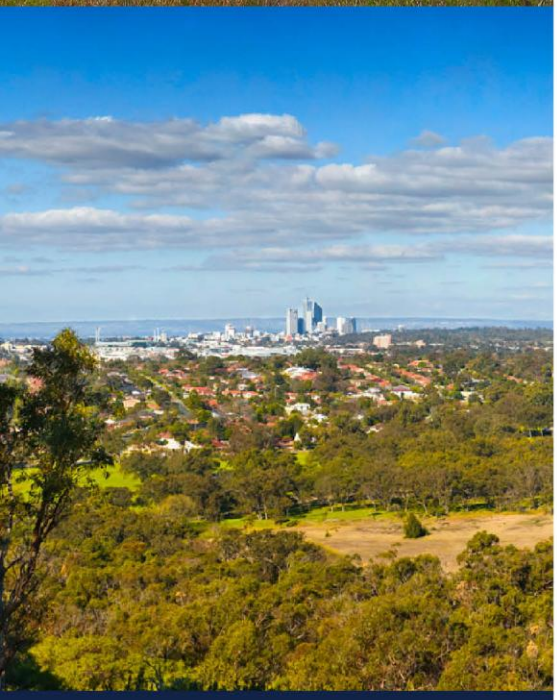

Christmas Creek Water Management Scheme

Fortescue Metals Group Ltd

Report and recommendations of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia

Report 1402
June 2011

Assessment on Proponent Information
Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
08/03/11	Level of assessment set	
06/05/11	Proponent's Final API document received by EPA	12
07/06/11	Publication of EPA report (3 days after report to Minister)	4
21/06/11	Close of appeals period	2

Timelines for an assessment may vary according to the complexity of the project and are usually agreed with the proponent soon after the level of assessment is determined.

In this case, the Environmental Protection Authority met its timeline objective in the completion of the assessment and provision of a report to the Minister.

Dr Paul Vogel
Chairman
3 June 2011

ISSN 1836-0483 (Print)
ISSN 1836-0491 (Online)
Assessment No. 1873

Contents

1. Introduction and background

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for Environment on the proposal by Fortescue Metals Group Ltd to increase the dewatering rate to a maximum 50 gigalitres per annum (GL/a) and inject surplus water into the groundwater aquifers at the Christmas Creek Mine.

Section 44 of the *Environmental Protection Act 1986* (EP Act) requires the EPA to report to the Minister for Environment on the outcome of its assessment of a proposal. The report must set out:

- The key environmental factors identified in the course of the assessment; and
- The EPA's recommendations as to whether or not the proposal may be implemented, and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

The EPA may include in the report any other advice and recommendations as it sees fit.

The proponent has submitted a document setting out the details of the proposal, potential environmental impacts and proposed commitments to manage those impacts.

The EPA considers that the proposal, as described, can be managed to meet the EPA's environmental objectives, subject to the EPA's recommended conditions being made legally binding.

The EPA has therefore determined under Section 40 of the EP Act that the level of assessment for the proposal is Assessment on Proponent Information (API), and this report provides the EPA advice and recommendations in accordance with Section 44 of the EP Act.

2. The proposal

The Christmas Creek Mine is located in the Pilbara region of Western Australia approximately 111 kilometres north of Newman (Figure 1).

The Christmas Creek Water Management Scheme (CCWMS) proposal involves the dewatering and injection of groundwater within the Christmas Creek project area to enable mining of iron ore below the water table (Figure 2). The three components of the CCWMS include:

- Dewatering mining areas at a rate of up to 50 gigalitres per annum (GL/a);
- Use of abstracted water for operational purposes such as, ore processing, dust suppression and construction; and

- Injection of water, surplus to the operational demand, into nearby aquifers (in separate brackish and saline injection zones) as the primary method of disposing of abstracted water.

Implementation of the proposal would require:

- construction of transfer ponds and settlement ponds;
- construction and trenching for pipelines;
- clearing for access roads;
- clearing for drill pads; and
- installation of culverts, rock spalls, rock aprons and levees for surface water management.

