PILBARA IRON ORE AND INFRASTRUCTURE PROJECT

Chichester Operations
Noise and Vibration
Environmental Management Plan

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

Fortescue Metals Group Limited (Fortescue) has commenced operation of the Pilbara Iron Ore and Infrastructure Project (the Project), which consists of several iron ore mines and associated rail and port infrastructure in the Pilbara region of Western Australia. The primary environmental approvals for the project have been obtained in four stages:

- Stage A consisting of an iron ore export facility at Port Hedland and a north-south railway from the central Pilbara to Port Hedland (approved under Ministerial Statement 690);
- Stage B consisting of two iron ore mines in the Eastern Pilbara (Christmas Creek and Mindy Mindy) and an east-west spur rail line connecting to the Stage A railway (approved under Ministerial Statement 707);
- Cloudbreak iron ore mine west of the Christmas Creek area (approved under Ministerial Statement 721 and Commonwealth Assessment EPBC 2005/2205); and
- Port facility upgrade of the third berth at Anderson Point, Port Hedland: Dredging and wharf construction (approved under Ministerial Statement 771).

The Cloudbreak and Christmas Creek mine sites are located on the southern slopes of the Chichester Range; collectively the two mine sites are referred to as the Chichester Operations.

During the initial stages of operation, mining will occur in the Cloudbreak and Christmas Creek areas, with ore hauled by truck from Christmas Creek to the ore processing facility at Cloudbreak. Ore from Cloudbreak and Christmas Creek is then transported by train along the approved north-south (Stage A) and east-west (Stage B) railways to Port Hedland.

Proposed extensions of the rail line to the south and to the east will be considered in future expansions.

The existing infrastructure at Fortescue's Herb Elliott Port provides for train unloading, stacking and reclaiming and ship loading of iron ore via a conveyor system. Expansion of the port facility to include an additional

fourth and fifth berth and increased reclaiming capacity is proposed to handle increased ore production from the Chichester Operations.

1.2 PURPOSE

The purpose of this plan is to outline the existing information on operational noise and vibration resulting from Fortescue's Chichester Operations. The Plan further details the potential impacts to local receptors and the management actions employed to mitigate and reduce these impacts.

The Plan is developed to meet the requirements of Commitment 5 of Ministerial Statement 707 and Commitment 30 of Ministerial Statement 721, as described in Table 1.

Table 1: Requirements of Ministerial Statements 707 and 721

Ministerial Statement	Requirement	Location
707	*Prepare an Operational Noise and Vibration Management Plan for the mines which:* • identifies noise reduction strategies;	5.2 5.3
	• minimises disturbance to the Fortescue Marshes and residence(s) from blasting noise generated at operations; and	1.5.2 5.3
	• outlines a monitoring program to measure noise emissions and assess optimal placing of noise barriers.	5.2 5.3
721	*Prepare an Operational Noise and Vibration Management Plan for the mines which:* • identifies noise reduction strategies;	5.2 5.3
	• identifies impacts on susceptible fauna, including the Night Parrot, Bilby and other species of Specially protected (Threatened) Fauna and strategies to mitigate the impacts on them;	1.5.2 5.3
	• minimises disturbance to the Fortescue Marshes and residence(s) from blasting noise generated at operations; and	1.5.2 5.3
	• outlines a monitoring program to measure noise emissions and assess optimal placing of noise barriers.	5.2 5.3

The specific objective of this management plan, as described in Ministerial Statements 707 and 721 is to:

- Ensure that noise levels comply with statutory requirements and acceptable (and appropriate) standards.

1.3 SCOPE

This plan applies to noise and vibration generated from mining and associated operational activities within the Chichester Operations.

1.4 BACKGROUND

Noise prediction modelling was undertaken during the initial environmental impact assessment (Lloyd Acoustics, 2005) and again for construction of the Project (Lloyd Acoustics, 2006). As part of this process the 'worst- case scenario' was considered.

