1986

Rehabilitation and mine closure can be regulated by the EPA under Part IV of the EP Act. The EPA applies the following objective to the assessment of mine closure and rehabilitation:

> To ensure that premises can be closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the State.

The EPA has developed policies to assist with achieving its objective. These include policies and guidance notes on the use of the precautionary principle, consideration of intergenerational equity, the conservation of biological diversity and ecological integrity, and waste minimisation.

The following regulatory position and guidance statements set the framework for the management of rehabilitation and mine closure:


Elements of the Solomon Project were approved under Part IV of the EP Act (MS 862), released by the Minister for the Environment on 19 April 2011. Conditions relevant to mine closure outlined in MS 862 include:

9 **Rehabilitation**

9-1 The proponent shall undertake progressive rehabilitation, beginning within 12 months of the commencement of ground-disturbing activities and continuing until the following outcomes are achieved to the satisfaction of the CEO:

1. The waste material landforms and tailings storage facility shall be non-polluting and shall be constructed so that their stability, surface drainage, resistance to erosion and ability to support local native vegetation are similar to undisturbed natural analogue landforms as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the CEO of the Office of the EPA on advice from the Department of Environment and Conservation and the Department of Mines and Petroleum.

2. The waste material landforms, tailings storage facility and other areas disturbed through implementation of the proposal, shall be progressively rehabilitated with vegetation composed of native plant species of local provenance (defined as seed material collected within a suitable maximum distance of the proposal area as agreed by the CEO of the EPA on advice from the Department of Environment.

3. The percentage cover and species diversity of living, self-sustaining native vegetation in all rehabilitation areas shall be comparable to that of undisturbed natural analogue sites as demonstrated by Ecosystem Function Analysis or other methodology acceptable to the CEO of the Office of the EPA.

11 **Groundwater**

11-1 The proponent shall ensure that water levels in groundwater fed pools within and adjacent to the project area are maintained consistent with pre-mining levels as defined in the report required by condition 11-2.

14 **Mine Plan and Conceptual Closure Strategy**

14-1 Prior to construction of the mine waste rock dumps and tailings storage facilities for both the Early Ore and Full Production stages respectively, the proponent shall submit a detailed, staged and project-specific Mine Plan and Preliminary Closure Strategy to the requirements of the CEO of the EPA on advice of the Department of Mines and Petroleum and the Department of Environment and Conservation.

14-6 The Mine Plan and Preliminary Closure Strategy shall demonstrate that waste disposal facilities will be located, designed and constructed to ensure that they are non-polluting and so that their final shape, height, stability and ability to support native vegetation are comparable to natural landforms in the area.
The Mine Plan and Closure Strategy shall demonstrate that the amount of backfill material available will be sufficient to allow backfilling to an extent that will preclude the formation of pit lakes after mine completion and closure, and to ensure there is capillary break between the surface and groundwater to maintain groundwater quality.

**Final Closure and Decommissioning Plan**

At least three years prior to mine completion, the proponent shall prepare and submit a Final Closure and Decommissioning Plan to the requirements of the CEO of the EPA on advice of the Department of Environment and Conservation and Department of Mines and Petroleum.

Fortescue is currently undertaking a PER approval process under Part IV of the EP Act for an expansion of the current Solomon Project footprint as described in Section 1.1.

**Mining Act 1978**

The tenements of the approved Solomon Project were granted pursuant to the Mining Act 1978. All decommissioning and rehabilitation activities will be conducted in accordance with Mining Proposals and this Mine Closure Plan required under Section 70(O) of this Act.

**Environmental Protection and Biodiversity Act 1999**

The Solomon Project has been approved under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). The following conditions of the approval (EPBC 2010/5567) relate to closure:

- Condition 1. The approval holder must comply with the conditions relating to surface water and groundwater of the Western Australian Approval as in force or existing from time to time; and

- Condition 3. For the better protection of habitat for listed threatened fauna species in the Pilbara region of Western Australia, the approval holder must backfill all mine pit voids to a level that prevents the formation of pit lakes following the closure of the mine.

**Permits, Licences and Regulatory Approvals**

Iron ore mining and processing operations at the existing Solomon mine are subject to the following approvals:

- Works approvals and licences pursuant to Part V of the EP Act and associated Regulations. Specifically the environmental operating licence L8464/2010/2 for the Solomon Project;
Licences to construct and alter wells for water abstraction pursuant to the *Rights in Water and Irrigation Act 1914* and associated Regulations; and

Approval to disturb Aboriginal sites under section 16 and 18 of the *Aboriginal Heritage Act 1972* and associated Regulations.


Approval to construct and operate waste treatment facilities under the *Health Act 2011* and the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974.

### 3.2 Closure Guidelines and Industry Standards

This MCP has been developed recognising the following guidelines and Industry standards:

- **DMP/ EPA Guidelines for Preparing Mine Closure Plans.** The aim of this guideline is to ensure that, for every mine in Western Australia, a planning process is in place so that the mine can be closed, decommissioned and rehabilitated to meet DMP and EPA’s objectives for rehabilitation and closure.

- **Strategic Framework for Mine Closure.** This handbook was prepared by the Minerals Council of Australia, and the Australian and New Zealand Minerals and Energy Council (ANZMEC and MCA) in 2000. It outlines strategic framework concepts associated with stakeholder involvement, planning, financial provision, implementation, standards, and relinquishment. Examples of best practice are also included.

- **Mine Closure and Completion.** This document was prepared by the Department of Industry, Tourism and Resources (DITR) in October 2006 (DITR 2006a) as part of an Australian Government initiative - Leading Practice Sustainable Development Program for the Mining Industry. The publication addresses sustainable development and closure, mine life phases, planning during the operational phase and mine completion and relinquishment, including case studies.

- **Managing Acid and Metalliferous Drainage.** This handbook is one within the Leading Practice Sustainable Development in Mining Series, and was prepared by the DITR in February 2007 (DITR 2007). It encompasses social, economic and environmental aspects of the various mining phases, addressing the decision making, regulatory framework, identification and prediction, risk, minimisation, control and treatment, monitoring and performance evaluation and management processes of acid and metalliferous drainage (AMD). Case studies are also included.
• **Mine Rehabilitation.** This handbook was published in October 2006 (DITR 2006a) within the Leading Practice Sustainable Development in Mining Series by the DITR. It outlines sustainable development and mine rehabilitation, planning, operations, and closure, and includes case studies addressing these aspects of mine rehabilitation.

### 3.3 Fortescue Standards and Guidelines

Fortescue’s Environmental Management System (EMS) (described further in Section 8.3) provides the environmental compliance framework to identify when environmental approvals are required and then captures environmental compliance obligations. Where non-conformance issues or opportunities for improvement are identified, these issues are documented and tracked via the Business Management System (BMS). Each compliance obligation is assessed for its relative risk, and the results are used to drive first and second party internal auditing functions. Results of risk assessments are also used to drive continual improvement processes.

Implementation of environmental compliance obligations is undertaken by site environmental teams, with oversight from the corporate environmental team. Regular review of Fortescue’s environmental performance by senior management ensures that focus is applied to areas of concern and that environmental performance is linked to the strategic direction of the business.

All identified Solomon Project mine closure strategies are subjected to a risk assessment in terms of the Fortescue Risk Management Framework (100-ST-RK-0031). Adherence to this framework ensures that all environmental and corporate closure risks are identified early in the design and planning phase so that the most appropriate and acceptable closure option can be identified and required management controls established to minimise potential risk and associated impacts.

Fortescue governs rehabilitation and closure planning at a corporate level through:

- Fortescue’s Mine Closure Steering Committee;
- progressive mine rehabilitation incorporated into project development and mine planning, enabling the reduction of LOM closure costs and overall environmental liabilities; and
- calculating Fortescue’s closure liabilities and provisioning requirements on an annual basis.
These objectives are achieved by requiring that:

- the collection of baseline information required for successful mine closure and rehabilitation is obtained as early as possible in the project design and approvals process;
- environmental risks are acknowledged during project design and appropriate management strategies implemented prior to and during operations;
- mine closure and rehabilitation liabilities and provisioning are recognised during project design and feasibility and updated annually; and
- mine closure and rehabilitation plans are in alignment with relevant current guidelines and are regularly reviewed through an integrated, multi-disciplinary approach.

Further details on Fortescue's Management Systems and Procedures are outlined in Sections 8.3 and 9.1.
4. **STAKEHOLDER ENGAGEMENT**

Fortescue’s stakeholder engagement strategy aims to establish open dialogue between key stakeholders and Fortescue, to ensure that the Solomon Project’s design and closure plans consider closure issues and address stakeholder’s needs, expectations and concerns. All stakeholder engagement within Fortescue is governed by the *Pilbara Iron Ore Infrastructure Project Stakeholder Consultation Strategy* 100-PH-EN-0003.

4.1 **Fortescue Stakeholder Engagement Strategy**

Fortescue began consultation for the Solomon Project in 2009, and intends to maintain established communication channels and stakeholder relations throughout the life of the Solomon Project, as part of normal business practice. Through the Solomon Project’s approvals process Fortescue has identified external stakeholders, (Table 4) who will continue to be consulted on closure planning throughout the life of the Solomon Project.

<table>
<thead>
<tr>
<th>Stakeholder Group</th>
<th>Stakeholder Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office of the Environmental Protection Authority (OEPA)</td>
<td>Department of Regional Development and Lands (DRD)</td>
</tr>
<tr>
<td>Department of Mines and Petroleum (DMP)</td>
<td>Shire of Ashburton</td>
</tr>
<tr>
<td>Department of Parks and Wildlife (DPaW)</td>
<td>Eastern Guruma and Yindjibarndi Native Title groups</td>
</tr>
<tr>
<td>Department of Environment Regulation (DER)</td>
<td>Mt Florence and Hamersley Pastoral Station</td>
</tr>
<tr>
<td>Department of Water (DoW)</td>
<td>Department of Aboriginal Affairs (DAA)</td>
</tr>
</tbody>
</table>

Consultation to date has aimed to involve stakeholders in the planning process by communicating with them regarding mining areas and operations, management of impacts, employment and other social matters. Table 5 provides a summary of formal comments received on the previous version (Revision 8) of the Solomon Project MCP (Fortescue 2013c). Comments received on previous revisions of the MCP have been resolved and communicated to the relevant groups.

Fortescue meets with relevant Native Title Working Groups on a regular basis, and will continue to do so throughout the life of the Solomon Project. These discussions cover a broad range of subjects, including closure, and will inform future revisions of this MCP.
Table 5: Stakeholder comments arising from Version 8 of the Solomon Project Mine Closure Plan

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Issue/Comment</th>
<th>Management measures/comment</th>
</tr>
</thead>
</table>
| DMP (14/11/13) | Completion Criteria.  
  - Measurement tools must be added in the next version of the MCP.  
  - Revisions to completion criteria listed must be included in the next version of the MCP.  
  - Firetail and the Kings/Queens pits should be separated into two separate domains in the next version of the MCP  
  - Specific completion criteria must be added for each version of the MCP. | Refer Section 6  
Refer Section 6.2  
Refer Section 2.4. All pits are considered as Domain 2.  
Refer Section 6 |
| Surface Water Management at Closure.  
  Further evidence is to be provided in the next version of the MCP which demonstrates that the initial flush of sediment from backfilled pits and rehabilitated areas during the first major storm event post-closure will not have a detrimental impact on vegetation downstream. | Refer Section 8.4.2. This will continue to be investigated by Fortescue through progressive rehabilitation trials |
| Identification and Management of Closure Issues.  
  The next version of the MCP must include proposed management actions for identified closure issues (e.g. Section 9.8). If management actions are unknown, the required research, trials and investigations must be detailed on the next versions of the mine closure plan. | Refer Section 9 |
| Temporary Closure.  
  Further investigations are required into methods to effectively control dust generation from the TSF in the event that deposition of tailings ceases for an extended period of time (i.e. Under a Care and Maintenance scenario). | Refer Section 9.5 |
5. POST MINING LAND USE AND CLOSURE OBJECTIVES

5.1 Final Land Use

The existing tenure for the Solomon Project (refer Figure 2) includes:

- UCL that is proposed to be returned to UCL; and
- Hamersley Station and Mt Florence pastoral leases proposed to be returned to pastoral use (low intensity grazing).

The mine closure domains (Section 2.4) are located on UCL, with the exception of a small part of the Zion deposit – the eastern portion is located within the Mt Florence Pastoral Lease.

With minimal pastoral or freehold use and mining as a temporary land use, land use for UCL has been interpreted as “native vegetation”. The post mining vegetation and landforms will be relative to the surrounding UCL and pastoral land uses.

The agency responsible for UCL is the Department of Regional Development and Lands (DRDL), with the Department of Parks and Wildlife (DPaW) responsible for fire, weed and feral animal management (DRDL, 2011). As outlined in Section 4.1, DRDL, DPaW and the managers of Hamersley Station and Mt Florence pastoral leases will continue to be consulted throughout the life of the Solomon Project regarding post-mining land use.

5.2 Closure Objectives

As specified in the 2011 and 2015 MCP Guidelines, the overall objective of closure is to construct a safe (to humans and animals), stable (physically, geochemically and geotechnically), non-polluting landform that is capable of sustaining an agreed post-operational land use. Although these holistic goals may seem unassuming and straightforward at first glance their achievement, particularly for an operation covering large areas and with a long lifespan, is a complex process requiring a ‘whole of company’ approach. To successfully achieve closure goals engagement at a corporate, legal, social, planning, operations and environmental level must occur. Failure to consult with one of these groups may result in successful closure and relinquishment of tenements not being realised.

Fortescue’s internal governance procedures ensure that a ‘whole of company’ management approach is applied to closure. These include:

- Planning for Closure Standard (100-ST-EN-0001);
- Rehabilitation and Revegetation Management Plan (100-PL-EN-0023);
Rehabilitation and Revegetation Monitoring Procedure (45-PR-EN-0027);

Stakeholder Consultation Strategy (100-PH-EN-0003);

Verification of High Risk Environmental Legal Obligations Procedure 100-PR--EN-1040; and

Fortescue Risk Management Framework (100-ST-RK-0031).

Fortescue’s key closure objectives include:

- Ensure the interests of all relevant stakeholders are considered during all stages of closure planning;
- Establish rehabilitation objectives and completion criteria, based on the findings of monitoring and research, appropriate to the agreed post-operational land use;
- Where practicable, progressively rehabilitate and revegetate disturbed areas in accordance with regulatory criteria, Ministerial conditions and commitments to meet agreed post-operational land use objectives and completion criteria;
- Construct safe, stable, non-polluting landforms that are geomorphologically and functionally consistent with the surrounding landscape and capable of sustaining agreed post-operational land use. Landforms are not to impact on surrounding environmental values or uses; and
- Develop indicators to demonstrate when rehabilitation activities meet the established objectives and completion criteria.

Through the implementation of the above closure objectives:

- no significant, long-term physical off-site impacts will occur as a result of operations;
- no significant long-term impact on baseline surface or groundwater flow patterns and quality will occur as a result of operations;
- no unsafe areas will remain after closure whereby members of the general public and animals could be harmed; and
- rehabilitated and closed operational areas will be aesthetically consistent with the surrounding landform and meet agreed stakeholder expectations.
6. **PROVISIONAL COMPLETION CRITERIA**

Completion criteria are measurable targets against which closure implementation and subsequent performance can be assessed. Fortescue applies an adaptive management approach (Section 8.5) to the development of completion criteria, with identification of provisional criteria commencing during early project approval stages, following stakeholder consultation and collection of baseline data. These provisional completion criteria are continually reviewed and updated throughout the entire LOM (i.e. iterative feedback loop refer Figure 4) as expectations of relevant stakeholders change over time and in response to ongoing monitoring, research and trial rehabilitation information.

Fortescue believes that completion criteria should be achievable, realistic and be aligned with stakeholder expectations. They should not be developed in isolation and should be intricately linked to:

- broad closure objectives (i.e. safe, stable, non-polluting and sustainable);
- stakeholder-agreed post-operational land use; and
- monitoring approach (i.e. to guide what parameters are monitored and ensure no redundancy in monitoring approach).

![Figure 4: Relationship between Completion Criteria and Other Aspects of the Closure Process](image-url)
6.1 Basis for Development

The Solomon Project is considered to be in the early stages of development. To date, mining has commenced at two deposits - Firetail and Kings - with an additional five known mining areas yet to be developed. Mining activities have been underway since 2012 and are planned to continue until approximately 2050. As such, Fortescue considers that the development of provisional completion criteria for the Solomon Project is appropriate.

Provisional completion criteria for the Solomon Project have been developed within the framework of Fortescue’s overarching EMS. Provisional completion criteria were developed in accordance with the following documents:

- *Guidelines for Preparing Mine Closure Plans* (EPA/DMP, 2011; 2014);
- *Strategic Framework for Mine Closure* (ANZMEC & MCA, 2000);
- *Rehabilitation of Terrestrial Ecosystems* (EPA, 2006);
- Leading Practice Sustainable Development Program for the Mining Industry Handbooks for *Mine Closure and Completion* (DITR, 2006), *Mine Rehabilitation* (DITR, 2006) and *Evaluation Performance: Monitoring and Auditing* (DITR, 2006);
- *Planning for Integrated Mine Closure Toolkit* (ICMM, 2008);
- *Good Practice Guidance for Mining and Biodiversity* (ICMM, 2006); and

Fortescue believes that completion criteria should:

- be specific enough to reflect unique environmental, social and economic circumstances;
- be flexible enough to adapt to changing circumstances without compromising objectives;
- include environmental indicators suitable for demonstrating that rehabilitation trends are heading in the right direction;
- undergo periodic review in light of changed circumstances or improved knowledge resulting in modification if required; and
- be based on targeted research which results in increasingly informed decisions.
6.2 Development of Completion Criteria

Rehabilitation objectives for a mine feature (e.g. mine pit, WRD) are primarily based on the closure objectives and agreed post mine land use. Fortescue’s rehabilitation objectives for landforms are to ensure that they are safe, stable and non-polluting whilst being capable of sustaining agreed post operational land use.