The Christmas Creek Mine proposal was previously referred to the EPA as part of the Stage B Project of Fortescue Metals Group Ltd (FMG) Pilbara Iron Ore Infrastructure Project. Approval of the Stage B Project was issued by the then Minister for the Environment on 16 December 2005 (Ministerial Statement 707). A number of amendments to the proposal have also been undertaken since the Ministerial Statement was first issued.

The CCWMS has been developed following a review of the dewatering requirements at Christmas Creek mine site which determined that current dewatering rates, as defined in the Stage B Project, are not sufficient to adequately access the ore below the water table.

The main characteristics of the proposal are summarised in the table below.

Table 1: Summary of key proposal characteristics

Element	Description
Project life	Up to 5 years
Areas disturbed	Up to 600 hectares (of the 10,135.5 approved hectares in Ministerial Statement 707)
Dewatering rate	Up to 50 gigalitres per annum
Re-injection rate	Up to 42.5 gigalitres per annum

The potential impacts of the proposal are discussed by the proponent in the referral document (FMG, 2011).

3. Consultation

During the preparation of the API, the proponent has undertaken consultation with government agencies and key stakeholders. The agencies, groups and organisations consulted, the comments received and the proponent's response are detailed in the Proponent's document (FMG, 2011).

A number of environmental issues were raised by the stakeholders during the consultation. Table 2 summarises the main issues raised and details the actions taken by the proponent to address the issues.

The EPA considers that the consultation process has been appropriate and that reasonable steps have been taken to inform the community and stakeholders on the proposed development.