In this scenario, noise modelling was conducted for all equipment operating simultaneously with bulk earthworks being conducted. Additionally, the scenario of 'unconfined' blasting was considered with assessment of blasting noise to the nearest noise sensitive premises and to fauna habitats.

Interpretation of noise modelling as applied to the Chichester Operations is discussed further in section 1.5.

1.5 POTENTIAL ENVIRONMENTAL IMPACTS

The local receptors that are potentially impacted by noise and vibration are:

- Surrounding human populations; and
- Fauna species.

Mining activities at the Chichester Operations that have the potential to result in impacts to these receptors include:

- Drilling and blasting of areas to prepare for mining;
- Use of large mining equipment to remove ore and overburden;
- Operation of fixed and mobile conveyors to transport ore;
- Operation of the Ore Processing Facility; and
- Loading and operation of trains to transport ore to Port Hedland.

1.5.1 Human Receptors

The nearest noise sensitive premises to Cloudbreak are:

- Cloudbreak Mine Accommodation Village 1.5 km
- Warrie Outcamp (not residential) 10 km
- Mulga Downs Outcamp (not residential) 20 km
- Hillside Outcamp (not residential) 20 km
- Marillana Station 30 km
- Bamboo Springs 35 km

The nearest noise sensitive premises to Christmas Creek are:

- Christmas Creek Temporary Camp 1.5 km
- Roy Hill Station 25 km
- Warrie Outcamp (not residential) 30 km
- Bonney Downs 30 km
- Marillana Station 45 km

The predicted operational noise levels for the Cloudbreak and Christmas Creek mine sites are shown in Tables 2 and 4 respectively. The results of the operational noise predictions show that, under EPA default meteorological conditions, the worst affected premises (Marillana Station) will receive a noise level of L_{A10} 7 dB(A). This level is significantly below the assigned night-time noise levels under the *Environmental Protection (Noise) Regulations 1997* and is unlikely to be audible. Higher noise levels (L_{A10} 24 dB(A)) are predicted at Warrie Outcamp, however, this is a remote camp and is not considered to be a residence. The predicted noise level to the Cloudbreak Mine Camp is L_{A10} 34 dB(A).

The predicted blast noise levels for the Cloudbreak and Christmas Creek mine sites are shown in Tables 3 and 5 respectively. Noise levels from blasting were modelled in 2005 (Lloyd Acoustics, 2005) for the original impact assessment and again prior to project construction (Lloyd Acoustics, 2006). Modelling was conservative as it is based on unconfined blasting whereas it is expected that only confined blasting will be used.

Therefore, the data presented in Table 5 can be regarded as a ‘worst case’. Recent blast monitoring, undertaken at a distance of 1,000 m from the blast, shows air blast levels of between 115 and 124 dB $_{(\text{linear peak})}$. Based on these

results, the anticipated air blast levels at the accommodation village would be 108 $dB_{(linear\ peak),}$ well within the benchmark limit of 140 dB.

With respect to vibration, monitoring of blasts was conducted during construction. The results have shown peak particle velocity (PPV) ground vibration levels between 2.53 and 4.50 mm/s at a distance of 1,000 m from the blast. These results show good correlation with predicted levels and suggest that ground vibration levels at the accommodation village, which are 1.5 km away from both mine sites at the nearest point, will be well within the widely accepted PPV ground vibration criterion of 5 mm/s.

Table 2: Predicted L_{A10} Night-time Noise Levels at Potentially Sensitive Receivers from Cloudbreak (Lloyd Acoustics, 2005)

Sensitive Receiver	Predicted Noise Levels for Initial Mining Phase	Most Stringent Noise Level Criteria (Noise Regulations)
Marillana Station	7 dB(A)	35 dB(A)
Warrie Outcamp (not residential)	24 dB(A)	-
Mine Camp	34 dB(A)	65 dB(A)

Table 3: Predicted L_{A10} Night-time Noise Levels at Potentially Sensitive Receivers from Christmas Creek (Lloyd Acoustics, 2004)