The purpose of monitoring against completion criteria is to demonstrate that a given area or landform has achieved the rehabilitation objectives and provide confidence to regulators and post operational land users that these areas or landforms are capable of sustaining over the long term the agreed post operational land use, utilising normal management practices.

The development of completion criteria will continue throughout the operational period of the mine to allow integration of data from ongoing rehabilitation trials, research and monitoring. The goals of this development are to progressively refine monitoring activities and rehabilitation to develop measurable metrics based on site specific data, providing confidence that completion criteria can fulfil the intended role within the mine closure planning framework.

Provisional completion criteria developed for use by Fortescue are presented in Table 6.
### Table 6: Closure Objectives and Completion Criteria

<table>
<thead>
<tr>
<th>Subject</th>
<th>Objective</th>
<th>Domain</th>
<th>Criteria</th>
<th>Verification Tools</th>
<th>MCP Section</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Safety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Safety</td>
<td>Site is safe for use under the agreed post mine land use</td>
<td>All</td>
<td>Hazards which may endanger safety of humans or animals are identified and eliminated where possible. Residual safety hazards have been identified and appropriate management controls developed and implemented.</td>
<td>Relevant regulator guidelines have been met. Mine safety inspection audit.</td>
<td>Sections 8 and 10</td>
</tr>
<tr>
<td>1.2 Landform safety</td>
<td>Final landforms are safe</td>
<td>All</td>
<td>Landforms have been constructed as per management and operation guidelines for each domain: Solomon Project Waste Rock Dump Closure Plan (SO-PL-EN-0004) Solomon TSF1 Raise and Trinity WRD – Closure Plan (SO-PL-IF-0001)</td>
<td>Rehabilitation monitoring confirms landforms constructed to design guidelines. Monitoring results display landform safety in relation to design criteria, geotechnical audits and relevant guidelines.</td>
<td>Sections 9 and 10</td>
</tr>
<tr>
<td><strong>2. Stability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Landform Stability</td>
<td>Final landforms are stable</td>
<td>All (excluding mine voids)</td>
<td>Landforms have been constructed as per management and operation guidelines for each domain: Solomon Project Waste Rock Dump Closure Plan (SO-PL-EN-0004) Solomon TSF1 Raise and Trinity WRD – Closure Plan (SO-PL-IF-0001)</td>
<td>Rehabilitation monitoring programs and geotechnical audits to confirm landforms constructed to design guidelines.</td>
<td>Sections 9 and 10</td>
</tr>
<tr>
<td>2.2 Surface Stability</td>
<td>Constructed surface is stable and does not display significant erosion</td>
<td>All (excluding mine voids)</td>
<td>Surface of landforms have been constructed in accordance with guideline specifications for each domain: Solomon Project Waste Rock Dump Closure Plan (SO-PL-EN-0004) Solomon TSF1 Raise and Trinity WRD – Closure Plan (SO-PL-IF-0001)</td>
<td>Rehabilitation monitoring confirms landform surfaces constructed to design guidelines. Rehabilitation monitoring results indicate surface is stable.</td>
<td>Sections 9 and 10</td>
</tr>
<tr>
<td><strong>3. Pollution</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Sedimentation</td>
<td>Landform surfaces not prone to sediment transport beyond natural</td>
<td>All (excluding mine voids)</td>
<td>Surface of landforms have been constructed in accordance with guideline specifications for each domain: Solomon Project Waste Rock Dump Closure Plan (SO-PL-EN-0004) Solomon TSF1 Raise and Trinity WRD – Closure Plan (SO-PL-IF-0001)</td>
<td>Rehabilitation monitoring confirms landform surfaces constructed to design guidelines.</td>
<td>Sections 9 and 10</td>
</tr>
<tr>
<td>Subject</td>
<td>Objective</td>
<td>Domain</td>
<td>Criteria</td>
<td>Verification Tools</td>
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<td>-------------</td>
</tr>
</tbody>
</table>
|         |           |        | • Solomon Project Waste Rock Dump Closure Plan (SO-PL-EN-0004)  
|         |           |        | • Solomon TSF1 Raise and Trinity WRD – Closure Plan (SO-PL-IF-0001) | Backfill monitoring confirms geomorphological stability of reconstructed surface is consistent with natural systems. Monitoring completed as per the Rehabilitation and Revegetation Monitoring Procedure (45-PR-EN-0027). |            |
|         |           |        |          | Monitoring reports generated through Fortescue’s Acid and/or Metalliferous Drainage Plan (100-PL-EN-1016) indicate material is appropriately managed. | Sections 8 and 10 |
| 3.2 Acid and/or Metalliferous Drainage | Acid and/or metalliferous drainage is appropriately managed | All | Waste material used in landform construction is characterised through Fortescue’s Guideline Planning for Closure – Characterisation of Mineral Waste Rock and Soils (100-GU-EN-0018). | Monitoring monitoring confirms landform surfaces constructed to design guidelines. | Sections 9 and 10 |
| 4. Sustainability | Rehabilitation is sustainable and suitable for the agreed post mine land use | All where relevant | Rehabilitation activities are carried out in accordance with Fortescue’s Rehabilitation and Revegetation Management Plan (100-PL-EN-0023). | Monitoring reports generated through Fortescue’s Rehabilitation and Revegetation Monitoring Procedure (45-PR-EN-0027). | Sections 8 and 10 |
| 4.2 Growth medium | Suitable growth medium is in place to facilitate rehabilitation and agreed post mine land use | All (except voids) | Surface of landforms have been constructed in accordance with guideline specifications for each domain:  
- Solomon Project Waste Rock Dump Closure Plan (SO-PL-EN-0004)  
- Solomon TSF1 Raise and Trinity WRD – Closure Plan (SO-PL-IF-0001) | Rehabilitation monitoring confirms landform surfaces constructed to design guidelines. | Sections 8 and 10 |
<p>| 4.3 Vegetation development | Vegetation is suited to the agreed post mine land use | All (except voids) | Rehabilitation activities are carried out in accordance with Fortescue’s Rehabilitation and Revegetation Management Plan (100-PL-EN-0023). | Monitoring reports generated through Fortescue’s Rehabilitation and Revegetation Monitoring Procedure (45-PR-EN-0027). | Sections 8 and 10 |
| 4.4 Provenance | Vegetation is of local provenance | All | Rehabilitation activities are carried out in accordance with Fortescue’s Rehabilitation and Revegetation Management Plan (100-PL-EN-0023) and supporting documentation | Monitoring reports generated through Fortescue’s Rehabilitation and Revegetation Monitoring Procedure (45-PR-EN-0027). | Sections 8 and 10 |</p>
<table>
<thead>
<tr>
<th>Subject</th>
<th>Objective</th>
<th>Domain</th>
<th>Criteria</th>
<th>Verification Tools</th>
<th>MCP Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5 Weeds</td>
<td>Presence of weeds does not limit the sustainability of rehabilitation or its potential to sustain agreed post mine land use</td>
<td>All</td>
<td>Rehabilitation activities are carried out in accordance with Fortescue’s <em>Rehabilitation and Revegetation Management Plan</em> (100-PL-EN-0023). Weed management is carried out in accordance with Fortescue’s <em>Weed Management Plan</em> (45-PL-EN-0013).</td>
<td>Monitoring reports generated through Fortescue’s <em>Rehabilitation and Revegetation Monitoring Procedure</em> (45-PR-EN-0027).</td>
<td>Sections 8 and 10</td>
</tr>
<tr>
<td>5. Hydrology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 5.1 Surface Hydrology | Mining related impacts on natural surface water flows is minimised | All    | Landforms have been constructed as per management and operation guidelines for each domain:  
  - *Solomon Project Waste Rock Dump Closure Plan* (SO-PL-EN-0004)  
  - *Solomon TSF1 Raise and Trinity WRD – Closure Plan* (SO-PL-IF-0001)  
  Rehabilitation monitoring confirms landforms constructed to design guidelines.  
  Backfill monitoring confirms geomorphological stability of reconstructed surface is consistent with natural systems  
  Surface water monitoring confirms backfilled pit voids do not negatively impact on downstream surface water quality.                                                                                                                                                                                                                                                                                                                                                       | Sections 9 and 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              |
| 5.2 Groundwater Hydrology | Mining related impacts on groundwater quality have been minimised | All    | Landforms have been constructed as per management and operation guidelines for each domain:  
  - *Solomon Project Waste Rock Dump Closure Plan* (SO-PL-EN-0004)  
  - *Solomon TSF1 Raise and Trinity WRD – Closure Plan* (SO-PL-IF-0001)  
  Rehabilitation monitoring confirms landforms constructed to design guidelines.  
  Groundwater monitoring confirms that backfilled pit voids do not negatively impact on downstream groundwater quality.                                                                                                                                                                                                                                                                                                                                                       | Sections 9 and 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              |
| 6. Miscellaneous  |                                                                             |        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |
| 6.1 Visual Amenity | Visual amenity of constructed landforms are                               | All (except voids) | Landforms have been constructed as per management and operation guidelines for each domain:  
  Rehabilitation monitoring confirms landforms constructed to design guidelines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Sections 9 and 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |              |
<table>
<thead>
<tr>
<th>Subject</th>
<th>Objective</th>
<th>Domain</th>
<th>Criteria</th>
<th>Verification Tools</th>
<th>MCP Section</th>
</tr>
</thead>
</table>
| compatible with local landforms | | All | • Solomon Project Waste Rock Dump Closure Plan (SO-PL-EN-0004)  
• Solomon TSF1 Raise and Trinity WRD – Closure Plan (SO-PL-IF-0001) | Environmental reports available for review. | |
| 6.2 Heritage | No disturbance of heritage sites during rehabilitation and access to sites of significance preserved | All | Landforms have been constructed as per management and operation guidelines for each domain:  
• Solomon Project Waste Rock Dump Closure Plan (SO-PL-EN-0004)  
• Solomon TSF1 Raise and Trinity WRD – Closure Plan (SO-PL-IF-0001)  
Rehabilitation activities are carried out in accordance with Fortescue’s Rehabilitation and Revegetation Management Plan (100-PL-EN-0023).  
Fortescue’s Stakeholder Consultation Strategy (100-PH-EN-0003) has been adhered to.  
Fortescue’s Ground Disturbance Permits Procedure (100-PR-EN-0004) has been adhered to.  
Fortescue’s Guideline for the Management of Aboriginal Cultural Heritage (100-GU-HE-0003 Rev 2) has been adhered to.  
Fortescue’s Land Access Agreements (LAA) and Heritage Agreements have been adhered to. | Rehabilitation monitoring confirms landforms constructed to design guidelines.  
Stakeholder register has been completed  
Site heritage register has been maintained.  
Compliance audits of Ground Disturbance Permit Procedure  
Compliance audits of Fortescue’s Heritage Management Guidelines and LAA. | Sections 9 and 10 |
7. ANALYSIS OF CLOSURE DATA

7.1 Interim Biogeographic Regionalisation of Australia

The Solomon Project is situated within the Pilbara Bioregion of WA in the Interim Biogeographic Regionalisation of Australia (IBRA). The Pilbara Region can be divided into four subregions: Chichester (PIL1), Fortescue Plains (PIL2), Hamersley (PIL3) and Roebourne (PIL4). The Solomon Project is located within the Hamersley subregion, and is described by Kendrick (2001) as follows:

“The Hamersley subregion is the Southern section of the Pilbara Craton. Mountainous area of Proterozoic sedimentary ranges and plateau, dissected by gorges (basalt, shale and dolerite). Mulga low woodland over bunch grasses on fine textured soils in valley floors, and Eucalyptus leucophloia over Triodia brizoides on skeletal soils of the ranges. The climate is Semi-desert tropical, average 300 mm rainfall, usually in summer cyclonic or thunderstorm events. Winter rain is not uncommon. Drainage into either the Fortescue (to the north), the Ashburton to the south, or the Robe to the west. Subregional area is 6,215,092 ha.”

7.2 Climate

As mentioned above, the climate of the Hamersley subregion is classified as semi-desert tropical, characterised by hot dry summers (October to April) and mild winters (May to September). Rainfall peaks during the summer months. Climatic conditions in the Pilbara are influenced by tropical cyclone systems that produce heavy rainfall, predominantly between January and March. Rainfall during May and June is generally less significant and is a result of cold fronts extending north into the Pilbara.

The closest Bureau of Meteorology (BoM) operating weather station is located in Wittenoom, approximately 50 km east of the Solomon Project area (Station Number: 005026). Wittenoom receives an average of 461.7 millimetres (mm) of rainfall per annum (Figure 5). Monthly mean rainfall for Wittenoom ranges from 3.1 mm in September to 115.3 mm in January (BoM 2014). The mean monthly maximum temperature ranges from 24.3 degrees Celsius (°C) in July to 39.6 °C in December while the mean monthly minimum temperature ranges from 11.5 °C in July to 26.0 °C in January (BoM 2014).
The intensity frequency duration (IFD) design rainfall depth data for the Solomon Project is presented in Table 7. The design rainfall depth for a 72 hour duration, 1% annual exceedance probability (AEP) event is 433.3 mm total (BoM 2014).

### Table 7: Rainfall depth, frequency and duration for the Solomon Project

<table>
<thead>
<tr>
<th>Duration</th>
<th>1 EY(^1)</th>
<th>5% AEP</th>
<th>10% AEP</th>
<th>20% AEP</th>
<th>50% AEP</th>
<th>2% AEP</th>
<th>1% AEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 minutes</td>
<td>5.9</td>
<td>6.7</td>
<td>9.4</td>
<td>11.2</td>
<td>13</td>
<td>15.4</td>
<td>17.2</td>
</tr>
<tr>
<td>10 minutes</td>
<td>10</td>
<td>11.5</td>
<td>16.2</td>
<td>19.5</td>
<td>22.7</td>
<td>27</td>
<td>30.3</td>
</tr>
<tr>
<td>20 minutes</td>
<td>12.8</td>
<td>14.8</td>
<td>20.8</td>
<td>25</td>
<td>29.1</td>
<td>34.6</td>
<td>38.9</td>
</tr>
<tr>
<td>30 minutes</td>
<td>17.8</td>
<td>20.4</td>
<td>28.6</td>
<td>34.2</td>
<td>39.7</td>
<td>47</td>
<td>52.7</td>
</tr>
<tr>
<td>1 hour</td>
<td>22.6</td>
<td>25.8</td>
<td>36.1</td>
<td>43</td>
<td>49.8</td>
<td>58.8</td>
<td>65.7</td>
</tr>
<tr>
<td>2 hours</td>
<td>27.5</td>
<td>31.5</td>
<td>44.4</td>
<td>53.2</td>
<td>61.9</td>
<td>73.6</td>
<td>82.6</td>
</tr>
<tr>
<td>3 hours</td>
<td>30.8</td>
<td>35.5</td>
<td>50.7</td>
<td>61.2</td>
<td>71.8</td>
<td>86.1</td>
<td>97.2</td>
</tr>
<tr>
<td>6 hours</td>
<td>38</td>
<td>44.5</td>
<td>65.7</td>
<td>81.2</td>
<td>97</td>
<td>119.1</td>
<td>137.1</td>
</tr>
<tr>
<td>12 hours</td>
<td>48.3</td>
<td>57.4</td>
<td>88.5</td>
<td>112.1</td>
<td>137.1</td>
<td>173.4</td>
<td>204</td>
</tr>
<tr>
<td>24 hours</td>
<td>61.8</td>
<td>74.5</td>
<td>119.1</td>
<td>154</td>
<td>192.1</td>
<td>249.2</td>
<td>298.7</td>
</tr>
<tr>
<td>48 hours</td>
<td>77.1</td>
<td>93.3</td>
<td>151.4</td>
<td>197.5</td>
<td>248.7</td>
<td>326.6</td>
<td>395.1</td>
</tr>
<tr>
<td>72 hours</td>
<td>85.1</td>
<td>102.9</td>
<td>166.4</td>
<td>216.6</td>
<td>272.6</td>
<td>358</td>
<td>433.3</td>
</tr>
</tbody>
</table>

\(^{1}\) EY denotes exceedances per year
7.2.2 Climate Change

The planned LOM is in excess of 35 years and revegetation of final disturbed areas post mining will take several seasons post establishment to achieve species diversity and stability. Hence, it is important to recognise climate change in regards to revegetation outcomes. As a hotter, drier climate is expected (Pitcock 2009), this might mean that attempts to re-establish baseline communities (identified now) are no longer a realistic option. It should be noted though that any changes in climate would be gradual and experienced by the natural areas and rehabilitated areas alike.