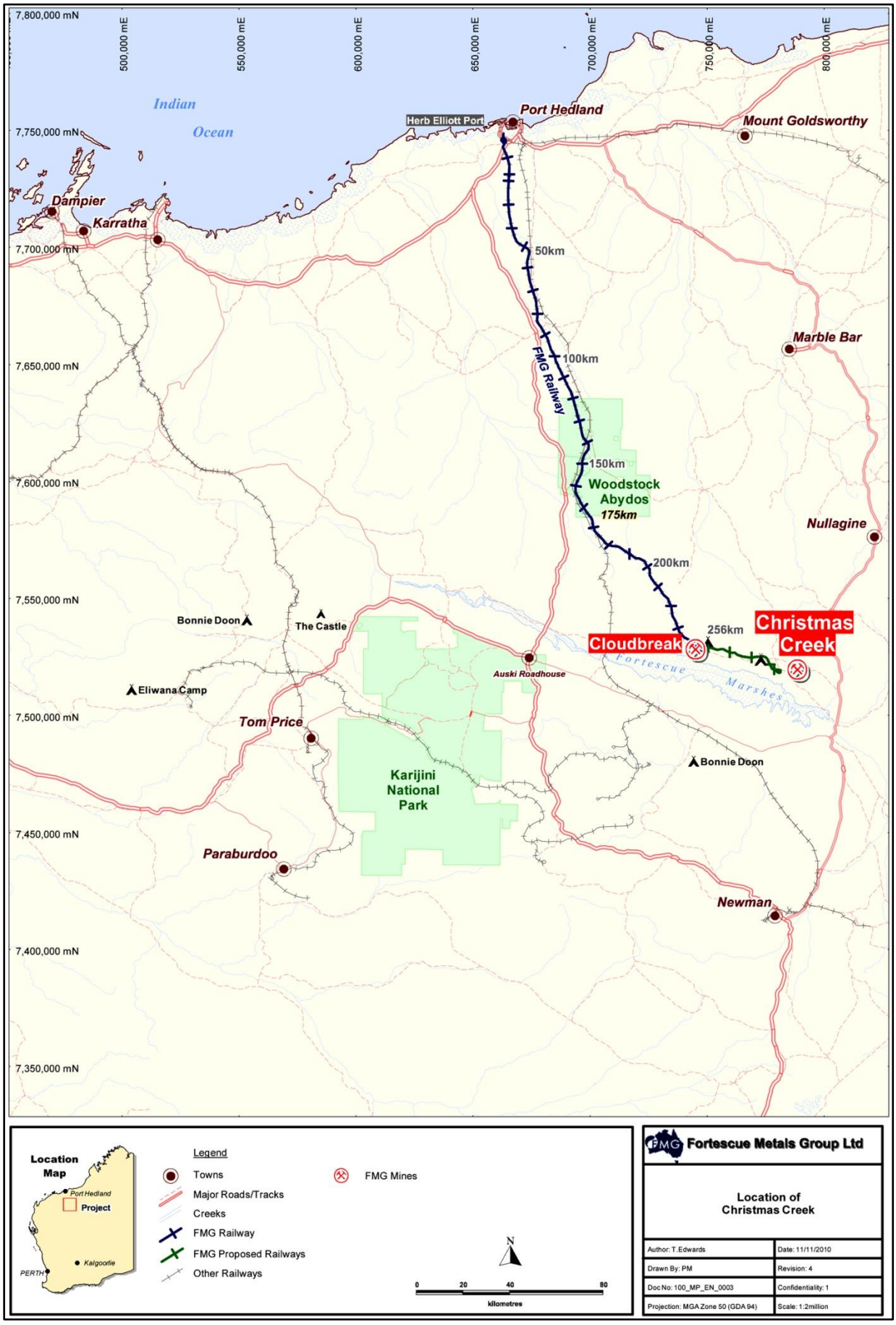

Figure 1: Location of the mine site

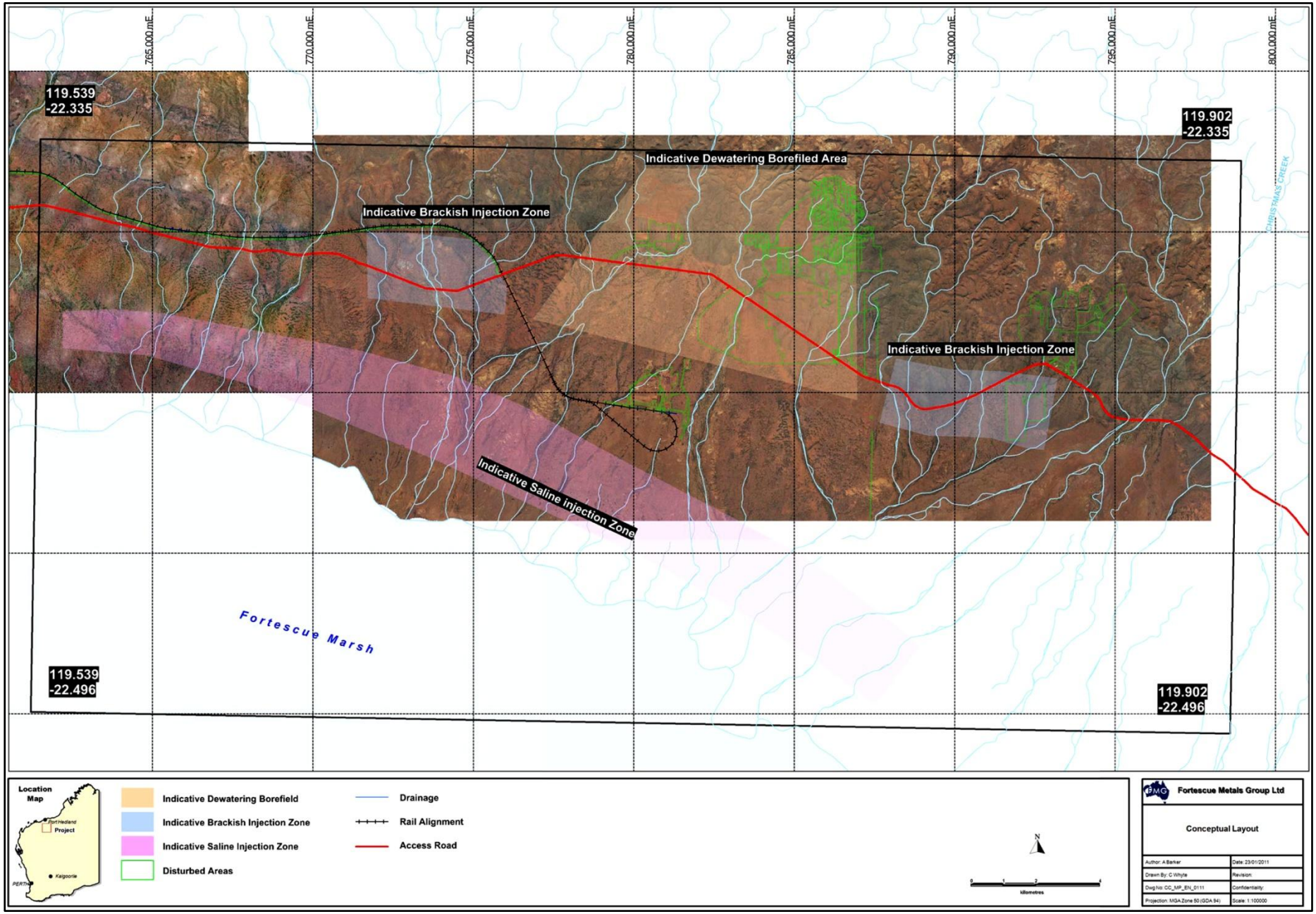

Figure 2: Location of project components

4. Key environmental factors

It is the EPA's opinion that the following key environmental factors relevant to the proposal require evaluation in this report:

(a) Flora and vegetation; and
(b) Fauna and habitat.

The key environmental factors are discussed in Sections 4.1 - 4.2. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

4.1 Flora and vegetation

Description

The proposal has the potential to impact flora and vegetation through the alteration of groundwater level and quality as a result of dewatering and re-injection of water. The proposal requires the clearing of 600 hectares (ha) of native vegetation for the installation of water conveyance infrastructure. This 600 ha of clearing has already been approved under Ministerial Statement 707 and therefore is not being assessed as part of this proposal.

The proposal is located on the border of the Chichester and Fortescue Interim Biogeographic Regionalisation for Australia (IBRA) subregions of the Pilbara bioregion. The Chichester subregion is characterised by plains with a shrub steppe of *Acacia inaequilatera* (Baderi) over *Triodia wiseana* (Limestone Spinifex), hummock grassland and *Eucalyptus leucophloia* (Snappy Gum) tree steppes on rangelands. The Fortescue subregion is characterised by alluvial plains with *Acacia aneura* (Mulga) over grass communities and *Eucalyptus camaldulensis* (River Red Gum) woodlands fringing drainage lines.