Sensitive Receiver	Predicted Noise Levels for Initial Mining Phase	Most Stringent Noise Level Criteria (Noise Regulations)
Roy Hill	17 dB(A)	35 dB(A)
Bonney Downs	5 dB(A)	35 dB(A)
Noreena Downs	13 dB(A)	35 dB(A)
Marillana	8 dB(A)	35 dB(A)
Warrie Outcamp (not residential)	20 dB(A)	-
Mine Camp	49 dB(A)	65 dB(A)

Table 4: Predicted Blasting Noise Levels from Unconfined Blasting Based on a Maximum Charge Mass of 20 kg per Delay - Cloudbreak (Lloyd Acoustics, 2006)

Sensitive Receiver	Predicted Linear Peak Noise Level (dB)
Mine Camp	128
Marillana Station	102
Bamboo Springs	100
Mulga Downs Outcamp (not residential)	106
Warrie Outcamp (not residential)	115
Hillside Outcamp (not residential)	106

Table 5: Predicted Blasting Noise Levels from Unconfined Blasting Based on a Maximum Charge Mass of 20 kg per Delay – Christmas Creek (Lloyd Acoustics, 2004)

Sensitive Receiver	Predicted Linear Peak Noise Level (dB)
Roy Hill	116
Bonney Downs	116
Noreena Downs	114
Marillana	-
Warrie Outcamp (not residential)	122

1.5.2 Fauna Receptors

The Chichester Operations are surrounded by native vegetation (principally mulga woodlands and hummock grasslands). This vegetation is largely intact although modified by pastoral and mineral exploration activities (Mattiske Consulting, 2005). These woodlands and grasslands provide habitat for a number of species of rare vertebrate fauna. These include mulgara (*Dasycercus cristicauda*), bilby (*Macrotis lagotis*), northern quoll (*Dasyurus hallucatus*) and the night parrot (*Pezoporus occidentalis*), all of which are specially protected under State or Commonwealth legislation.

To the south of the Chichester Operations, at a distance of approximately 3.5 km at its nearest point, is the Fortescue Marshes. The Marshes are listed on the Australian Heritage Commission Register of the National Estate

as an “Indicative Place”, and in the Directory of Important Wetlands in Australia (Environment Australia, 2001). When in flood, the Marshes can support a rich diversity of migratory birds, and breeding in a number of species has been recorded. The predicted operational noise and blasting noise levels at the Fortescue Marshes are shown in Tables 6 and 7 respectively.

The blast noise prediction is conservatively based on unconfined blasts and is well within the benchmark limit of 140 dB for impact on humans.

In respect of ground vibration, blast monitoring has indicated that peak particle velocity (PPV) ground vibration levels at the Fortescue Marshes will be well within the widely accepted PPV ground vibration criterion of 5 mm/s (see Section 1.4.1).

Table 6: Predicted L_{A10} Night-time Noise Levels at the Fortescue Marshes (Lloyd Acoustics, 2004 and 2005)

Sensitive Receiver	Predicted Noise Levels for Initial Mining Phase	Most Stringent Noise Level Criteria (Noise Regulations)
Fortescue Marshes	36 – 40 dB(A)	-

Table 7: Predicted Blasting Noise Levels at the Fortescue Marshes (Lloyd Acoustics, 2006)

Sensitive Receiver	Predicted Linear Peak Noise Level (dB) for Unconfined Blast
Fortescue Marshes	127

The potential impact of noise and vibration on fauna can be difficult to assess (AMEC Americas Ltd, 2005). There is a lack of information on Australian animals in particular, with most studies into noise impacts on fauna having been undertaken in Europe or America, often in relation to military operations. Where studies have been done, it may be not be correct to assume that similar responses occur across different species. It may also be difficult to separate visual and auditory effects within studies.