If the effects of climate change are experienced in the Pilbara the completion criteria and rehabilitation plans for future areas of rehabilitation would be modified accordingly.

7.3 Regional Geology

The Fortescue Province lies over the Pilbara Craton. The Hamersley Range was formed on the late Archaean-Palaeoproterozoic metamorphosed banded iron formation, shales, dolerite, carbonate, chert and rhyolite of the south Pilbara sub-basin (URS, 2010b). The Hamersley Basin has three major stratigraphic units (Fortescue, Hamersley and Turee Creek Groups) collectively called the Mount Bruce Supergroup. The valley floor is associated with colluvium, robe pisolite and a small amount of alluvium. Geographical mapping of the Mount Bruce Supergroup indicates two geological formations; the Mount (Mt) McRae and Mt Sylvia Formation, and the Brockman Iron Formation (Ecoscape, 2010b).

7.4 Topography and Landforms

The major topographical unit of the Solomon Project area is the Hamersley Plateau, which is described as rounded hills and ranges, mainly of jaspilite and dolomite with some shale, siltstone and volcanics (URS, 2010b).

Land system mapping was completed for the Pilbara region with Payne et al. (2002) delineating the region into a system of mapping units. These land units occur in association with characteristic physiographic types (URS, 2010b). The proposed components traverse three land system units, as described below:

- Boolgeeda Land System - Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands;
- Platform Land System – dissected slopes and raised plains supporting hard Spinifex grasslands; and
- Newman Land System – rugged jaspilite plateau, ridges and mountains supporting hard Spinifex grasslands.
7.5 Soil Characteristics

Fortescue has completed a physicochemical characterisation of the growth medium found in the Solomon Project area and specifically within the footprints of the mine pits and WRDs. This work was completed by both Outback Ecology (2011) and Tetra Tech (2011b). Across the Solomon Project area five major soil management units were identified including Ridgelines, Scree Slopes, Low Rises, Stony Plains and Drainage Lines.

Ridgelines

The soil material from the ridgelines is characterised by a large amount of coarse material. The soil is generally single-grained with little to no structure and is interspersed throughout large coarse fragments. The ridgelines are characterised by frequent rock outcropping. The surface mantle of coarse material protects the weakly structured soil material from accelerated erosion. Soil material can be stripped from these areas to a depth of 20 centimetres (cm). Competent or semi-weathered rock generally occurs at depths greater than 20 cm. However, in some localised areas the depth of topsoil material extends to 50 cm.

Scree Slopes

Soil material from the scree slopes had similar physical properties to material from the ridgelines, except that the profile depth of the scree slopes was limited to depths of 10 to 20 cm. Material from the scree slopes had limited soil structure and the profile was dominated by large coarse fragments. The surface soil material is likely to be suitable for placement on the upper, mid and lower slopes of WRDs (Outback Ecology 2011).

Low Rises

The material from low rises is variable due to the undulating topography of these areas. The profile depth of suitable soil material at the survey sites ranged from <20 to 150 cm. Areas which only have shallow depths of soil material usually have a layer of competent or semi-weathered rock near the surface. The surface material is typically single-grained with few soil aggregates and is dominated by coarse fragments. The surface profile has moderate amounts of root material and a vegetation cover of greater than 60%. These soils are suitable for placement on the mid and lower slopes of WRDs (Outback Ecology 2011).

Stony Plains

Soil material from the stony plains of the Valley of the Kings is classified as loamy sand with some aggregates of a weak to moderate consistence. The soil profiles had relatively low amounts of coarse fragments, particularly within the upper layers (0 to 20 cm depth). These soils were classified as non-hardsetting, and exhibited moderately slow drainage. The soils
have a neutral pH and are non-saline. Organic carbon content and nutrient status was low throughout the profiles.

**Drainage Lines**

These soils have significantly fewer coarse fragments and have moderate soil structure with distinct soil aggregates. The profile typically has a layer of deposited riverbed cobble and pebble material over a layer of single-grained sandy loam material. Surface material from these areas is prone to erosion because they are focal points for surface flow and it is fine-textured. Minimising the disturbance area when clearing and stripping this material will limit the risk of erosion and downstream effects on the broader catchment.

### 7.6 Waste Rock and Tailings Characterisation

Detailed acid base accounting (ABA), total element concentration and short-term leaching tests have been conducted as part of the Life of Mine Geochemistry Programme (Tetra Tech 2014a-c; Tetra Tech 2015a) to comply with the *Acid and Metalliferous Drainage Management Plan 100-PL-EN-1016* (Fortescue, 2014c) and to build on the initial studies conducted by Graeme Campbell and Associates (GCA) (2010a-d) and Tetra Tech (2011a-b). Characterisation test work has focused on all potential sources of contamination and AMD according to *Managing Acid and Metalliferous Drainage* (DITR, 2007): waste rock, ore stockpiles, pit walls and tailings material. A detailed sampling plan was developed for collection of sufficient volumes of samples in proportion to the amount of material to be disturbed (Tetra Tech, 2014a).

The acid and metalliferous drainage testing programme is ongoing and a summary of geochemical studies conducted at Solomon are listed Table 8 and the results of the testing programme is discussed in the following sections.

#### 7.6.1 Site Specific Trigger Values

In order to evaluate soluble metal concentrations and determine whether waste leachates are likely to pose a risk to the environment, Site Specific Trigger Values (SSTV) have been developed based on the upper limits of local groundwater element concentrations. The detailed assessment and development of the SSTV is given in Fortescue’s *Life of Mine Geochemistry Programme Site Specific Trigger Values* (45-SY-EN-0001) (Fortescue, 2015).
Table 8: Summary Table – Sample Number and Analysis Performed related to Solomon Geochemical Characterisation Programme (Tetra Tech, 2015a)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Static Testing</th>
<th>Kinetic Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>XRF ABA NAG</td>
<td>Total Element</td>
</tr>
<tr>
<td>(GCA, 2010a)</td>
<td>18,917</td>
<td></td>
</tr>
<tr>
<td>(GCA, 2010b)</td>
<td>9,094</td>
<td></td>
</tr>
<tr>
<td>(GCA, 2010c)</td>
<td>- 23 23</td>
<td>6: full suite; 17: As, Sb, Se, Mo &amp; B</td>
</tr>
<tr>
<td>(GCA, 2010d)</td>
<td>- 21 21</td>
<td>6: full suite; 15: As, Sb, Se, Mo &amp; B</td>
</tr>
<tr>
<td>(Tetra Tech, 2011b)</td>
<td>- 25 -</td>
<td>44</td>
</tr>
<tr>
<td>(Tetra Tech, 2011c)</td>
<td>- 43 - 50</td>
<td>50</td>
</tr>
<tr>
<td>(Tetra Tech, 2012a)</td>
<td>- - -</td>
<td>-</td>
</tr>
<tr>
<td>(Tetra Tech, 2013a)</td>
<td>50 50 50</td>
<td>50</td>
</tr>
<tr>
<td>(Tetra Tech, 2014d)</td>
<td>- 74 74 74</td>
<td>74</td>
</tr>
<tr>
<td>(Tetra Tech, 2014e)</td>
<td>- - -</td>
<td>-</td>
</tr>
<tr>
<td>(Tetra Tech, 2015b)</td>
<td>- 66 66 66</td>
<td>66</td>
</tr>
<tr>
<td>(Fortescue, 2015g)</td>
<td>- 81 81 81</td>
<td>81</td>
</tr>
<tr>
<td>4th Quarter</td>
<td>- 110 110 110</td>
<td>110</td>
</tr>
<tr>
<td>(GCA, 2011)</td>
<td>- 3 3 3</td>
<td>3</td>
</tr>
<tr>
<td>(Tetra Tech, 2012a)</td>
<td>- 3 3 3</td>
<td>3</td>
</tr>
<tr>
<td>(Tetra Tech, 2012b)</td>
<td>- - -</td>
<td>-</td>
</tr>
<tr>
<td>(SRK, 2014a)</td>
<td>- 1 1 1</td>
<td>1</td>
</tr>
<tr>
<td>(Tetra Tech, 2014b)</td>
<td>-</td>
<td>(8 samples reported on again in (Tetra Tech, 2014d))</td>
</tr>
<tr>
<td>(Tetra Tech, 2014d)</td>
<td>- 13 13 13</td>
<td>13</td>
</tr>
<tr>
<td>(Tetra Tech, 2015b)</td>
<td>- 12 12 12</td>
<td>12</td>
</tr>
<tr>
<td>(Fortescue, 2015g)</td>
<td>- 13 13 13</td>
<td>13</td>
</tr>
<tr>
<td>(Fortescue, 2015d)</td>
<td>(32 samples reported in (Tetra Tech, 2014d; Tetra Tech, 2015b; Fortescue, 2015g))</td>
<td>3 for 18-40 weeks</td>
</tr>
<tr>
<td>4th Quarter</td>
<td>- 13 13 13</td>
<td>13</td>
</tr>
<tr>
<td>(GCA, 2010c)</td>
<td>- 11 11</td>
<td>5: full suite; 6: As, Sb, Se, Mo &amp; B</td>
</tr>
<tr>
<td>(GCA, 2010d)</td>
<td>- 7 7</td>
<td>4: full suite; 3: As, Sb, Se, Mo &amp; B</td>
</tr>
<tr>
<td>(Tetra Tech, 2012a)</td>
<td>- 1 1 1</td>
<td>1</td>
</tr>
<tr>
<td>(Tetra Tech, 2012b)</td>
<td>- - -</td>
<td>-</td>
</tr>
<tr>
<td>(Tetra Tech, 2014d)</td>
<td>- 9 9 9</td>
<td>9</td>
</tr>
<tr>
<td>(Tetra Tech, 2015b)</td>
<td>- 6 6 6</td>
<td>6</td>
</tr>
<tr>
<td>(Fortescue, 2015g)</td>
<td>- 9 9 9</td>
<td>9</td>
</tr>
<tr>
<td>4th Quarter</td>
<td>- 8 8 8</td>
<td>8</td>
</tr>
</tbody>
</table>
7.6.2 Acid Drainage Potential

Acid base accounting has been conducted on approximately 540 waste rock, pit wall or ore stockpiles with an additional 58 samples of tailings material tested. The majority of samples are classified as non-acid forming with a number being classified as uncertain-unlikely, where the Net Acid Generation (NAG) pH is greater than 4.5, but the Net Acid Production Potential (NAPP) is positive.

The unweathered Mt McRae Shale Formation was identified in the exploration phase as containing significant sulfide material that may pose a risk for acidic drainage. This Formation occurs below the ore body and will not be excavated or exposed. Some samples (6) of the basal Dales Gorge Member (BDb) have given NAG pH values below 5 indicating a minor potential for acid generation. The capacity of this material to generate acid is very low as sulfide concentrations are below detection limits and the low pH is as a result of a very low neutralising potential.

An elevated organic material lens in the western-most area of Queens has been identified. This material has not been analysed according to the acid-base accounting method but has been assayed by x-ray fluorescence (XRF) for the routine geological suite of grade control elements and several samples were sent for analysis of organic carbon. Based on these analyses and observations of diamond core in the field, it was determined that this material is similar to a peat or a low-grade lignite. Considering the paleo-environment in which such a deposit would form, that of a bog or marsh, typically a reducing environment, it has been assumed that all the sulphur assayed occurs as sulfide. Sulphur concentrations range from 0.007 – 4.4% (n=231) with 50% of the assays indicating sulphur greater than 0.5%. As a result of these factors, it is assumed as a precaution that this material will be acid forming, without undertaking detailed ABA tests. Following the accepted management strategy for unweathered Mt McRae Shale, this material in Queens will not be excavated or dewatered.

The acid potential of overburden waste rock, pit wall, ore stockpile and tailings material is low.

7.6.3 Saline Drainage Potential

The range of salinity for short-term leach testing for waste rock, ore stockpile or pit wall material is 2 – 431 µS/cm. This is well below the regional groundwater saline range where the 95th percentile trigger value is 1,030 µS/cm. Waste rock is not considered to pose a risk for saline drainage.

Tailings supernatant solutions have salinity ranges of 447 – 1,310 µS/cm, which is elevated above local groundwater concentrations. The risk of saline drainage from tailings is moderate. The severity of this potential risk is low as tailing supernatant solution is only
slightly elevated above local groundwater conditions and when this salinity is compared to
the distribution of salinity across the greater Solomon area, it can be seen that on a regional
scale, there is considerably greater variation in salinity, and tailings seepage of
800 – 1,300 µS/cm is unlikely to have a significant effect on water quality. The potential for
significant seepage from TSF is also reduced by low permeability.

7.6.4 Metalliferous Drainage Potential

When comparing the overburden, ore stockpile and pit wall water leaching potential to the
local groundwater concentration as estimation of metalliferous potential can be made.

Metalliferous drainage potential is low with only 2 % of recent analyses exceeding the SSTV
for leach testing. The majority of these exceedances occur for aluminium, mercury, titanium
and tungsten. The source of tungsten is likely an artefact from the drill bit or from the milling
balls. The mercury concentration is highly correlated with the tungsten concentration which
is known to interfere with mercury detection and has been reported to be an analytical error.
Titanium is a non-toxic element and is not of concern. Aluminium concentrations range from
<0.005 to 0.49 mg/L. Aluminium is detected in leach solutions from many different rock types
and tailings material and may potentially be a concern. Arid conditions and lower
permeability of waste material is likely to reduce the potential of this element to leach and
groundwater concentrations will be monitored.

Tailing metalliferous drainage has been examined in detail in two studies assessing whether
in-pit tailings disposal has the potential to negatively impact groundwater (Tetra Tech,
2014d; Fortescue, 2015b). Approximately 9 % of analysed parameters exceed the SSTV in
the supernatant solution. The majority of these analyses are the highly soluble major ions
chloride, potassium, sodium, fluoride and sulphate as well as minor soluble elements
boron, strontium and titanium, which have low toxicity. The risk of metalliferous drainage
from Solomon tailings is considered low.

7.6.5 Fibrous Materials

A total of 37 samples have been submitted for asbestos determinations in three separate
studies (Tetra Tech 2011b, 2012b, 2013a). None of the samples showed any evidence of
asbestiform minerals being present. Coffey Environments Australia Pty Ltd was
commissioned by Fortescue to conduct airborne fibre monitoring at various locations
throughout the Solomon Project; the monitoring was conducted in January 2013. The results
of this monitoring showed that all samples were below the National Exposure Standard of
0.1 fibres/mL (Coffey 2013). If fibrous material is identified, it will be managed in accordance
with Asbestos Management (45-PR-SA-0024).
7.6.6 Dispersive Materials

The geotechnical properties and characteristics of the Solomon waste rock materials have been thoroughly investigated, as well as successfully used in waste dumps and TSF embankments at Solomon. The waste rock materials have been characterised as very competent rock/soil, with very little to no geotechnically deleterious material such as weak or swelling clay.

The characterisation of the alluvial/detrital waste rock material has been investigated and quantified during field and laboratory testing programs including investigations for the TSF design and a detailed mining geotechnical study (SRK, 2014).

The alluvial/detrital material is the dominant waste rock type in the Kings/Queens area, comprising well-graded gravel and oversized cobble- to boulder-sized particles. The fines are a minor fraction and have low plasticity and are characterised as non-dispersive. At low stresses friction angles range between $30^\circ$ and $40^\circ$. The dominant waste material within the Firetail deposits is from the Dales Gorge Unit. At low stresses friction angles range between $33^\circ$ and $41^\circ$. Both waste rock types are durable and erosion resistant and given the overall geotechnical characteristics of these materials, they will facilitate effective closure and rehabilitation.

7.7 Surface Water

The existing surface water and landform characteristics of the Solomon Project area are summarised as follows:

- creek lines are ephemeral;
- rugged hill tops and ridges with cliff escarpment faces and steep erosional or palaeo-landslide scarps;
- steep, stony mid slopes and scree slopes with dense to moderately spaced dendritic and sub-parallel drainage;
- gently undulating stony lower slopes with some incision; and
- flat, stony valley floors with wide, flat river channels.

Figure 6 outlines the pre-mining surface water drainage network for the Solomon Project area.
The mining area lies in catchments of three main creek systems (Table 9):

Table 9: Main creek systems of the Solomon Project

<table>
<thead>
<tr>
<th>Creek system</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kangeenarina</td>
<td>Kangeenarina Creek contains the Kings, Trinity, Castle and Firetail mining areas. It flows north through the Solomon mine and then north east for approximately 14 km before discharging to the Lower Fortescue River floodplain through an alluvial fan.</td>
</tr>
<tr>
<td>Zalamea</td>
<td>Zalamea Creek is located in the eastern extent of the mine area and flows in a north easterly direction prior to discharging onto the Lower Fortescue River floodplain through an alluvial fan. The Zion and Frederick mining areas are located in the Zalamea Creek catchment, along with a portion of the Kings mining area.</td>
</tr>
<tr>
<td>Weelumurra</td>
<td>An unnamed tributary from the Queens mining area contributes to the main branch of Weelumurra Creek system through culverts under the Rio Tinto railway. The Weelumurra Creek catchment encompasses the southern and western extent of the Solomon mine area. The main channel flows in a north westerly direction around the mine area to discharge into the Lower Fortescue River floodplain through an alluvial fan. The Weelumurra Creek system is significantly larger than the Kangeenarina Creek and Zalamea Creek systems.</td>
</tr>
</tbody>
</table>

The proposed disturbance is contained wholly within the Lower Fortescue River catchment (upstream of Gregory’s Gorge).