A number of surveys have been undertaken in and near the proposal area. These include:

- Vegetation and flora survey for the wider Chichester projects area, including Christmas Creek (Biota 2004a);
- Impacts on groundwater dependent vegetation (Biota 2004b);
- Vegetation and flora survey of areas near the Fortescue Marsh (Mattiske 2007);
- Water flow in Mulga areas adjoining the Fortescue Marsh (Muller 2005); and
- Vegetation assessment for the Cloudbreak and Christmas Creek areas (ENV Australia 2010).

Flora

A total of 727 taxa were recorded in the above surveys. One Declared Rare Flora (DRF), *Lepidium catapycnon*, taxon and 17 Priority taxa were identified as

potentially occurring in the area. However, no DRF plant taxa and only six Priority Flora species were found during the surveys.

The Priority Flora species include *Eremophila spongiocarpa* (Priority 1), *Tecticornia* sp. Christmas Creek (Priority 1), *Tecticornia* sp. Fortescue Marsh (Priority 1), *Atriplex flabelliformis* (Priority 3), *Tecticornia* sp. Roy Hill (Priority 3), and *Rhagodia* sp. Hamersley (Priority 3).

Vegetation

A total of 17 vegetation types have been described and mapped in the proposal area. None of the vegetation communities resembled any of the known Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs). The proposal is located on the edge of the Fortescue Marsh, which contains the Fortescue Marsh Priority 1 PEC.