Despite these limitations, the potential impact of noise and vibration has been considered in environmental impact assessments carried out for Cloudbreak and Christmas Creek (see Environ 2005; Lloyd Acoustics 2005; Cherriman and Bamford, 2007). It was noted that an animal's initial reaction

to a new noise source can be fright and avoidance, resulting in increased energy expenditure, and potentially mortalities if young are abandoned. However, if other sensory systems, such as sight or smell, are not stimulated, the animal may quite quickly learn to ignore the noise source. Furthermore, the extent of these impacts is likely to be limited to animals within close proximity of the mining operations with impacts lessening with increasing distance from the source (e.g. as seen in the red-cockaded woodpecker – see Delaney *et al*., 2002). For this reason, pre-disturbance biological survey of new open pit areas will be extended into a buffer zone of 100 m to take account of the potential presence of rare vertebrate fauna that may be disturbed by new mining activities. If rare fauna are located within the buffer zone, case-by-case decisions will be made about the actions warranted. These actions would range from no action, to monitoring, and through to relocation. If relocation was deemed appropriate, it would be undertaken in consultation and approval from the State and Commonwealth agencies as appropriate.

This potential for disturbance to fauna would not appear to extend to the Fortescue Marshes as the distance is too great – while blast noise would be audible, in the absence of other stimuli, it is unlikely to disrupt any bird populations. Based on the modelling undertaken to date, the sound levels from blasting at the nearest point of the Fortescue Marshes is such that would result in a “low risk of noise complaints” from human receptors (US Army Centre for Health Promotion and Preventive Medicine, 2005 – see Table A3). A corresponding low level of disturbance to fauna populations could be expected.

1.6 OTHER RELEVANT DOCUMENTS

This Management Plan is to be read in conjunction with the following Fortescue documents:

- *Chichester Operations Construction Environmental Noise Management Plan* (CB-PL-EN-0008);
- *Fortescue Marshes Management Plan* (45-PL-EN-0009);
- *Operations Fauna Management Plan* (45-PL-EN-0007);
- *Bilby, Northern Quoll and Mulgara Management Plan* (45-PL-EN-0008) ; and
- *Night Parrot Management Plan* (CB-PL-EN-0010).

2. STAKEHOLDER CONSULTATION

Fortescue has undertaken an extensive stakeholder consultation program whereby landowners, regulators and other relevant parties have been consulted with regard to investigation and design of the Project.

Fortescue applies the principles of its *Stakeholder Consultation Strategy* (100-PH-EN-0003) for the development and implementation of stakeholder engagement during management plan development and implementation.

3. APPLICABLE LEGISLATION

Fortescue employees and contractors shall comply with all Commonwealth and State legislation that applies to the development and operation of the Project. Legislation relevant to the management of issues relevant to operational noise and vibration is outlined in Table 8.

Table 8: Relevant Legislation and its Application

Legislation	Application
Environmental Protection Act 1986	State environmental impact assessment and Ministerial approval process.
Wildlife Conservation Act 1950	State process that assesses the conservation significance of fauna species and forms the framework for significant species protection.
Environment Protection and Biodiversity Conservation Act 1999	Assesses the conservation significance of fauna species and forms the framework for significant species protection at the federal level.
Environmental Protection (Noise) Regulations 1999	Management of noise emissions and vibration from premises and public places.

Other relevant standards and guidelines:

- *AS 2436-1981: Guide to noise control on construction, maintenance and demolition sites.*
- *AS 1055-1997: Acoustics- Description and measurement of environmental noise.*
- *AS 1269:2005: Occupational noise management.*
- *Guideline: Noise control in mines* (2003), Department of Consumer and Employment Protection, Western Australia.

4. ROLES AND RESPONSIBILITY

Table 9 provides provisional roles and responsibilities of the personnel responsible for the implementation of the *Chichester Operations Noise and Vibration Environmental Management Plan*.

Table 9: Roles and Responsibilities

Position	Responsibility
Head of Environment	Implementation and maintenance of the *Chichester Operations Noise and Vibration Environmental Management Plan.* Undertake review of the management plan.
Environment Superintendent	Ensure all staff are aware of their obligations in relation to the plan. Participate in compliance audits and inspections. Provide technical support to site personnel.
Construction / Operations Managers	Ensure that the plan is being adhered to by all staff and contractors. Participate in compliance audits and inspections.