A number of hydrologic, hydraulic and geomorphological studies of the Solomon mine area have been completed and are summarised in SO-03018-RP-WM-0003 Solomon Life of Mine Surface Water Implementation Program. Key findings from these studies and associated monitoring include the following:

- Occurrences of streamflow are limited to intense rainfall events, typically associated with tropical cyclones and large low pressure systems;
- Creeks respond rapidly to rainfall and with flows peaking and receding quickly;
- The creeks have generally been observed to be losing streams (i.e. significant volume of flow is lost to infiltration as it travels downstream);
- Stream beds and floodplains in the mining areas have been observed to have high infiltration rates, resulting in rapid recharge to the underlying aquifer, which in turn supplied the downstream groundwater pool systems;
- Erosion is a naturally occurring processing within the catchments; and
- Flood flows can reach some distance outside of the main channels, but the creeks themselves are morphologically stable, albeit displaying a highly mobile channel bed, with numerous areas of bank erosion and instability (Lesleighter 2012).
Detailed surface water management planning continues to be refined using monitoring data and is developed as an integrated component of mine planning. Management of surface water for mine closure is discussed in Section 8.4.2.

### 7.8 Groundwater

Groundwater in the Solomon Project area is associated with four major aquifer units; in descending stratigraphic order:

- alluvial, colluvial and detrital deposits within the palaeochannels which overlie the channel iron deposits (CID). The alluvial deposits can also include calcrete and silcrete deposits at palaeo water tables;

- an Upper CID unit which generally has low permeability;

- an ochreous goethite rich Lower CID unit which generally has high permeability from secondary porosity and is considered to be the primary aquifer in the Solomon Project area; and

- weathered bedrock at the base and walls of the palaeochannel valley that may have limited groundwater storage and/or permeability.

The top three units are primary aquifers that are significant to Solomon mine water management. Since the weathered bedrock has low permeability, it is not likely to have significant effects on the palaeochannel aquifer system. However, it might provide some recharge to the aquifer system in some local areas over a long term period, such as groundwater recovery after mine closure. Therefore, the weathered bedrock layer was built into the model.

The Solomon Project area contains groundwater-fed pools on several of the local watercourses including:

- **Kangeenarina Creek Pools** – various permanent and ephemeral pools on the lower reaches of the creek, north of the Kings Deposit;

- **Weelemurra Creek Pools** - various permanent and ephemeral pools on the lower reaches of the creek, west of the Queens Deposit; and

- **Zalamea Pool within the Zion Mining Area** – ephemeral pools southeast of the Kings Deposit near the headwaters of local tributaries to Kangeenarina Creek.
7.9 Flora and Vegetation

The Solomon Project area is located within the Fortescue Botanical District of the Eremaean Botanical Province (Beard, 1975). The vegetation of the Solomon Project area as described by Beard is:

- Eucalyptus isolated trees / Triodia open hummock grassland – hummock grasslands, low trees steppe; Snappy Gum (*Eucalyptus leucophloia*) over *Triodia wiseana* (Coffey Environments 2009);
- Acacia open shrub land: Low woodland, mulga (*Acacia aneura*) (Coffey 2010); and
- Short bunch grassland; savannah/grass plain (Pilbara) (Ecoscape 2010b).

The vegetation in the Kingfisher Valley falls into two broad zones: the valley base and slopes. The base of the valley is characterised by scattered low trees of *Corymbia hammersleyana* over a tall shrub land of *Acacia dictyophleba*, *Acacia inaequilatera*, and *Acacia tumida* var. *pilbarensis* with a scattered undergrowth of the shrubs *Eremophila longifolia* and Hummock Grassland, *Triodia wiseana* and *Triodia epactia*.

A total of 534 species of vascular flora from 208 genera belonging to 65 families have been found throughout the Solomon Project area. Studies were conducted between 2009 and 2014 (ecologia 2014).

The site is located in an area without a significant disturbance history but does have a number of introduced species – largely associated with pastoral activities. The introduced species in the region have not been listed as declared plants under the *Agricultural and Related Resources Protection Act 1979*, but 34 weed species have been found within 50 km of the Solomon mine. The species of highest importance to the *Environmental Weed Strategy of Western Australia* and found within the Solomon area, are Buffel Grass (*Cenchrus ciliaris*) and Birdwood Grass (*Cenchrus setiger*). Other species found are:

- *Acetosa vescaria*;
- *Aerva javanica*;
- *Alternanthera pungens*;
- *Argemone ochroleuca subsp. Ochroleuca*;
- *Bidens bipinnata*;
- *Cenchrus echinatus*;
- *Chenopodium album*;
- *Chloris virgata* (assessed as *Chloris* sp.);
- *Citrullus colocynthis;
- *Citrullus lanatus;
- *Conyza bonariensis;
- *Crotalaria juncea;
- *Cucumis melo subsp. agrestis (not assessed);
- *Cynodon dactylon;
- *Cyperus polystachyos;
- *Datura leichhardtii;
- *Digitaria ciliaris;
- *Echinochloa colona;
- *Eragrostis minor;
- *Euphorbia hirta;
- *Flaveria trinervia (not assessed);
- *Lactuca serriola;
- *Lysimachia arvensis (not assessed);
- *Malvastrum americanum;
- *Portulaca oleracea;
- *Setaria verticillata;
- *Sigesbeckia orientalis;
- *Solanum nigrum;
- *Sonchus oleraceus;
- *Trianthema portulacastrum;
- *Tribulus terrestris; and
- *Vachellia farnesiana.

No Threatened Ecological Communities (TEC) have been recorded within the Solomon Project area (ecologia 2014). One TEC is located just to the south of the Solomon Project area. A Priority Ecological Community (PEC) has been recorded within Solomon Project area (Southern Borefield). One vegetation community is considered locally significant due to its restricted extent regionally and within the Solomon Project area. No flora species recorded within the Solomon Project area are listed under Schedule 1 of the EPBC Act or
gazetted as Declared Rare pursuant to Subsection 2 of Section 23F of the *Wildlife Conservation Act 1950*.

Within the Solomon Project area, 15 further priority flora species have been recorded:

- *Aristida jerichoensis* var. *subspinulifera* (P1);
- *Teucrium pilbaranum* (P1);
- *Euphorbia australis* var. *glabra* (P2);
- *Gompholobium karijini* (P2);
- *Acacia daweana* (P3);
- *Acacia effusa* (P3);
- *Astrebla lappacea* (P3);
- *Glycine falcate* (P3);
- *Grevillea saxicola* S.J.Dillon (P3);
- *Indigofera* sp. *gilesii* (M.E. Trudgen 15869) (P3);
- *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3);
- *Triodia* sp. Millstream (A.A. Mitchell PRP207) (P3);
- *Eremophila magnifica* subsp. *magnifica* (P4);
- *Goodenia nuda* (P4);
- *Ptilotus mollis* (P4); and
- *Rhynchosia bungarensis* (P4).

### 7.10 Fauna

Vertebrate and invertebrate fauna surveys have been undertaken for the Solomon Project area (ecologia 2010a and 2010b and Ecoscape 2010c). The Solomon Project area supports eleven broad fauna habitat types, all of which are widespread throughout the region (ecologia 2014). These are described as:

- Gorges/Gullies;
- Hilltops/ridges/plateau;
- Drainage line/River/Creek (Major);
- Woodland (Open Eucalypt);
• Shrubland (Open);
• Plain (stony gibber) (includes lower slopes and midslopes);
• Plain (Cracking clay);
• Plain (Alluvial);
• Plain (stony calcrete);
• Hummock grassland; and
• Tussock grassland (on loam/clay).

**Significant Fauna Species**

Assessments of the Solomon Project area recorded over 260 terrestrial fauna species. Seventeen conservation significant fauna species were identified and are listed below (ecologia 2014):

• Northern Quoll (*Dasyurus hallucatus*) (listed under the *Wildlife Conservation Act 1950* Schedule 1 and as “Endangered” under the EPBC Act);
• Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) (Pilbara form) (*Rhinonicteris aurantia*) (Schedule 1, Vulnerable);
• Pilbara Olive Python (*Liasis olivaceus barroni*) (Schedule 1, Vulnerable);
• Eastern Great Egret (*Ardea modesta*) (Migratory);
• Fork Tailed Swift (*Apus pacificus*) (Migratory);
• Rainbow Bee-eater (*Merops ornatus*) (Migratory);
• Peregrine Falcon (*Falco peregrinus*) (Schedule 4);
• Blind snake (*Ramphotyphlops ganei*) (Priority 1);
• Pilbara Barking Gecko (*Underwoodisaurus seorsus*) (Priority 1);
• Australian Bustard (*Ardeotis australis*) (Priority 4);
• Bush Stone-curlew (*Burhinus grallarius*) (Priority 4);
• Flock Bronzewing (*Phaps histrionica*) (Priority 4);
• Ghost Bat (*Macroderma gigas*) (Priority 4);
• Lined Soil-crevice Skink (*Notoscincus butleri*) (Priority 4);
• Long-tailed Dunnart (*Sminthopsis longicaudata*) (Priority 4);
• Pebble-mound Mouse (*Pseudomys chapmani*) (Priority 4); and
Short-tailed Mouse (*Leggadina lakedownensis*) (Priority 4).

Surveys were also conducted for short range endemic fauna and subterranean fauna covering the Solomon Project area. No short-range endemic fauna species were identified (Bennelongia 2014). No subterranean fauna has been identified as likely to be restricted to the Solomon Project impact area.

Based on the ecologia (2014) survey potential Northern Quoll denning habitat and Pilbara Olive Python winter shelter habitat has been observed throughout the Solomon Project area.

### 7.11 Visual Amenity

A Visual Impact Assessment (VIA) study (Ecoscape 2010a) was completed for the Solomon Project in April 2010, in accordance with the Visual Landscape Planning Manual (Department of Planning and Infrastructure [DPI] [now Department of Planning] 2007). The Solomon Project was divided into key visual areas according to significance and accessibility of the viewing site, with particular importance on national highways, and the Karijini and Chichester National Parks. Ecoscape used Geographical Information System (GIS) software to identify viewsheds from each of the roads, where the public could potentially view the Solomon Project.

The likely impact on these viewsheds is described in Table 10:

<table>
<thead>
<tr>
<th>View Sheds</th>
<th>Impact description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tom Price Railway Road</td>
<td>The skyline is within the mid-ground (0 to 6.5 km) of the observer due to the surrounding topography of the Hamersley Ranges. A few high points further in the background may be potentially visible.</td>
</tr>
<tr>
<td>Hamersley Road</td>
<td>The skyline is in the near mid-ground (0 to 1.5 km) on the northern side of the road. The view to the south is more distant with the skyline in the background (6.5 km+).</td>
</tr>
<tr>
<td>Nanutarra Wittenoom Road</td>
<td>The skyline varies along this road, generally there are potential distant views over the flatter terrain on the northern side of the road. On the southern side, the skyline is in the mid-ground to near background (0 to 8 km) due to the presence of the Hamersley Ranges.</td>
</tr>
<tr>
<td>Fortescue Crossing Road</td>
<td>The viewshed extends across the flat terrain of the Fortescue Valley to the distant skyline of the Hamersley Ranges to the west and south of this road.</td>
</tr>
<tr>
<td>Roebourne Wittenoom Road</td>
<td>Same description as Fortescue Crossing Road.</td>
</tr>
<tr>
<td>Great Northern Highway</td>
<td>The viewshed extends to the distant skyline of the Hamersley Ranges to the south and southwest where the highway traverses through the flat terrain of the Fortescue Valley. As the highway passes through the Chichester Ranges the skyline is closer to the road within the mid-ground zone (0 to 6.5 km).</td>
</tr>
</tbody>
</table>
In relation to the Solomon Project area, the viewshed analysis illustrates that most views of the project areas are screened by topography except for a few high points. It is noted that the Solomon Project area is in close proximity to the Karijini National Park.

From the VIA study it is likely that once above ground infrastructure is removed and rehabilitation of the WRDs is complete, the visual impact of the Solomon Project will be minimal. As the majority of waste rock is planned to be backfilled into the pit void, this will further reduce potential for external WRD. Fortescue will be mindful of any changes in public access around the area in future reviews of the MCP.

### 7.12 Indigenous Cultural Heritage

The Solomon Project is located within the Eastern Guruma and Yindjibarndi Native Title Claim areas. Fortescue signed a land access agreement (LAA) with the Eastern Guruma people in 2009. This agreement manages and facilitates Heritage and Native Title matters between Fortescue and the Eastern Guruma people. Similarly, Fortescue has consulted with the Yindjibarndi People since 2007, and regularly conducts heritage surveys in collaboration with Yindjibarndi People, as represented by the Wiru-Murra Yindjibarndi Aboriginal Corporation (WYAC). In addition, Fortescue continues to provide Yindjibarndi Aboriginal Corporation (YAC) with the opportunity to participate in heritage surveys and consult over heritage matters. Fortescue will continue to liaise with the Eastern Guruma and Yindjibarndi Native Title Parties regarding the development of the Solomon Project.

As required by the tenement conditions of the mining leases, a copy of all Mining Proposal submissions are forwarded to the relevant Native Title Parties following submission to DMP. Aboriginal Heritage surveys (archaeological and ethnographic) have been conducted over significant portions of the proposed work areas. Fortescue will continue to conduct surveys, in collaboration with Heritage Consultants and relevant Traditional Owners, to ensure all sites of heritage significance are recorded. Once Aboriginal heritage sites are identified within proposed work areas, wherever possible the proposed activities are amended to avoid heritage sites.

If heritage sites within proposed project areas cannot be avoided, Fortescue will submit the appropriate applications, as required under Section 16 and 18 of the *Aboriginal Heritage Act 1972*, requesting ministerial consent to use the land containing sites. Prior to receipt of Section 18 consent, any works conducted in the vicinity of heritage sites will be managed under the *Solomon Ground Disturbance Procedure* (SO-PR-EN-0002) to ensure sites are avoided. Where required this may include the implementation of site specific mining practices to minimise the risk of impact to sites. Section 16 and 18 applications will be completed by Fortescue’s Heritage Approvals team and will involve significant consultation with the relevant Native Title Groups.
Furthermore, to ensure all Fortescue personnel and contractors give consideration to Aboriginal Heritage matters, Fortescue requires all personnel and contractors attend Aboriginal Engagement and Cross Cultural Awareness training. These training programs include information on Aboriginal heritage sites, Aboriginal people and their country. The training also informs Fortescue personnel and contractors of Fortescue’s obligations under the *Aboriginal Heritage Act 1972*. 
8. IDENTIFICATION AND MANAGEMENT OF CLOSURE ISSUES

All closure planning activities for the Solomon Project are governed by Fortescue’s Planning for Closure Standard 100-ST-EN-0001. The general process is:

- planning;
- risk identification;
- risk management;
- research; and
- continuous improvement.

These activities are continuous throughout the life of the Solomon Project.

8.1 Risk Identification and Management

Risk management is a key component of Fortescue’s HSES Management System and is incorporated throughout all stages of the Solomon Project, including closure and decommissioning, to minimise risk.

Closure planning risk assessments identify the risks and potential outcomes associated with closure of the Solomon Project. The assessment considers the likelihood and consequence of the unwanted event which arises as a result of the identified risk without controls in place, and then with controls in place. Through this process, suitable management controls can be identified to mitigate the potential risks, before they present a problem.

Risk and Change Management processes shall be managed in accordance with the following Fortescue documents:

- HSES Management Standard 3 – Risk and Change Management 100-ST-HSES-0003;
- Risk Management Procedure 100-PR-RK-0001; and
- Risk Management Guideline 100-GU-RK-0001.

8.2 Identification of Closure Issues

The identification of closure issues and gap analysis was conducted with reference to the Leading Practice Sustainable Development in Mining handbooks published by DITR, as related to mine closure (DITR, 2006b) and mine rehabilitation (DITR, 2006a). In 2013 closure strategies were subjected to a risk assessment following the Fortescue Risk
Management Policy Standards (100-ST-RK-0011 to 116 inclusive). Each mine aspect was analysed in respect to the closure data with the management strategies for each aspect being a direct outcome of the domain specific constraints (data-based) and leading practice in the industry (concept-based). At the same time, preliminary closure risks for the Solomon Project were identified by experienced environmental and mining personnel (both Fortescue staff and specialise consultants) during a Closure Risk Assessment Workshop. In the preparation of this MCP, all closure issues were reviewed in line with Fortescue’s Risk Management Policy Standards. Items assessed as potentially significant risks that require further consideration in this MCP and are summarised in Table 11.