Three vegetation types in the proposal area are associated with locally significant Mulga, which are sheetflow dependent vegetation communities. One vegetation type is associated with the partially groundwater dependent species Coolibah (*Eucalyptus victrix)* and River Red Gum. A further seven vegetation types are associated with Samphire vegetation. Six vegetation types are locally significant and are associated with the Fortescue Marsh.

Mulga

The Mulga vegetation located at the foot slopes of the Chichester Ranges and to the northern and southern flanks of the Fortescue Marsh is considered to be the northern limit of Mulga in Western Australia. Mulga is highly morphologically variable and appears to play an important role in water and nutrient capture, and is thus important to ecosystem function (ENV Australia 2010).

Mulga has a relatively shallow root system at approximately 2 metres (m) and is known to harvest surface water flows. Mulga is therefore considered to be dependent on sheetflow or direct rainfall, rather than groundwater resources.

Mulga generally occurs in groves or distinct patches and can produce a banding pattern across the landscape. These groves act as a sink for water and nutrients and intercept sheetflow, thus increasing soil moisture and nutrient availability for plant uptake. Due to high biological activity, Mulga vegetation creates fertile patches in a landscape that is generally impoverished in terms of soil nutrients (ENV Australia 2010).

Linear infrastructure such as roads and railways which require raised embankments, sections of cut and fill, or culverts and spillways, have the potential to alter natural sheetflow characteristics.

The proponent considers that Mulga dominated communities are unlikely to be impacted by potential drawdown of groundwater as a result of the proposal. This is due to Mulga being considered to be dependent on sheetflow, not groundwater resources. Furthermore, Mulga root zones are likely to be highly resilient to prolonged periods of low water availability in the rooting zone (FMG 2011).

The proponent considers that impacts on surface water or sheetflow dependent vegetation are expected to be insignificant as the dewatering and injection infrastructure has been designed to minimise impact on the natural flow of surface water. Additionally, changes to flow regimes are not expected to alter the final destination of the water.

Mulga is also considered to have a low to moderate tolerance to salinity. Predicted maximum change in the water table level at the reinjection areas is 4 m. Modelling results indicate that groundwater is unlikely to rise within 2 m of the surface in Mulga dominated areas, except in one location (MB1). Within the vicinity of MB1, mounding of brackish groundwater is predicted to reach within 2 m of the surface for an area of approximately 173 ha.

To minimise potential impacts to surface water flow regimes, infrastructure will be designed as follows:

- pipelines will be buried at regular intervals to prevent obstruction of surface water flows;
- construction of major stream crossings using cement stabilising at stream bed level;
- rock spalls will be used downstream of major stream floodways to dissipate energy and reduce flow velocities;
- where raised crossing is required this will be kept as low as possible to permit flood debris to be carried over in peak flows without obstruction;
- culverts will be used for the full width of any raised crossing;
- where there are incised gullies with steeper banks that require significant cut, culverts will be installed to permit access roads to be levelled with imported fill; and
- using floodways in preference to culverts.

Surface water monitoring will also be undertaken. This includes monitoring at major creek crossings and the Fortescue Marsh, along with the inspection of culverts, bridges, floodways, respreading devices and water diversion structure periodically and after significant rainfall events.

Partial Groundwater Dependent Species

River Red Gums (*Eucalyptus camaldulensis*) and Coolibahs (*Eucalyptus victrix*) are considered to be facultative phreatophytes, which are species that can utilise groundwater opportunistically at times when water availability is limited (ENV Australia 2010).

River Red Gums and Coolibahs grow in areas subject to highly varying groundwater levels, which may vary by more than 10 m due to rainfall conditions. These communities are generally located higher in the landscape where groundwater is at least 15 m below ground level.

The proponent considers that a 5 m decline in groundwater levels to 20 m below ground level would affect the health of communities dominated by River Red Gum and Coolibah. This means that up to 82 ha of this community that is not proposed to be mined may be impacted by dewatering.