5. ENVIRONMENTAL MANAGEMENT

A series of management objectives has been determined. For each of these objectives, several management actions have been developed to ensure the impacts from Fortescues operations are managed, and a range of monitoring and assessment functions to which the plan is being implemented. The general approach to management of groundwater and bores has been detailed according to the following structure:

Item	Content
Objective	What is intended to be achieved?
Management Actions	Tasks that will be undertaken to ensure the Objective is met, lists of procedures required
Performance Indicators	Qualitative or quantitative measurement to gauge the performance of the actions undertaken
Monitoring	Details of measurement of performance indicators
Reporting	Nature, timing and responsibility for reporting results
Corrective Action	Action to be taken if monitoring indicates objective is not being met
Term	Active term of management plan
Responsibility	Delegation/nomination of responsibilities for overseeing management plan operation

5.1 MANAGEMENT STRATEGIES

The most recent prediction modelling report (Lloyd Acoustics, 2006) identified that noise and blasting impacts expected were below those on which the original environmental impact assessment was based (Lloyd Acoustics, 2005; see also Environ, 2005, Section 6.9). During mining operations, ‘confined’ blasting shall be used in most cases.

Other noise reduction strategies (e.g. use of low noise plant and equipment, use of noise barriers) will be adopted as required although these measures would not appear to be warranted at this stage.

5.2 HUMAN RECEPTORS

The management strategies to be adopted for noise and vibration management (impacts on human receptors) are outlined in Table 10.

Table 10: Management Strategies for Impacts on Human Receptors

Objective	Ensure that noise and vibration impacts emanating from mining activities comply with the statutory requirements and appropriate standards.
Management Actions	Low-noise plant and equipment will be used where practicable. Noise emission monitoring will be conducted on mobile plant where a potential exceedance is identified. Noise emission reduction will be addressed through the maintenance process. As necessary noise emission monitoring will be conducted on fixed plant and noise and vibration emission reduction will be addressed through the maintenance process. 'Confined' blasting will be used, and should 'unconfined' blasting be required on a regular basis, air blast monitors shall be set up to monitor emissions, and charges will be restricted to 10 kg or less.
Performance Indicators	Noise complaints received Noise monitoring results Vibration levels < 5 mm/s at the accommodation village
Monitoring	Noise or vibration complaints received will be recorded, investigated and the outcome of the investigation conveyed to the complainant.
Reporting	The results of noise and vibration monitoring and a summary of complaints will be provided in the Annual Environmental Report.
Corrective Action	Where noise or vibration complaints are received, the following corrective actions may be implemented: • Where equipment is identified to be exceeding the applicable noise criteria for that machine (as described in the manufacturer's data), it will be taken out of the fleet and repaired as required; • Will not be used in locations near noise sensitive premises; and/or • Options such as constructing barriers for noise will be considered if monitoring indicates they are likely to be effective.
Term	For the life of the project.

Responsibility	Operations Managers Environment Superintendent

5.3 FAUNA RECEPTORS

The management strategies to be adopted for noise and vibration management (impacts on fauna receptors) are outlined in Table 11.

Table 11: Management Strategies for Impacts on Fauna Species

Objective	To minimise any detrimental impacts on fauna species from noise and vibration resulting from mining activities.
Management Actions	Low-noise plant and equipment will be used where practicable. Regular noise emission monitoring will be conducted on mobile plant during maintenance or where a potential exceedance is identified. Noise emission reduction to be assessed through the maintenance processes. Where necessary noise emissions monitoring will be conducted on fixed plant and noise and vibration emission reduction will be addressed through the maintenance process. 'Confined' blasting will be used, and should 'unconfined' blasting be required, air blast monitors shall be set up to monitor emissions, and charges will be restricted to 10 kg or less. Survey for fauna within a minimum 100 m buffer zone when new open pit operations or other ground disturbance are being assessed.
Performance Indicators	Evidence of fauna disturbance.
Monitoring	Where necessary, additional noise and/or fauna monitoring may be implemented in order to determine the effectiveness of implemented corrective actions.
Reporting	The results of noise and fauna monitoring will be reported in the Annual Environmental Report
Corrective Action	Where equipment is identified to be exceeding the applicable noise criteria for that machine (as described in the manufacturer's data), it will be taken out of the fleet and repaired as required. Further monitoring (as described above) shall be conducted to determine the effectiveness of corrective actions.
Term	For the life of the project.
Responsibility	Operational Managers Environment Superintendent