Table 11: Summary of potential closure issues for the Solomon Project

<table>
<thead>
<tr>
<th>Site Contamination</th>
<th>Water Management</th>
<th>Final Landform</th>
<th>Rehabilitation</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Lack of control of potentially Acid Forming waste work exposed in mine void walls or on the outer surface of WRDs</td>
<td>• Unsuccessful implementation of planned surface water regimes</td>
<td>• Erosion and instability of TSF1 embankment</td>
<td>• Lack of identification and management of problematic materials such as asbestiform minerals, excessive dust lift-off, dispersive soils and spoils / overburdens</td>
<td>• Inability to relinquish tenure</td>
</tr>
<tr>
<td>• Presence of suspected hydrocarbon contaminated sites</td>
<td>• Unsuccessful reinstatement of planned Groundwater aquifers</td>
<td>• Erosion and instability of waste rock dump embankments</td>
<td>• Unsuccessful revegetation</td>
<td>• Inability to achieve agreed completion criteria</td>
</tr>
<tr>
<td></td>
<td>• Reduced water quality leading to impacts to downstream environments and aquifers</td>
<td>• Lack of stability of mine pit walls and inadvertent access to a hazardous area</td>
<td>• Unacceptable erosion of embankments of waste dumps and TSF</td>
<td>• Unexpected cost of closure</td>
</tr>
<tr>
<td></td>
<td>• Lack of preservation of Groundwater fed pools post-mining</td>
<td></td>
<td></td>
<td>• Unexpected / unplanned closure</td>
</tr>
</tbody>
</table>

Section 8.4 provides a discussion of each of these risk issues, including how they are likely to affect closure, and how they can best be managed or mitigated. Current knowledge gaps have also been provided. The MCP risk assessment will be reviewed and updated prior to the next revision of the MCP.

8.3 Fortescue Environmental Management Systems

Fortescue is committed to environmentally responsible mining in the Pilbara. This commitment is recognised, communicated and achieved through the implementation of Fortescue’s EMS. The EMS is consistent with ISO 14001, and is guided by Fortescue’s Environmental Policy which governs all of its operations such that Fortescue will:
• respect the need to protect the environment in which they operate to minimise, mitigate and remEDIATE impacts of its operations;

• strive to achieve effective and acceptable environmental outcomes through disciplined environmental management. This includes the consideration of innovative environmental management techniques in project development, operations and rehabilitation;

• comply with all relevant environmental laws and obligations as the minimum standard to which Fortescue operates and the minimum requirement against which environmental performance is measured; and

• acknowledge that environmental protection is a cornerstone of Fortescue’s success and sustainability. This success benefits not just Fortescue but its families, communities and future generations.

Through this EMS, management of rehabilitation and closure aspects across all of Fortescue’s operations are addressed by:

• environmental risks are identified, analysed and evaluated, and controls established;

• responsibility for meeting environmental objectives, targets and obligations, and the implementation of controls are clearly communicated;

• regular reviews are undertaken to determine whether environmental objectives, targets, obligations and controls are being met; and

• environmental performance is monitored and reviewed to ensure continuous improvement.

A key aspect to the function of the EMS is the development and implementation of Environmental Management Plans (EMPs), which at a site level are realised through Procedures and Standard Work Instructions (SWI). These EMPs effectively detail how baseline environmental data is collected, utilised and interpreted against relevant criteria, how rehabilitation and closure performance is monitored and how this monitoring data is to be applied to assess compliance against relevant conditions, and whether closure is achieved.

Table 12 lists the key EMS documents related to Solomon MCP.
**Table 12: Key Environmental Management System documents related to Solomon MCP**

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Title</th>
<th>Relevance to Mine Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-PO-EN-0001</td>
<td>Fortescue Environmental Policy</td>
<td>Fortescue’s Policy governing all potential environmental aspects arising from activities including closure</td>
</tr>
<tr>
<td>100-GU-EN-0042</td>
<td>Waste Rock Landform Design Guidelines</td>
<td>Outlines the considerations for designing WRDs at all mine sites</td>
</tr>
<tr>
<td>100-PO-EN-1018</td>
<td>Design Approval for Waste Rock Landforms</td>
<td>Outlines the approval process for WRDs designs prior to implementation</td>
</tr>
<tr>
<td>100-ST-EN-0001</td>
<td>Planning for Closure Standard</td>
<td>Outlines the requirements for mine closure planning</td>
</tr>
<tr>
<td>100-ST-RK-0011 to -0016</td>
<td>Risk Management Policy Standards</td>
<td>Provides the risk assessment methodology for all activities across Fortescue operations including mine closure</td>
</tr>
<tr>
<td>KG-02067_MA-OP-0001</td>
<td>TSF Operations Manual</td>
<td>Solomon Operations. TSF Operating Manual that also incorporates Monitoring and Surveillance requirements</td>
</tr>
<tr>
<td>100-GU-EN-0018</td>
<td>Characterisation of Mineral Waste Rock and Soil Guideline</td>
<td>Provides guidance for identification of potentially inert or hazardous materials that may be encountered during mining and mine closure activities.</td>
</tr>
<tr>
<td>45-GU-EN-0007</td>
<td>Seed Collection and Management Guidelines</td>
<td>Provides guidance to seed collectors for the appropriate collection, handling, storage and use of native seed in revegetation activities.</td>
</tr>
<tr>
<td>100-PH-EN-0003</td>
<td>Stakeholder Consultation Strategy</td>
<td>Outlines the framework for identifying and undertaking engagement with various stakeholders</td>
</tr>
<tr>
<td>100-PR-DC-0002</td>
<td>Document Control Procedure</td>
<td>Specifies the requirements for documentation within Fortescue operations</td>
</tr>
<tr>
<td>SO-03018-RP-WM-0003</td>
<td>Solomon Life of Mine Surface Water Strategy</td>
<td>Summarises key research undertaken on surface water to date at the Solomon Project and outlines key management requirements for the consideration, design and implementation of activities and possible impacts to surface water</td>
</tr>
<tr>
<td>100-PL-EN-0022</td>
<td>Conservation Significant Fauna Management Plan</td>
<td>Outlines the requirements for the consideration, design and implementation of activities and possible impact on Conservation Significant fauna</td>
</tr>
<tr>
<td>SO-00018-RP-HY-0001</td>
<td>Solomon Groundwater Operating Strategy</td>
<td>Outlines the management of groundwater abstraction and water use at the Solomon mine site. It describes operation, monitoring and reporting commitments and provides strategies and action plans for potential groundwater abstraction impact management, water use efficiency and contingency planning</td>
</tr>
<tr>
<td>100-PL-EN-0011</td>
<td>Chemical and Hydrocarbon Management Plan</td>
<td>Outlines the requirements for the consideration, design and implementation of activities arising from the use of chemicals and hydrocarbons for all Fortescue operations.</td>
</tr>
<tr>
<td>45-PL-EN-0013</td>
<td>Weed Management Plan</td>
<td>Specifies the identification, mitigation, implementation key programmes to minimise weeds across all Fortescue operations.</td>
</tr>
<tr>
<td>45-PL-EN-0014</td>
<td>Waste Management Plan</td>
<td>Outlines programmes and procedures for the appropriate management of liquid and solid (non-rock) waste across all Fortescue operations</td>
</tr>
</tbody>
</table>
### Document List and Relevance to Mine Closure

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Title</th>
<th>Relevance to Mine Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>45-PL-EN-0017</td>
<td>Significant Flora and Vegetation Management Plan</td>
<td>Outlines requirements for the preservation and management of species and vegetation associations of significant conservation value.</td>
</tr>
<tr>
<td>100-SP-CL-0004</td>
<td>Standard Engineering specifications for Drainage and Flood Protection</td>
<td>Outlines the engineering requirements for the consideration, design and implementation of surface drainage features.</td>
</tr>
<tr>
<td>100-PL-EN-1015</td>
<td>Surface Water Management Plan</td>
<td>Provides company-wide objectives and guidance for management of surface water</td>
</tr>
<tr>
<td>100-PL-EN-1016</td>
<td>Acid and Metalliferous Management Plan</td>
<td>Outlines the considerations and requirements for management of potentially acid generating waste rock</td>
</tr>
<tr>
<td>45-PL-EN-0018</td>
<td>Borrow Pit Management Plan</td>
<td>Specifies the requirements for planning, undertaking and rehabilitating borrow pits.</td>
</tr>
<tr>
<td>45-PL-EN-0023</td>
<td>Rehabilitation and Revegetation Management Plan</td>
<td>Outlines the planning, implementation and monitoring requirements for rehabilitation and revegetation of disturbed areas and landforms across Fortescue’s operations.</td>
</tr>
<tr>
<td>45-PL-EN-0030</td>
<td>Mine and Rail Dust Management Plan</td>
<td>Outlines the planning, implementation and monitoring requirements for all potentially dust generating activities across Fortescue’s mine and rail operations.</td>
</tr>
<tr>
<td>E-EN-PP-0032</td>
<td>Marking Out Environmentally Sensitive Areas</td>
<td>Provides the requirements for how to delineate identified environmentally sensitive areas in order to preserve these areas from Fortescue’s activities</td>
</tr>
<tr>
<td>45-PR-EN-0012</td>
<td>Overburden Management Re-Growth and Waste Procedure</td>
<td>Outlines the planning, implementation and monitoring requirements for rehabilitation and revegetation of WRDs across Fortescue’s operations.</td>
</tr>
<tr>
<td>100-PR-EN-0013</td>
<td>Vegetation Clearing and Topsoil Management Procedure</td>
<td>Outlines the procedure for clearing, storage and re-use of vegetation and topsoil ahead of planned activities across all Fortescue operations.</td>
</tr>
<tr>
<td>SO-PR-EN-0002</td>
<td>Solomon Ground Disturbance Procedure</td>
<td>Specifies the procedure for planning, approving and implementing ground disturbance across all Fortescue operations.</td>
</tr>
<tr>
<td>45-PR-EN-0027</td>
<td>Rehabilitation / Revegetation Monitoring Procedure</td>
<td>Specifies the procedure to be adopted for planning, implementation and monitoring of rehabilitation and revegetation of disturbed areas and landforms.</td>
</tr>
<tr>
<td>SO-FR-EN-0007</td>
<td>Land Clearance Authorisation Form</td>
<td>The signoff record required to permit land clearance across all Fortescue operations.</td>
</tr>
<tr>
<td>SO-FR-EN-0008</td>
<td>Topsoil Data Tracking Form</td>
<td>Recording of removed and stored topsoil in order to track the inventory of topsoil across all Fortescue operations.</td>
</tr>
<tr>
<td>SO-FR-EN-0007</td>
<td>Rehabilitation Assessment Form</td>
<td>Recording of rehabilitation monitoring success across all Fortescue operations.</td>
</tr>
</tbody>
</table>

### 8.4 Management of Identified Closure Risks

Management of the identified mine closure risks (Section 8.2) are administered by Fortescue’s Environment Governance and Sustainability team with Executive oversight provided by Fortescue’s Mine Closure Steering Committee. This structure provides a
procedural, iterative approach to the decision making process involved in management of closure issues.

8.4.1 Acid and Metalliferous Drainage

The unweathered Mt McRae Shale Formation and the low grade lignite at the western end of Queens contains elevated sulfides and have the highest potential to generate AMD. Using the risk “hierarchy of control”, the highest level of risk mitigation is “elimination”; when applied to the unweathered Mt McRae Shale and the low grade lignite, this means not mining or exposing this geological formation.

Life of mine planning has been conducted to ensure that mining operations will not excavate or expose the unweathered Mt McRae Shale Formation or the low grade lignite at the west end of Queens. Exploration drilling and geological modelling of the Solomon Project area confirms that the unweathered Mt McRae Shale Formation and the low grade lignite at the west end of Queens occurs below all the ore-bearing formations in the Project area. The continuous, horizontal, sedimentary layering of the geological units across the area ensures that all potentially economic iron resources can be extracted without excavating the unweathered Mt McRae Shale. As a result no waste rock will contain, or pit walls will expose, unweathered Mt McRae Shale. Similarly the low grade lignite is located at western extent of the Queens mining area is located below the pit boundary where the ore above can be excavated without exposing or dewatering the PAF material.

The potential for materials within the WRDs and TSFs of the Solomon Project to produce AMD is considered very low. As discussed in Section 7.6 (Waste Rock and Tailings Characterisation) geochemical test work for the site demonstrated that the majority of materials tested for the Solomon Project were non-acid forming, posing very little environmental risk for closure. Planning and operational activities during the life of the Solomon Project will be undertaken in accordance with the Acid and/or Metalliferous Management Plan 100-PL-EN-1016 (Fortescue, 2014c), as well as continued sampling and monitoring of tailings and waste material. Should any PAF material be identified, it will be stored and managed in accordance with Acid and/or Metalliferous Management Plan 100-PL-EN-1016 to ensure that the landforms remain non-polluting during operations and post closure.

8.4.2 Surface Water

Surface Water at Fortescue is managed under Surface Water Management Plan 100-PL-EN-1015. The Solomon Life of Mine Surface Water Strategy SO-03018-RP-WM-0003 is the site specific plan that outlines the surface water studies undertaken for the Solomon Project
and broad strategy for operational planning, management and monitoring to manage potential surface water impacts.

Mine Voids

Modification to surface hydrology may remain at closure due to changes to catchment divides caused by the development of the pits and waste dumps. These changes are likely to be limited to the upper reaches of the catchments. In these areas the difference in elevation between the pits backfilled above groundwater level and the natural topography would result in some drainage lines not being reinstated. This is due to a deeper pre-mining water table in the upper part of the catchments. The pre-mining groundwater level is very shallow at the downstream end of the Kings and Queens mining areas. Consequently when these areas are backfilled above the pre-mining water table, the downstream end of the backfilled pits is at the same level as natural topography, which will result in surface water flows being restored through the main Kings and Queens pits, which encompass the majority of the proposed pit area.

In areas where backfill is below natural topography at the downstream end of the pit, surface drainage will not be reinstated. In these areas runoff will infiltrate and provide recharge to the underlying aquifer, which will supply the groundwater-fed pool systems downstream. There is not expected to be permanent standing water in these areas as the final landform will be backfilled above pre-mining groundwater table. Hydraulic modelling has been undertaken to assess impact of modification to catchment boundaries on flood extents. Modelling output is provided in The Solomon Life of Mine Surface Water Strategy (SO-03018-RP-WM-0003) along with a discussion around the significance of this modelling.

Fortescue has developed a guideline for the Chichester operations to be followed when backfilling pits to reinstate major watercourses, which will plan for backfill to be geomorphically stable and self-sustaining under similar drainage dynamics that existed before mining commenced. At Solomon, Fortescue will implement a similar strategy, incorporating site specific hydrological, hydraulic, geological and geomorphological considerations as well as the potential for proposed in-pit tailings facilities in a number of mine pits. Designs will be assessed using a risk based approach which includes a range of storm events up to the PMF. Monitoring data will be used to refine the understanding of site hydrology over the mine life in order to further develop this strategy, with flood frequency analysis becoming more reliable with an increased period of record.

Where practicable, pits need to be backfilled as early as possible, through progressive closure, to provide as much time as possible to observe and monitor the potential effects of post-construction settlement, water table recovery and evolution of creek lines.

Mine closure projects that have historically attempted to re-establish major watercourses by constructing well-defined, rock-armoured (i.e. engineered) channels are unlikely to be
successful in the longer term. Closure landscapes that incorporate engineered structures in which the hydraulic forces are greater than those which the pre-mining geomorphology can accommodate may deteriorate by weathering and fail under concentrated flows associated with rainfall events from tropical cyclones or large low pressure systems.

Although engineered drainage structures may be required in some circumstances during operations and at closure, a long-term geomorphically stable post-mining landscape should attempt to replicate the dynamics of the pre-mining landscape and flow features as closely as possible in order to accommodate infrequent but severe rainfall events in an analogous fashion to the original landforms.

Analyses conducted at Fortescue’s Chichester operations indicate that by mimicking the natural landscape, the flow velocity is kept sufficiently low, allowing the channels to self-armour to an extent sufficient to prevent uncontrolled erosion. Observation of natural systems also support this conclusion. The channels can however be expected to move around the surface as streams do (naturally) when evolving geomorphologically with time.

Pit backfill designs will be assessed using a risk based approach which includes a range of storm events up to the PMF. Backfill designs needs to be assessed to ensure that the design is fit for the specific conditions applicable to that pit and includes consideration of the following:

- Optimisation of the backfill plan in collaboration with the mine planning team to achieve the desired landform stability outcomes;
- Review of the local hydrogeology and the dewatering program to understand how groundwater level recovery may influence the stability of the operating slopes and/or settlement of the backfill;
- Confirmation that the proposed backfill design configuration does not result in measurable geochemical impacts to surface and/or groundwater quality;
- Geotechnical considerations during and after backfilling:
- In-pit tailings disposal;
- Post-backfill settlement potential; and
- Evaluation of the surface water hydraulics for any planned re-established watercourse under expected site hydrological conditions, and evaluation of performance under a range of storm events.

Waste Rock Dumps

The preferred surface water management strategy for closure is retention and infiltration on berms and the top surface of the waste dumps as detailed in the Waste Rock Landform
Design Guide (100-GU-EN-0042). The storage capacity of the berms and top surface of the waste dump is assessed using a risk based approach which includes a range of storm events up to the PMF. Several methods for retention of storm water will be considered for the top surface of the waste dump. These include, but are not limited to:

- Retention basins excavated at selected locations on the top surface
- Paddock dumping of the top surface, which will increase the surface water storage volume of the top surface by providing depression storage in the top surface.

Given the likelihood of progressive failure of hard engineering features such as batter chutes due to weak points at interfaces, passive retention is considered to be the most risk averse method of managing surface water on the waste dumps. Ground level toe drains or toe bunds may be positioned to act as sediment traps and prevent the wider dispersal of eroded soil and will be evaluated on a case by case basis using a risk based design approach. Output from landscape erosion modelling will be used as required to inform the closure design of waste rock dumps.

**Tailing Storage**

At closure, the TSF1 facility will have a waste rock landform placed on the face of the embankment, which will be designed in accordance with the *Waste Rock Landform Design Guide* (100-GU-EN-0042). The tailings will be covered with a layer of waste rock of sufficient thickness to prevent the erosion of tailings. Runoff within the TSF will flow with the slope of the tailings and a spillway out the back of the facility will be constructed if required. Further detail is provided in the *Solomon TSF1 Raise and Trinity WRD – Closure Plan* (SO-PL-IF-0001) and *Solomon TSF1 Raise – Closure Plan* SO15OP001A-03029-PL-GE-0002 (AECOM, 2015).

**8.4.3 Groundwater**

Mining of the Firetail deposit is entirely above groundwater table, while mining of the Kings, Queens, Trinity, Zion, Fredrick and Castle Valley deposits will require below water table mining. In order to satisfy Condition 2 of EPBC 2010/5567 (*Backfill all mine voids to a level that prevents the formation of pit lakes following closure of the mine*), on completion of mining activities the mine pits will be backfilled to above pre-mining groundwater levels (with the exception of Firetail).

Groundwater investigations and modelling studies have been undertaken in order to understand and predict groundwater behaviour and surface water relationships post-mining. The outcomes of studies and resulting management actions for operations are detailed in *Solomon Groundwater Operating Strategy* SO-00018-RP-HY-0001.
As backfill will be composed primarily of loosened alluvial overburden and ore body internal waste from the mining operations, the actual hydraulic conductivity of the backfill material is expected to be higher than that of the in-situ alluvial layer (Kx = 20 m/d). The increase in hydraulic conductivity of the backfill material and the flattened surfaces in the backfilled areas will also enhance infiltration recharge from direct rainfalls and surface runoff events. Fortescue is also evaluating the potential for discrete areas of the pit voids to store both run of mine waste rock and tails. These investigations will include evaluation of the performance of the rebounding water table post-mining.

Predicted steady state groundwater levels using the measured hydraulic and hydrogeological properties and with the mining pits backfilled to above the pre-mining water table may be high enough to protect the environmentally sensitive areas. If increases in actual hydraulic conductivity and infiltration recharge are not enough to combat the increase in evapotranspiration loss, elevated backfill in the areas around the groundwater divides can be used. Groundwater modelling with simulations of elevated backfill predicts groundwater levels higher than the corresponding pre-mining levels may occur in both the discharge areas adjacent to the groundwater-fed pools and the areas around the groundwater divides. The reduction in evapotranspiration loss is great enough to compensate for the increases in through-flow losses and raise the quasi-steady state storage recovery by about 14%.

In order to protect the integrity of groundwater-fed pools during mining, Kangeenarina Pools will be maintained by supplementation in accordance with the Solomon Project Kangeenarina Pools Supplementation Plan - Northern Pools Addendum 600SO-00018-RP-HY-0003. This supplementation system will be an aquifer reinjection system with a backup direct supplementation system. The aquifer reinjection system is likely to be a buried pipeline that is slotted along its full length. The buried pipeline is likely to be several hundred meters. The depth of burial will be designed so that it is high enough that the groundwater level around the pools is maintained, but deep enough so that mounding doesn’t create additional pools. Reinjection will continue through operations and will continue in closure until the groundwater level in backfilled mine area has recovered. Using the long term average rainfall recharge rate, the aquifer reinstatement could take 20 years.

The feasibility of a groundwater barrier at the western end of the Queens mining area is currently being investigated in order to enhance the protection of Weelumurra Pools during dewatering activities that will lower the groundwater table. Cut off walls, Grout walls and Geopolymer walls are currently at different stages of assessment for the hydraulic barrier at Weelumurra Creek. The hydraulic barrier would be installed across the aquifer (CID, alluvials and weathered bedrock). Abstraction and injection bores would be used to replicate the through flow of the aquifer to the downstream part of the aquifer where the pools are located. The hydraulic barrier would be used to reduce the hydraulic connection between the mining area and the pool system so that aquifer reinjection on the western side of the barrier will maintain the pool levels. This means the barrier does not have to be completely
impermeable as the abstraction and injection bores can recirculate any seepage. Modelling has indicated that an overall permeability of $10^{-6}$ m/s would be sufficient to prevent downstream impacts due to seepage through the barrier.

The hydraulic barrier would remain in place during operations and also in closure until the groundwater level in the mine area recovers to steady state conditions. The mining area will be backfilled to a level which precludes the formation of pit lakes. This backfilled material will then be recharged through natural processes and potentially aquifer reinjection if the opportunity arises to accelerate the process.

Preliminary modelling indicates that it may take approximately 20 years to restore the groundwater to the pre-mining level on the upstream side of the Queens groundwater barrier. Hence, the estimated recharge time of the aquifer system is 20 years from the end of mine dewatering. During the recharge phase of the aquifer recovery, supplementary water will continue to be injected to protect the groundwater-fed pools.

Recovery simulations of these closure modelling exercises are considered preliminary because of the uncertainties associated with the hydraulic parameters of the backfill materials. With the progresses of the proposed mining and concurrent mine closure operations, more information on the hydraulic properties of the backfill material will be developed. The preliminary recovery models can then be updated with the updated hydraulic properties of the backfill materials. Simulation results from the updated models will be used to inform future versions of the MCP.

In-pit Tails

Fortescue originally proposed to backfill mine voids with waste rock. However given the experience of other operations in the Pilbara, Fortescue has recently completed a study to investigate the viability of in-pit waste storage using a combination of both waste rock and tailings (Groundwater Assessment of In-pit Tailing Disposal SO-RP-HY-0004). As the hydraulic properties of these materials are different, the hydraulic properties of backfill materials were investigated via a modelling assessment to determine the best backfill strategy.

To further confirm the long term effect of this methodology, Fortescue proposes to conduct in situ tests to characterise the backfill properties; test outcomes will then be used to refine the closure plan. Presently, conservative values have been used and sensitivity analysis conducted in order to present a worst case scenario.

The simulation results revealed no significant mounding upstream of the in-pit tailings disposal segment even at the highest level of tailing usage. Hence, the assessment simulations predict no significant long-term mounding impacts upstream of the in-pit tailings disposal segment.
Borefields

Infrastructure such as bores may have asset value and a new owner or user may wish to retain them. Table 13 assumes that no future owner accepts responsibility for the infrastructure in a closure scenario. In the case that an owner accepts responsibility for an item of infrastructure, an acceptable closure indicator is deemed to be appropriate documentation from the new and old (Fortescue) owners and a letter of acceptance by DMP. The matter of suitable title and management of the land can be expected to be resolved and identified in that documentation.

Table 13  Task list for groundwater infrastructure

<table>
<thead>
<tr>
<th>Sub-domain</th>
<th>Item</th>
<th>Action</th>
<th>Indicator</th>
<th>Target / guideline for acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipeline</td>
<td>Pipes</td>
<td>Remove and recycle or dispose</td>
<td>Audit</td>
<td>Pipes removed</td>
</tr>
<tr>
<td>Bores</td>
<td>Bore equipment</td>
<td>Remove equipment</td>
<td>Audit</td>
<td>Bore equipment removed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cap bore to standard agreed to by DoW &amp; DMP</td>
<td>Audit</td>
<td>Bore capped to agreed standard</td>
</tr>
<tr>
<td>Power</td>
<td>Remove reticulated power or power generator</td>
<td>Audit</td>
<td>Power infrastructure removed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check for contamination</td>
<td>Contamination investigation report. Remediation report (if required)</td>
<td>Accepted by DER</td>
<td></td>
</tr>
<tr>
<td>Turkeys nest dams</td>
<td>Turkeys nest dams</td>
<td>Remove liner to licensed landfill or fold in &amp; bury at least 1 m below surface</td>
<td>Audit</td>
<td>Liner removed or buried at least 1 m below ground</td>
</tr>
<tr>
<td></td>
<td>Remove equipment &amp; Infrastructure</td>
<td>Audit</td>
<td>Equipment and infrastructure removed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Landform area to tie in with surroundings</td>
<td>Audit</td>
<td>Landform consistent with surroundings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Replace topsoil and rip</td>
<td>LFA</td>
<td>LFA data shows vegetation trending towards analogue site</td>
<td></td>
</tr>
<tr>
<td>Re-establish natural drainage patterns, surface water and groundwater flows</td>
<td>Groundwater flows</td>
<td>Backfill mine pits above historical groundwater levels with permeable waste rock, cease dewatering activities</td>
<td>Hydrogeological investigations, audit. Ongoing monitoring may be required</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maintain groundwater levels in Kangeenarina Creek pools until surrounding groundwater system stabilised. Fracture groundwater barrier at this stage only.</td>
<td></td>
<td>Accepted by OEPA</td>
<td></td>
</tr>
<tr>
<td>Groundwater systems</td>
<td>Groundwater levels</td>
<td>Monitor groundwater levels</td>
<td>Monitoring data, health of dependent ecosystems</td>
<td>Monitoring of groundwater indicates that levels are consistent with target</td>
</tr>
<tr>
<td>Sub-domain</td>
<td>Item</td>
<td>Action</td>
<td>Indicator</td>
<td>Target / guideline for acceptance</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------</td>
<td>-------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Groundwater quality</td>
<td>Monitor groundwater quality</td>
<td>Monitoring data, health of dependent ecosystems</td>
<td>Pools connecting to groundwater to be deep with small surface area; Monitoring of groundwater indicates that quality is consistent with target surrounding locations for a period not less than 12 months</td>
<td></td>
</tr>
<tr>
<td>All areas</td>
<td>All areas</td>
<td>All areas</td>
<td>Configure drainage to minimise erosion risks</td>
<td>Drainage audit LFA monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Check outcomes against closure obligations</td>
<td>Audit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acceptance of area by new land manager</td>
<td>Acceptance documentation</td>
</tr>
</tbody>
</table>

Once backfilling of the Kings mine pit has commenced, dewatering will stop or gradually be reduced until the backfill level is sufficient to keep the pit base dry. Based on studies by NTEC (2012) and Fortescue (2012), it is expected that the drawdown proposed in the Full Production Mining Proposal (FPMP) will take approximately 20 years from the end of mining for groundwater levels to return close to pre-mining levels. This estimate is based on typical recorded rainfall events, however the groundwater system will respond to natural recharge events so significant events may greatly affect the time that is required to reinstate the system.

**8.4.4 Final Landforms**

Whilst the majority of mine waste material will be returned to pit voids as backfill, numerous out of pit WRDs will remain post mining. As per Section 8.4.1 waste rock will be non-acid forming hence the key environmental risks are:

- **geotechnical stability** - slumping or mass failure of the WRD or batter slopes. Potential release or dispersion of material into the surrounding environment;
- **erosion** - WRD slopes are to be battered to required angle to achieve stable slope as determined by geotechnical modelling;
- **vegetation failure** (refer Section 8.4.5);
- **surface water management**; and
- **potential for minor saline drainage**.
The design, construction, management and rehabilitation of external WRDs will be undertaken in Fortescue’s relevant Procedures and Guidelines. As more information and knowledge is collected for the site through ongoing studies and investigations, these dynamic Procedures and Guidelines will be appropriately updated.

### 8.4.5 Rehabilitation

Rehabilitation will be completed in accordance with *Rehabilitation and Revegetation Management Plan* 45-PL-EN-0023 and *Overburden Management Re-Growth and Waste Procedure* 45-PR-EN-0012. The revegetation program will be designed to establish local provenance vegetation which provides habitat for native fauna.

Fortescue propose to monitor natural re-colonisation that will occur as a consequence of seed contained in the recovered topsoils and seed otherwise naturally transported into the affected area and where required will employ direct broadcast seeding of provenance species. The species to be used in the seeding and planting program, as well as the timing and methodology, will be subject to investigation as per *Seed Collection and Management Guidelines* 45-GU-EN-0007. Appropriate seeding rates will be determined as an outcome of rehabilitation trials and subsequent learnings from the Solomon Project area as well as from Fortescue’s other Pilbara operations.

Monitoring the success of rehabilitation and revegetation will be undertaken in accordance with *Rehabilitation and Revegetation Monitoring Procedure* 45-PR-EN-0027.

### 8.5 Adaptive Management

Adaptive management or the iterative development of rehabilitation and closure is governed by Fortescue’s *Rehabilitation and Revegetation Management Plan* 100-PL-EN-0023. This Plan outlines Contingency Actions to be considered if monitoring shows that the management objectives and closure criteria are not being achieved.

Initial qualitative Management Triggers are to be revised after the first and subsequent monitoring programs and refined with quantitative values to ensure objectivity in assessing monitoring data.

Expert opinion will be sought if and when required to guide contingency measures which will include further monitoring work to better understand influences causing those changes in the environment. By understanding why certain management strategies or monitoring does not work, specialist advice can be used to modify and improve these programs so that Fortescue is continually moving forward with respect to environmental stewardship.
8.6 Rehabilitation trials and research

As part of Fortescue’s adaptive management approach learnings from the outcomes of progressive rehabilitation, trials and research from across their Pilbara operations will inform closure and rehabilitation planning for the site.

With the commencement of mining activities in 2012 and a projected mine life beyond 2050, there are currently very limited opportunities for rehabilitation trials and research to be conducted at the Solomon Project. Fortescue will demonstrate its capacity to deliver effective restoration outcomes by means of research and completing rehabilitation trials when suitable areas are identified over the next several years. Specifically, Fortescue will:

- complete growth medium trials on the WRDs and other selected landforms to identify:
  - the optimum cover depth (rooting depth) for establishing a suite of plant species comparable with analogous landforms;
  - the construction materials and methods that will ensure that the growth medium has sufficient water retention/storage capacity for plant survival during periods of low rainfall. Specific consideration will be given to how best to avoid low hydraulic conductivity of newly created surface layers that could, in turn, limit water entry into the new soils and hence water availability to plants; and
  - the most cost effective means of placement (how and what machines are to be used);

- complete revegetation trials, in collaboration with a recognised research institution, to determine:
  - the best mechanism for plant re-establishment (e.g. natural regeneration from the in situ seed bank in the salvaged soils, seed harvesting and subsequent direct seeding, nursery management of seedlings and subsequent patch planting of seedlings\(^2\), relocation of established plants to act as a seed population etc.);
  - seed quality criteria, application rates, and application methods in rehabilitation, given that some re-seeding is likely to be necessary; and
  - the local provenance species to be used to achieve the quickest re-establishment of cover and habitat complexity to create a stable growing environment for other plant species;

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\(^2\) As per the general tenement condition, Fortescue will complete planting trials of "trees and/or shrubs and/or any other plant as shall conform to the general pattern and type of growth in the area and as directed by the Environmental Officer, DMP and properly maintain same until the Environmental Officer advises regrowth is self-supporting, unless the Mining Registrar or Minister responsible for the Mining Act orders or consents otherwise."
• consider involvement in third party research into the best means of re-establishing *Triodia* aft. *epactia* and *Triodia wiseana*;

• complete nutrient analysis of the growth medium created in the progressive rehabilitation of the WRDs to determine its nutrient status. This information will in turn be used to determine:
  o whether or not there is likely to be a material benefit in fertiliser application during broadcast seeding and or direct planting during the final revegetation works;
  o whether or not there is likely to be a potential problem with high nutrient levels, or high levels of a specific element, that may aid the establishment of weed species;
  o if relevant, the best mechanism for fertiliser application;

• complete biological analysis of both the soils and growth medium salvaged to determine the following:
  o size of the viable seed store and its decline over time. This is important for determining how much reliance can be placed on the in situ seed store and whether or not there is likely to be a weed problem; and
  o microbial biomass and organic matter content of both the soils to be salvaged, its decline or otherwise over time once stockpiled, and subsequent recovery once applied to embankments or slopes; of particular note will be the mycorrhizal fungi.

Fortescue will document the progress of research and rehabilitation trials in subsequent revisions of this MCP and apply the learnings to future rehabilitation programs at the site.

Fortescue have identified areas of the Solomon Project for progressive rehabilitation (Table 14) (Fortescue 2014b). It is expected that rehabilitation activities at these sites will commence within the next few years.