5.4 COMPLAINTS

Given the distance of the Chichester Operations from residential or recreational areas, and public roads, it is very unlikely that numbers of complaints would be received due to noise or vibration from the site. However, in the event that complaints are received, Fortescue will undertake the following procedure:

- Record any complaints received as an incident and treat the complaint as such, in line with Fortescue's incident reporting system;
- Investigate the complaint by determining the impact and whether it is attributable to Fortescue's operations;
- Advise of the actions and outcomes of the investigations and of any remedial measures that are appropriate;
- Liaise with representatives from the Department of Environment and Conservation (DEC), as appropriate;
- Prepare annual summary reports of noise or vibration complaints and corrective actions to include in the Annual Environmental Report.

6. AUDITS AND INSPECTIONS

Auditing of Fortescue's performance against environmental compliance obligations is achieved through the conduct of regular internal audits.

Fortescue will conduct compliance audits at least annually. Audit reports will describe the status of compliance with environmental obligations at the time of the audit and identify areas of non-conformance and non-compliance.

7. REVIEW

This Management Plan will be reviewed at least every five years, or when significant additional information comes to hand. The review will be based on achieving approval requirements, Fortescue commitments, and progress in implementing the management plan and will incorporate any new investigations, information, techniques and advice from experts and regulatory authorities.

Upon review, the document will be revised where appropriate and the revision status will be updated in accordance with Fortescue's document control procedures.

8. CONSOLIDATED MANAGEMENT ACTIONS

Table 12 gives a summary of the management actions identified within this plan.

Table 12: Summary of Management Actions

Environmental Aspect	Management Actions
Human Receptors	Low-noise plant and equipment will be used where practicable. Noise emission monitoring will be conducted on mobile plant where a potential exceedance is identified. Noise emission reduction will be addressed through the maintenance process. As necessary noise emission monitoring will be conducted on fixed plant and noise and vibration emission reduction will be addressed through the maintenance process. 'Confined' blasting will be used, and should 'unconfined' blasting be required on a regular basis, air blast monitors shall be set up to monitor emissions, and charges will be restricted to 10 kg or less.
Fauna Receptors	Low-noise plant and equipment will be used where practicable. Regular noise emission monitoring will be conducted on mobile plant during maintenance or where a potential exceedance is identified. Noise emission reduction to be assessed through the maintenance processes. Where necessary noise emissions monitoring will be conducted on fixed plant and noise and vibration emission reduction will be addressed through the maintenance process. 'Confined' blasting will be used, and should 'unconfined' blasting be required, air blast monitors shall be set up to monitor emissions, and charges will be restricted to 10 kg or less. Survey for fauna within a minimum 100 m buffer zone when new open pit operations or other ground disturbance are being assessed.