**Table 14: Areas of Solomon Project identified for Progressive Rehabilitation**

<table>
<thead>
<tr>
<th>Area</th>
<th>Site description</th>
<th>Proposed works</th>
<th>Proposed trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valley of the Kings</td>
<td>Valley of the Kings to TSF Haul Road. Section of disturbed ground adjacent to haul road, and large topsoil stockpile area.</td>
<td>• battering of slope to 15 degrees</td>
<td>• no ripping, no topsoil, no seed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• incorporation of bench berm structure</td>
<td>• ripping, no topsoil, no seed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• ripping, topsoil. No seed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• ripping, topsoil, seed</td>
</tr>
<tr>
<td>Area north of the stockyards/train load out</td>
<td>Previously cleared for borrow material and will be left in situ with no further disturbance</td>
<td>A permanent rehabilitation monitoring transect has already been installed to determine the success of natural re-establishment of native vegetation over time in this area.</td>
<td>• rate of natural re-establishment of cleared areas</td>
</tr>
</tbody>
</table>
### Area off stockyards/train load out Access Road

<table>
<thead>
<tr>
<th>Site description</th>
<th>Proposed works</th>
<th>Proposed trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disturbed ground</td>
<td>This area has a nearby topsoil stockpile in place which can be spread over the area prior to ripping and seeding.</td>
<td></td>
</tr>
</tbody>
</table>

### Firetail

<table>
<thead>
<tr>
<th>Site description</th>
<th>Proposed works</th>
<th>Proposed trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firetail North WRD</td>
<td>The initial batter of the Firetail North WRD will be available within the next 24 to 36 months for rehabilitation earthworks. This will provide an opportunity to undertake works and monitoring trials on an as-built slope, given the prevailing material properties and proposed seed mix to be utilised.</td>
<td>• trials on as-built slopes</td>
</tr>
</tbody>
</table>

### Firetail

<table>
<thead>
<tr>
<th>Site description</th>
<th>Proposed works</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction laydown area of firetail OPF</td>
<td>Whilst not seen as a priority in the short-term, this area may provide an additional area of trials if not utilised for sediment disposal/storage from the nearby Firetail OPF.</td>
<td></td>
</tr>
</tbody>
</table>

Fortescue will document the progress of research and rehabilitation trials in subsequent revisions of this MCP.
9. CLOSURE IMPLEMENTATION

Fortescue applies a whole of mine life approach to closure implementation, commencing with preliminary stakeholder consultation and culminating in relinquishment of the rehabilitated site back to the State. All aspects of rehabilitation and closure planning, scheduling, implementation and monitoring are considered under Fortescue’s closure governance to ensure that:

- stakeholder interests are considered during all stages of closure planning;
- rehabilitation objectives and completion criteria that are developed are appropriate to agreed post-operational land use;
- progressively rehabilitated and revegetated areas that are not required for ongoing operations;
- surfaces of constructed safe, stable, non-polluting landforms are not prone to sediment transport beyond natural geomorphic processes and are capable of sustaining agreed post-operational land use;
- surface and groundwater flow patterns and quality do not significantly impact downstream environmental values or uses;
- revegetated disturbed areas meet agreed post-operational land use objectives and completion criteria; and
- indicators are developed that demonstrate when rehabilitation activities meet the established objectives and completion criteria.

For each of the above objectives, specific Management Plans or Management Actions (MA) have been developed to ensure rehabilitation and closure activities are managed and that appropriate monitoring, reporting and corrective action functions are developed to support the successful implementation and continual improvement of closure. EMPs have been developed that cover all aspects of:

- baseline data collection (i.e. identifying resources available for closure and potential closure risks);
- material handling and utilisation (i.e. ensuring that rehabilitation resources are appropriately captured and handled during the mining process);
- construction of the post-mine landforms (i.e. providing specific guidance on ‘how’ to construct the landforms);
- rehabilitation and revegetation of the post-landforms (i.e. providing specific guidance on ‘how’ to rehabilitate the landforms);
monitoring of rehabilitation performance (i.e. assessing rehabilitation performance against stakeholder agreed completion criteria); and

adaptive management (i.e. to ensure lessons learned from rehabilitation performance monitoring are integrated into future closure plans).

9.1 Closure planning process

Operational decisions have the potential to significantly impact on rehabilitation and mine closure outcomes and costs. Making mine closure planning an integral component of operations planning (ANZMEC/MCA 2000) sets the groundwork for successful closure and rehabilitation.

As outlined in Section 8.3, Fortescue has a comprehensive EMS that incorporates all Fortescue’s activities including mine closure. The MCP will be updated every three years in accordance with the requirements of the Mining Act 1978.

9.2 Closure strategies for specific domains

Based on the 2014 LOM Plan (Fortescue, May 2014a), the Solomon Project comprises a number of current and planned mining areas:

- Firetail mining area (commenced mining FY2012 until approximately FY2035);
- Kings mining area, including the Trinity and Zion deposits (commenced mining FY2012 until approximately FY2050); and
- Queens mining area, including the Castle Valley and Fredrick deposits (plan to commence in FY2021 until approximately FY2050).

A summary of the mining and sequencing plans have been included in this version of the MCP (Section 9.4). It is likely that ongoing exploration in the Solomon Mine project area will identify additional mining areas. The closure strategies for these areas will be developed in line with the closure strategies outlined here and incorporated into future versions of the Solomon MCP.

9.2.1 Domain 1 - Waste Rock Dumps

Planning and movement of waste rock for the Solomon Project is undertaken in accordance with SO-PL-EN-0004 Solomon Project Waste Rock Dump Closure Plan using the following guidance:
• ensure that potentially problematic material is handled and stored according to the relevant management plan (e.g., Acid and/or Metalliferous Drainage Plan (100-PL-EN-1016);

• minimise the use of ex-pit and maximise the use of in-pit permanent WRDs where possible;

• WRDs (in-pit or ex-pit) are to be located locally where possible;

• progressively (re)handle waste into pit voids so as to meet backfill requirements of pit voids. Where pit voids are below the water table, voids should be backfilled to three metres above the pre-mining water table level;

• minimise post mining rehandle of waste rock to meet backfill requirements;

• WRD (in-pit or ex-pit) will form a basis that allows for successful rehabilitation post-use;

• consider potential surface water and groundwater impacts; and

• minimise potential visual amenity impact.

Consistent with previous versions of the Solomon MCP, LOM planning requires that ex-pit WRDs will be required for approximately the first five to six years of mine life (in order to create mined out pit voids), then backfilling of pits is able to commence. The current LOM planning is presented in Table 15.

Table 15: Life of Mine Planning for the Solomon Project

<table>
<thead>
<tr>
<th>Mine Area</th>
<th>Obligation to backfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firetail and Fredrick</td>
<td>Nil (mining above water table)</td>
</tr>
<tr>
<td>Kings, Trinity and Zion</td>
<td>Approximately 83% of total waste rock mined to achieve 3 m above water table</td>
</tr>
<tr>
<td>Queens, Castle Valley</td>
<td>Approximately 75% of total waste rock mined to achieve 3 m above water table</td>
</tr>
</tbody>
</table>

As demonstrated in Table 14 for each mining location the current LOM mine plan will return more waste rock to the pit voids than is required to achieve the commitment of “pit voids backfilled to above the pre-mining water table”. It should be highlighted that previous versions of LOM plans indicated that all waste rock from Firetail would be stored in ex-pit WRDs; it is now predicted that approximately half of the total waste rock can be stored in-pit. This beneficial outcome is an example of the ongoing mine planning optimisation process, as well as demonstrating that backfilling opportunities continue to be identified as part of the ongoing mine planning process for the Solomon Project.

In order to achieve the backfill requirements for Kings and Queens pit voids, ongoing planning and optimisation studies will continue during the LOM in order to reduce the requirements for post-mining rehandle.
9.2.2 Domain 2 - Mine voids

Fortescue applies a whole of mine life approach to closure of mine pits, commencing from preliminary stakeholder consultation, background data collection, material movement, rehabilitation and culminating in relinquishment of the rehabilitated site back to the state. Table 16 summarises each stage of the closure process and identifies the relevant Management Plan(s) that will govern closure implementation of the mine voids, and ensure that all closure risks, issues and their management are addressed.

<table>
<thead>
<tr>
<th>Rehabilitation/ Closure Aspect</th>
<th>Management Plan(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline data collection</td>
<td>Solomon Groundwater Operating Strategy (SO-00018-RP-HY-0001)</td>
</tr>
<tr>
<td></td>
<td>Surface Water Management Plan (100-PL-EN-1015)</td>
</tr>
<tr>
<td></td>
<td>Significant Flora and Vegetation Monitoring Guidelines (45-GU-EN-0001)</td>
</tr>
<tr>
<td></td>
<td>Overburden Management Re-Growth and Waste (45-PR-EN-0012)</td>
</tr>
<tr>
<td></td>
<td>Acid and/or Metalliferous Drainage Plan (100-PL-EN-1016)</td>
</tr>
<tr>
<td>Material handling and utilisation</td>
<td>Vegetation Clearing and Topsoil Management (45-PR-EN-0013)</td>
</tr>
<tr>
<td></td>
<td>Surface Water Management Plan (100-PL-EN-1015)</td>
</tr>
<tr>
<td></td>
<td>Overburden Management Re-Growth and Waste Procedure (45-PR-EN-0012)</td>
</tr>
<tr>
<td>Design and construction of WRDs</td>
<td>Waste Rock Landform Design Guideline (100-GU-EN-0042)</td>
</tr>
<tr>
<td></td>
<td>Surface Water Management Plan (100-PL-EN-1015)</td>
</tr>
<tr>
<td></td>
<td>Standard Engineering Specifications for Drainage and Flood Protection (100-SP-CL-0004)</td>
</tr>
<tr>
<td>Rehabilitation of WRDs</td>
<td>Waste Rock Landform Design Guideline (100-GU-EN-0042)</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation and Revegetation Management Plan (100-PL-EN-0023)</td>
</tr>
<tr>
<td>Monitoring of rehabilitation performance</td>
<td>Rehabilitation and Revegetation Management Plan (100-PL-EN-0023)</td>
</tr>
<tr>
<td></td>
<td>Rehabilitation and Revegetation Monitoring Procedure (45-PR-EN-0027)</td>
</tr>
<tr>
<td></td>
<td>Acid and/or Metalliferous Drainage Plan (100-PL-EN-1016)</td>
</tr>
<tr>
<td></td>
<td>Solomon Groundwater Operating Strategy (SO-00018-RP-HY-0001)</td>
</tr>
<tr>
<td></td>
<td>Surface Water Management Plan (100-PL-EN-1015)</td>
</tr>
</tbody>
</table>

9.2.3 Domain 3 - Tailings Storage

TSF closure and rehabilitation will be undertaken in accordance with Solomon TSF1 Raise and Trinity Waste Rock Dump – Closure Plan SO-PL-IF-0001 and recognise the relevant DMP and ANCOLD Tailings Guidelines. The closure and rehabilitation strategy involves covering the top surface of TSF1 with overburden and revegetating the surface and embankment. The revegetation technique that is adopted will be based on site specific trials and experience. In overview, TSF1 construction, operation and closure will consist of:

- the construction of a cover i.e. store and release, over the tailings at the cessation of tailings deposition and once the tailings have dewatered sufficiently to allow
heavy mining equipment to access the surface to construct this cover. The materials to be used for the closure cover will be sourced from the closure material stockpile and topsoil stockpiles. The closure cover will be vegetated; and

- the design and construction of surface water control features to control erosion and/or overtopping, as required. The final design, including the need for and location of a spillway, will depend on the final TSF height and the tailings and capping surface levels and topographies.

Rehabilitation will likely be undertaken in stages as the tailings consolidate (Table 17).

<table>
<thead>
<tr>
<th>Rehabilitation/Closure Aspect</th>
<th>Management Plan(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline data collection</td>
<td>Vegetation Clearing and Topsoil Management (45-PR-EN-0013)</td>
</tr>
<tr>
<td></td>
<td>Planning for Closure – Characterisation of Mineral Waste Rock and Soils (100-GU-EN-0018)</td>
</tr>
<tr>
<td></td>
<td>Solomon Groundwater Operating Strategy (SO-00018-RP-HY-0001)</td>
</tr>
<tr>
<td></td>
<td>Surface Water Management Plan (100-PL-EN-1015)</td>
</tr>
<tr>
<td></td>
<td>Significant Flora and Vegetation Monitoring Guidelines (45-GU-EN-0001)</td>
</tr>
<tr>
<td></td>
<td>Acid and/or Metalliferous Drainage Plan (100-PL-EN-1016)</td>
</tr>
<tr>
<td></td>
<td>Solomon TSF1 Raise and Trinity WRD – Closure Plan (SO-PL-IF-0001)</td>
</tr>
<tr>
<td>Material handling and utilisation</td>
<td>Rehabilitation and Revegetation Management Plan (100-PL-EN-0023)</td>
</tr>
<tr>
<td></td>
<td>Vegetation clearing and topsoil management (45-PR-EN-0013)</td>
</tr>
<tr>
<td></td>
<td>Acid and/or Metalliferous Drainage Plan (100-PL-EN-1016)</td>
</tr>
<tr>
<td>Design and construction of TSFs</td>
<td>Rehabilitation and Revegetation Management Plan (100-PL-EN-0023)</td>
</tr>
<tr>
<td></td>
<td>Solomon TSF1 Raise and Trinity WRD – Closure Plan (SO-PL-IF-0001)</td>
</tr>
<tr>
<td>Rehabilitation of TSFs</td>
<td>Rehabilitation and Revegetation Management Plan (100-PL-EN-0023)</td>
</tr>
<tr>
<td></td>
<td>Solomon TSF1 Raise and Trinity – Closure Plan (SO-PL-IF-0001)</td>
</tr>
<tr>
<td>Monitoring of rehabilitation performance</td>
<td>Rehabilitation and Revegetation Monitoring Procedure (45-PR-EN-0027)</td>
</tr>
<tr>
<td></td>
<td>Acid and/or Metalliferous Drainage Plan (100-PL-EN-1016)</td>
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<tr>
<td></td>
<td>Solomon Groundwater Operating Strategy (SO-00018-RP-HY-0001)</td>
</tr>
<tr>
<td></td>
<td>Surface Water Management Plan (100-PL-EN-1015)</td>
</tr>
</tbody>
</table>
9.3 Progressive Revegetation

Fortescue understands the importance and need for progressive rehabilitation and revegetation given the long life and large spatial footprint of the Solomon Project. It would not be economically or environmentally feasible to rehabilitate this area of land in its entirety at the end of mining, and consequently progressive rehabilitation is considered throughout the LOM to ensure that it is practically and progressively implemented.

As outlined in Section 8.6, implementation of progressive rehabilitation is seen by Fortescue as a beneficial and favourable process as it enables continuous and iterative learning and refinement of rehabilitation processes, through an ‘action – response’ approach. The extended LOM of the operation allows for the long-term performance of implemented rehabilitation activities and processes to be monitored to accurately assess both their ecosystem function (e.g. response to fire, dispersal mechanisms of vegetation and/or colonisation of fauna) and environmental impacts. The anticipated length of the Solomon Project provides unique opportunities to assess long-term development of rehabilitation and its overall stability and sustainability, particularly in respective to adverse climatic (e.g. drought, cyclones) and natural (e.g. fire, weeds, pests) events.

The EMPs that govern the implementation of rehabilitation and closure to achieve the stakeholder agreed objectives have been developed following review of rehabilitation monitoring data obtained at other Fortescue and Pilbara mining operations, and industry-wide guidelines. Rehabilitation and closure tasks or activities to be implemented at the Solomon Project are therefore considered best-practice and their evolution and monitoring over time will assist in improving industry standards across the board.

9.4 Implementation Schedule

Table 18 outlines the most recent LOM sequence for the Solomon Project (2014). It is important to note that the Solomon Project is at the very early stages of development; as such mine plans will change and continue to be optimised. Future versions of the Solomon MCP will incorporate the latest updates to the LOM sequence as well as planned development of Trinity, Zion, Castle Valley and Fredrick mining areas. Figures 7 to 9 display 10 year indicative overviews of the Firetail, Kings and Queens development, highlighting conceptual ex-pit WRD and backfilling sequencing.
### Table 18: Life of Mine Plan (2014) waste rock movement summary

<table>
<thead>
<tr>
<th>Mine Area</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
<th>FY18</th>
<th>FY19</th>
<th>FY20</th>
<th>FY21</th>
<th>FY22</th>
<th>FY23</th>
<th>FY24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firetail</td>
<td>100% ex-pit</td>
<td>100% ex-pit</td>
<td>100% ex-pit</td>
<td>100% ex-pit</td>
<td>100% backfill</td>
<td>100% backfill</td>
<td>100% backfill</td>
<td>100% backfill</td>
<td>100% backfill</td>
<td>100% backfill</td>
</tr>
<tr>
<td>Kings, Trinity and Zion</td>
<td>100% ex-pit</td>
<td>100% ex-pit</td>
<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
<td></td>
</tr>
<tr>
<td>Queens, Castle Valley and Fredrick</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100% ex-pit</td>
<td>100% ex-pit</td>
<td>100% ex-pit</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mine Area</th>
<th>FY25</th>
<th>FY26</th>
<th>FY27</th>
<th>FY28</th>
<th>FY29</th>
<th>FY30</th>
<th>FY31</th>
<th>FY32</th>
<th>FY33</th>
<th>FY34</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firetail</td>
<td>100% backfill</td>
<td>100% backfill</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td>Kings, Trinity and Zion</td>
<td>100% backfill</td>
<td>100% backfill</td>
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<td>100% backfill</td>
</tr>
<tr>
<td>Queens, Castle Valley and Fredrick</td>
<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
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<td>Both ex-pit and backfill</td>
<td>Both ex-pit and backfill</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mine Area</th>
<th>FY35</th>
<th>FY36</th>
<th>FY37</th>
<th>FY38</th>
<th>FY39</th>
<th>FY40</th>
<th>FY41</th>
<th>FY42</th>
<th>FY43</th>
<th>FY44+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firetail</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Kings, Trinity and Zion</td>
<td>100% backfill</td>
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<tr>
<td>Queens, Castle Valley and Fredrick</td>
<td>100% backfill</td>
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</tr>
</tbody>
</table>
FMG Mines and Prospects
Waste Dumps
Proposed Indicative Mine and Rail Footprint
Conceptual Pit Outlines

LEGEND

FMG Mines and Prospects
Waste Dumps
Proposed Indicative Mine and Rail Footprint
Conceptual Pit Outlines

Figure 7
2020
Projected Mine and Waste Locations

Kings
Trinity
Solomon
Queen

FMG accepts no liability and gives no representation or warranty, expressed or implied, as to the information provided including its accuracy, completeness, merchantability or fitness for purpose.
LEGEND
- FMG Mines and Prospects
- Waste Dumps
- Proposed Indicative Mine and Rail Footprint
- Conceptual Pit Outlines

FMG accepts no liability and gives no representation or warranty, express or implied, as to the information provided including its accuracy, completeness, merchantability or fitness for purpose.

Figure 9
2040
Projected Mine and Waste Locations

Kilometres

0 0.5 1 1.5 2

Kilometres
9.5 Unplanned or Unexpected Closure

Fortescue understands that given the long life of the Solomon Project, future changes in economic environment may result in unplanned or unexpected permanent closure or suspension of operations under care and maintenance. As these events may represent an appreciable environmental risk, the DoE, DMP and EPA require that consideration is given in the MCP to addressing and mitigating any potential impacts to the environment, and which may result in an unacceptable liability to the State.

Progressive rehabilitation is the best mechanism to protect against unplanned or unexpected closure or suspension of operations. Through progressive rehabilitation, the area of land left open and not rehabilitated to an acceptable agreed standard is kept to a practicable minimum, reducing the potential liability of the site. As described in Section 9.3, Fortescue is committed to progressive rehabilitation throughout the life of the operation.

In addition to progressive rehabilitation during operations, planning for unexpected closure or suspension of operations at the Solomon Project will involve the following:

- making safe closure domains so that they do not represent a risk to humans and animals;
- preventing potential physical (e.g. erosion, subsidence) and chemical (e.g. acid and/or metalliferous drainage) pollution pathways from either establishing or exacerbating over time; and
- secure and signpost the site to prevent inadvertent entry.

Implementation of the Fortescue EMS through the various EMPs, Procedures and Standard Work Instructions (SWIs), and the overarching adaptive management framework, ensures that all environmental, and more specifically rehabilitation and closure strategies, are continually revised and updated as new information comes to light. A critical aspect of this process is the integration of mine closure into the LOM planning at all stages of the operations. This ensures that the resources required to undertake and complete the rehabilitation works, in both the short and long-term, are factored into budget planning during the operational phase; thus there is an up-to-date register of required rehabilitation and closure provisions. The strength of this process is enhanced through the application of annual cost provisioning for closure, congruent with the closure cost estimating methodology outlined in Section 10. This allows for the current closure cost liability to be readily established, and the present closure obligation costs to be defined in the case of unplanned or unexpected closure or suspension of operations.
In the unlikely event of an unexpected or temporary closure where the site will be placed into a care and maintenance phase for a period of time while options are identified and evaluated, as a minimum, the following would be undertaken:

- environmental/HSE audit to ascertain high priority risks and tasks for successfully managing the project during care and maintenance;

- development of a detailed care and maintenance plan in consultation with the DMP, to include:
  - monitoring schedule (geo-technical, geo-chemical or high risk areas, groundwater and in-pit monitoring, erosion and rehabilitation monitoring);
  - program to address high priority risks and ensure that appropriate risk mitigation measures are in place; and
  - considerations of safety obligations required under Sections 42 and 88 of the Mines Safety and Inspection Act 1994 relating to mine suspension or abandonment. One of these obligations is to notify the relevant DMP District Inspector before a mining operation is suspended or abandoned.

- an assessment of exposed land surfaces (e.g., external WRDs and TSFs) to determine the extent of possible dust generation / lift-off that may be generated in the event of prolonged unexpected closure. This assessment would be undertaken in accordance with Fortescue’s Mine and Rail Dust Management Plan 45-PL-EN-0030. Some of the potential strategies may include:
  - irrigation of exposed surfaces;
  - placement of a coarse material cover;
  - seeding to promote a temporary vegetative cover; or
  - permanent rehabilitation of the exposed land surfaces.

The Care and Maintenance Plan would also be provided and communicated to key external stakeholders.

In the event of unexpected closure, the closure process detailed within this MCP would be accelerated, including the development of a detailed decommissioning plan.
10. CLOSURE MONITORING AND MAINTENANCE

10.1 Monitoring Program Overview

Fortescue has implemented monitoring programmes at all its mining operations, to evaluate the performance of rehabilitated mine landforms and to assess whether they have either met the site completion criteria or are showing satisfactory progress towards meeting these criteria. These programmes will be expanded as new areas of the mine are rehabilitated and will be refined based on monitoring results and rehabilitation success.

Ecological monitoring post closure to measure the performance of rehabilitation and revegetation works against site specific completion criteria will be in accordance with Fortescue's Rehabilitation and Revegetation Monitoring Procedure 45-PR-EN-0027. An important component of leading practice rehabilitation is the use of monitoring and trials to track the progress of rehabilitation and ensure continuous improvement through adaptive management, such that:

- monitoring procedures will be used to assess whether initial establishment has been successful, rehabilitation is developing satisfactory and is ready for signoff; and
- trial activities will be undertaken where knowledge gaps or deficiencies in rehabilitation progress occur.

Fortescue’s adaptive management approach to rehabilitation involves regularly assessing performance by taking into consideration results of rehabilitation and trials from Fortescue’s operations in the region and refining its management practices to facilitate continuous improvement. Rehabilitation areas and trials will be monitored on a regular basis to assess the success or otherwise of a particular rehabilitation technique, with the results used to further refine the operations rehabilitation programme.

Monitoring events will be undertaken in line with the process outlined within this section, with the outcomes informing rehabilitation strategies, facilitating refinement in completion criteria and directing maintenance and remedial action plans.

10.2 Rehabilitation Monitoring Methodology

Progressive rehabilitation and ongoing performance assessment will be carried out in areas where mining and related operations have been completed and further disturbance is unlikely. Monitoring procedures will be used to assess whether initial establishment has been successful, rehabilitation is developing satisfactorily and is ready for signoff.

In accordance with Fortescue’s Rehabilitation and Revegetation Monitoring Procedure 45-PR-EN-0027 monitoring of rehabilitated areas may be conducted on an annual basis for the first three years to determine initial establishment, then on a biennial basis to determine trajectory towards reference sites and established completion criteria. High priority areas will
be identified and monitored as soon as possible, in the appropriate season, following completion of earthworks, spreading of topsoil and any seeding/planting. Ideally, monitoring should be conducted between April and June each year to capture vegetation growth and establishment following the summer rainfall in the first months of the year. Other areas will be subjected to monitoring on a representative basis.

In accordance with Fortescue’s *Conservation Significant Fauna Management Plan* 100-PL-EN-0022 where baseline survey results are available, monitoring sites will be established at locations where species have been previously recorded in suitable habitat and denning/shelter zones outside of direct impacts areas and within impact areas and rehabilitated areas.

Fauna monitoring will be completed as per the *Solomon Fauna Management Plan* 45-PL-EN-0027 and the *Conservation Significant Fauna Management Guidelines* 100-GU-EN-0034 during both operations and post-closure.

Vegetation parameters including species richness, diversity, composition, perennial percentage cover, density and vegetation condition are monitored along linear transects and quadrats as per the *Rehabilitation and Revegetation Monitoring Procedure* 45-PR-EN-0027.

The frequency of monitoring may be increased or decreased depending on the outcomes of specific areas. A more detailed description of Fortescue’s rehabilitation monitoring methodology is contained in the *Rehabilitation and Revegetation Monitoring Procedure* 45-PR-EN-0027.

### 10.2.1 Weed Monitoring

In accordance with Condition 8-1 of MS 862, Fortescue has undertaken weed management, such that:

- the cover of weeds (including both declared weeds and environmental weeds) within the proposal area will not exceed that existing on reference sites determined in accordance with Condition 8-1(1); and

- the reference sites and impact sites will be monitored every two years after commencement of ground-disturbing activities to determine whether changes in weed cover and type are as a result of project implementation or broader regional changes.

Condition 8-1 of MS 862 also states that no new species of weeds (including both declared weeds and environmental weeds) are introduced into the area as a result of the implementation of the Solomon Project. Fortescue’s *Weed Management Plan* (45-PL-EN-0013) describes the weed monitoring to be conducted, and measures used to prevent the introduction and spread of weeds and the ongoing effectiveness of weed control measures.
10.2.2 Flora and Fauna Monitoring of Rehabilitation Areas

Fortescue conducts its monitoring of significant flora and vegetation (excluding mangroves) under the *Significant Flora and Vegetation Management Plan* 45-PL-EN-0017, which covers all of Fortescue’s Operations.

Flora and fauna monitoring within the Solomon Project area has two components:

- monitoring of the natural ecosystems potentially affected by the Solomon Project; and
- monitoring of the rehabilitated areas.

The monitoring of natural ecosystems (actually or potentially) affected by the Solomon Project will be completed in accordance with the Significant Flora and Vegetation Management Plan. This Plan addresses the monitoring of the following:

- vegetation health and abundance at natural analogue sites; and
- known populations of the priority species *Gompholobium karijini*.

Fortescue has undertaken further flora and vegetation surveys of all proposed disturbance areas within the Solomon Project area that had not previously been surveyed when MS 862 was released. Consequently, Fortescue has also completed additional botanical survey work in the upper reaches of the Kingfisher Valley, Firetail and Kings Valley, and completed a census of the priority species *Gompholobium karijini* within the Solomon Project area.

Rehabilitated areas will be revegetated and the effectiveness of the revegetation works will be monitored in accordance with Solomon Project EMPs. Fortescue will develop specific performance targets to measure the success of the revegetation works. The primary objective for revegetation is to achieve a ground cover percentage and species diversity of self-sustaining living native vegetation comparable to that of undisturbed natural analogue sites, as demonstrated by EFA\(^3\) or other methodology acceptable to the Chief Executive Officer of the OEPA.

Fauna monitoring will be completed as per the *Conservation Significant Fauna Management Plan* 100-PL-EN-0022 during both operations and post-closure in accordance with Condition 12 of MS 862. This includes monitoring for impacts on short-range endemics.

10.2.3 Surface Water Monitoring

As described in the *Solomon Life of Mine Surface Water Strategy* SO-03018-RP-WM-0003, ongoing surface water monitoring is conducted to validate and refine the outcomes predicted

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\(^3\) The methodology for Ecosystem Function Analysis is set out in Tongway D.J. and Hindley, 2004 *Landscape Function Analysis – Procedures for Monitoring and Assessing Landscapes*, Commonwealth Scientific and Industrial Research Organisation Sustainable Ecosystems, Canberra.
by the hydraulic models. The monitoring program includes sufficient redundancy to allow for equipment failure.

Rigorous analysis of monitoring data collected to date shows that infiltration loss rates have been estimated to be significantly higher than values in published and proprietary literature (Flavell 2006). However the short period of record (in hydrological terms) does not provide enough confidence in these estimates for full application to planning and impact assessment scenarios. With this limited data record the two-dimensional hydraulic modelling of the catchments undertaken for baseline, current and proposed scenarios, has used direct rainfall inputs with infiltration rates from Flavell (2006), which is an extension of work originally presented in published literature (Flavell & Belstead 1986). Based on the observed data, the extent of flooding shown in this modelling is considered to be highly conservative based on understanding of site hydrology. The hydraulic modelling is intended to be refined as more monitoring data becomes available and further detailed sensitivity analysis will be undertaken as loss parameters are refined. The analysis of monitoring data and hydraulic modelling parameters are described in Solomon Life of Mine Surface Water Strategy SO-03018-RP-WM-0003.

The data collected to date has allowed for development of improved hydrological methodology and as noted by Peer reviewers (refer Solomon Life of Mine Surface Water Strategy SO-03018-RP-WM-0003) "In many cases, the customised approach's exceed typical level of analysis and the expected level of confidence that would be achieved by assigning published methodologies". Surface water monitoring will continue throughout operations and will include consideration of rehabilitation areas. Learnings from this monitoring will be used to guide future monitoring as well as being used to refine designs as part of adaptive management.

10.2.4 Groundwater Monitoring

Fortescue will complete further groundwater monitoring in accordance with the Solomon Groundwater Operating Strategy SO-00018-RP-HY-0001. This strategy specifies the groundwater monitoring activities that will be conducted during the life-of-mine and until relinquishment. Monitoring will be used to assess impacts, if any, on groundwater quality and potential secondary impacts. In accordance with Condition 11-1 of MS 862, Fortescue will ensure that water levels in groundwater-fed pools within and adjacent to the Solomon Project area are maintained consistent with pre-mining levels. Monitoring will be used to assess impacts, if any, on the water levels of the pools and trigger investigations for potential secondary impacts.

Monitoring of groundwater levels at the Kangeenarina and Weelumurra Creek pools will continue throughout operation and following final closure and decommissioning in order to ensure compliance with Condition 11-3 of MS 862.
10.3 Reporting

A Compliance Assessment Report detailing Fortescue’s compliance with Condition 14 of MS 862 will be submitted to the CEO of the OEPA in accordance the reporting requirements of Condition 4-6 of MS 862.

The results of closure monitoring, progress against the closure activities detailed in the MCP and the performance of progressive rehabilitation will be reported in Fortescue’s Annual Environmental Report (AER), as required under the *Mining Act 1978*, and will be used to show progress against the agreed completion criteria and rehabilitation targets. The results of monitoring will be used internally on an annual basis to assess rehabilitation performance and identify whether alternative management strategies are required or if completion criteria require review. This is a critical component of the adaptive management system (Section 9.4.1) employed by Fortescue and the iterative feedback loop in setting closure criteria (see Plate 1).

Planned closure will be reported to the DMP, EPA and other stakeholders in a Final Closure and Decommissioning Plan at least three years prior to closure.
11. FINANCIAL PROVISIONING FOR CLOSURE

Fortescue acknowledge that mining operations create environmental change and cause environmental disturbance, and that rehabilitation and revegetation of these operations is required to close and relinquish the site. The costs associated with these rehabilitation and closure works are significant, and Fortescue undertakes annual provisioning of closure to ensure adequate funds are available to progressively rehabilitate the site, conduct post closure monitoring and fund remediation activities.

Financial provisioning for closure within Fortescue is governed by the *Planning for Closure – Mine Closure Provision Estimate Calculations* 100-PR-EN-1037 document that outlines the methodology to be applied to obtain order of magnitude closure cost estimates. Closure cost estimates are developed and reviewed using the best available financial and mine information. Estimates that support the Mine Closure Strategy are conceptual (+/- 30%), while the Mine Closure Plan estimates have an accuracy of +/-20%.

Typically cost estimates will improve in accuracy over time to a point within five years from the end of mine life. These closure cost estimates have an accuracy of +/-10% as these figures will be utilised in the development of progressive rehabilitation capital budgets that are supported by the five year mine plans.

The financial provisioning methodology outlined in *Planning for Closure – Mine Closure Provision Estimate Calculations* 100-PR-EN-1037 has been externally peer reviewed to confirm that the approach adopted and assumptions made are sound and that the mine closure provision estimates reflect those used in similar operations elsewhere in Australia.

Closure cost estimates are determined using internal systems which calculate the rehabilitation and closure costs on a per hectare basis for each closure domain. Input data includes (data updated biannually):

- ground disturbance, including areas of each domain requiring rehabilitation;
- material volumes;
- machinery utilisation rates; and
- financial information, including salaries, fuel costs, fuel burn rate, and maintenance costs.

The closure cost estimate captures the following required information (EPA/DMP, 2014):

- earthmoving and landscape forming;
- management of problematic materials where relevant;
- post-closure management of surface water drainage;
- closure research and trials;
• decommissioning and removal of infrastructure;
• remediation of contamination;
• progressive and final rehabilitation;
• maintenance, and monitoring and auditing programs including post-closure phase;
• ongoing stakeholder engagement process;
• closure project management costs;
• project management;
• specialist and consultant fees;
• legal requirements;
• provision for premature closure (permanent closure or suspended operations under care and maintenance);
• provision for installing additional infrastructure if required for the agreed land uses; and
• provision for potential delays, extreme events or other external factors relevant to closure.
12. MANAGEMENT OF INFORMATION AND DATA

Management and storage of all rehabilitation and closure information and data will be undertaken in accordance with the Fortescue EMS (and corresponding company-wide Business Management System (BMS). In the BMS all document control is governed by the Document Control Procedure 100-PR-DC-0002.

Throughout the LOM of the Solomon Project, this MCP document will be progressively updated to capture and summarise current closure planning information associated with:

- closure planning prior to cessation of operations;
- implementation of the closure program of works; and
- post-closure monitoring and reporting period.
13. REFERENCES


Beard J.S. (1975). 1:1,000,000 vegetation series: explanatory notes to sheet 5: the vegetation of the Pilbara area. University of Western Australia Press


Environmental Protection Authority 2006, Guidance Statement No. 6: Rehabilitation of Terrestrial Ecosystems. Environmental Protection Authority, Western Australia.


Flavell, D and Belstead, B., S. (1986) Losses for Design Flood Estimation Western Australia, Hydrology and Water Resources Symposium, National Conference Proceeding, Institute of Engineers Australia


Fortescue Metals Group (2015). Life of Mine Geochemistry Programme Site Specific Trigger Values (45-SY-EN-0001)