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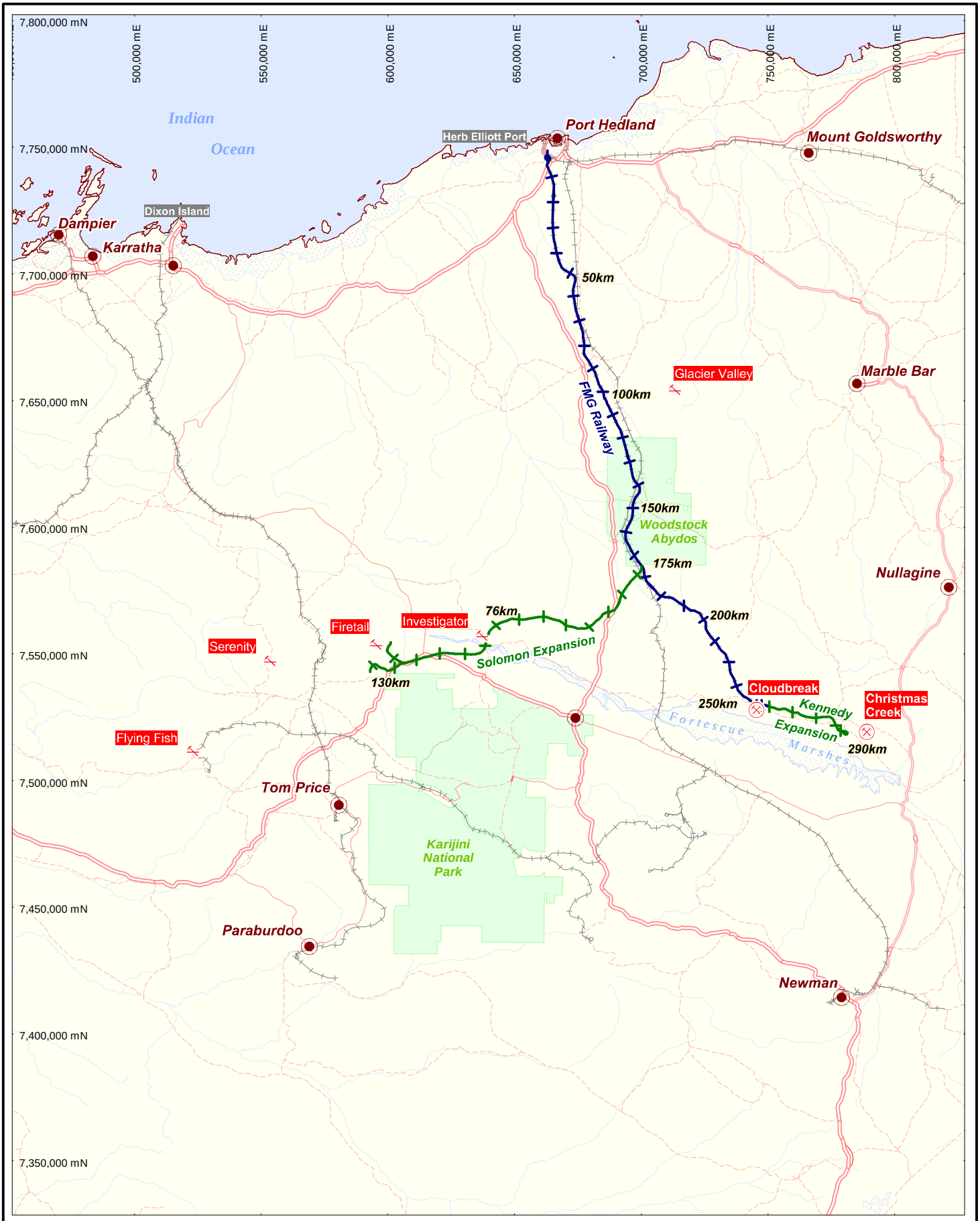
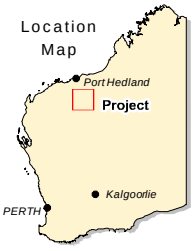
Figure 1

Regional Project Location



Location Map



Legend

- Towns
- Major Roads/Tracks
- Creeks
- FMG Railway
- FMG Proposed Railways
- Other Railways
- FMG Mines
- FMG Resources

N

0 20 40 80

kilometres

Fortescue Metals Group Ltd

FMG Regional Project

Author: P. Connolly	Date:3/8/2009
Drawn By: U. Boldbayar	Revision: 0
Doc No: 100_MP_EN_0003	Confidentiality: 1
Projection: MGA Zone 50 (GDA 94)	Scale: 1:2million