Samphire

In addition to the association with the Fortescue Marsh PEC, the Samphire vegetation types are considered to be unique in the Pilbara region and are locally restricted to the Marsh. The Samphire vegetation forms part of the locally and nationally significant marshes. Samphire vegetation relies on the surface environment of marshes, with key physical parameters such as evaporation, rainfall, surface run-off, groundwater levels, soil types, elevation and surrounding land use affecting their distribution (ENV Australia 2010).

The Samphire vegetation fringing the Fortescue Marsh is considered likely to have varying degrees of reliance on groundwater as a source of moisture. Samphire vegetation typically occurs in areas where saline or sub-saline groundwater is close to the surface (ENV Australia 2010).

Very little is understood of the Samphire root systems and water uptake physiology. Whilst it has been observed that various Samphire species have only shallow lateral root systems that do not penetrate into the deeper impervious clay deep in the soil profile, recent studies indicate that it is unlikely that moisture contained in the surface layer of the soil containing Samphires can sustain populations for several months, suggesting some dependence on groundwater for moisture (ENV Australia 2010).

Preliminary studies have suggested that groundwater dependence may vary between Samphire species based on changes in elevation (and therefore depth to groundwater). Species in areas of relatively low elevation are considered likely to be groundwater dependent and species in areas of relatively high elevation are considered to be possibly dependent on groundwater (ENV Australia 2010).

Modelling indicates that baseline groundwater levels within Samphire communities can vary by up to 3 m. The proponent considers that it is unlikely that the proposal will have an impact on Samphire as a result of dewatering and reinjection given that the change in water level below the northern fringe of the Samphire vegetation is anticipated to be 1 to 1.5 m which is within the natural variation of the water table and is not expected to impact on water quality.

<u>Vegetation condition</u>

The condition of the vegetation within the survey area ranged from Excellent to Good. The majority of vegetation in the fringe of Samphire Flats, Creek and Drainage Line and Ranges, Hills and Hill slope vegetation types was categorised as Excellent, whilst the majority of vegetation on Broad Flats and Plains was categorised as Good due to grazing pressures (ENV Australia 2010).

<u>Water quality</u>

Excess water will be injected into aquifers on a ‘like to like’ basis, whereby water is injected into aquifers with similar hydrochemical characteristics.

Excess brackish water will be injected into naturally brackish aquifers and no significant change to water quality in the receiving environment is expected. Water will be classified as suitable for injection to brackish aquifers where salinity is less than 6,000 mg/L (FMG, 2011).

Excess saline water will be injected into the naturally saline Oakover formation aquifer. The salinity of the Oakover Formation aquifer varies considerably with location and over time. The injected water will be prevented from upward migration into the fresher overlying aquifers by the very low permeability of the overlying clayey formation. In addition, the natural process of stratification development will tend to maintain the denser saline waters at depth (FMG, 2011).

Minor changes in groundwater quality may occur due to leakage between hydrostratigraphic units. However, it is proposed that an extensive monitoring program is implemented as an early detection system, allowing adjustments or modifications to the dewatering reinjection regime as necessary.

Measures proposed to minimise the potential for environmental impacts to groundwater include lining saline transfer ponds with 1.5 mm high density polyethylene lining; fresh-saline blending stations to lower salinity; telemetry monitoring and controls; and groundwater monitoring (FMG, 2011).

As part of the Department of Water's licensing process, the proponent is required to amend the existing Groundwater Operating Strategy for Christmas Creek Mine to update the monitoring requirements and adaptive management process.

Discharge to environment

The proponent has included the option of discharging water to creeks for a short period if required. This discharge will be undertaken in accordance with the existing Dewatering Discharging Contingency Procedure.

Assessment

The EPA's environmental objectives for this factor are:

- to protect DRF, Priority flora and other species of conservation significance, consistent with the provisions of the *Wildlife Conservation Act 1950*;
- to maintain the abundance, diversity, geographic distribution and productivity of vegetation and flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement of knowledge; and
- to protect the environmental values of areas identified as having significant environmental attributes.

Flora

Although the clearing of 600 ha for installation of the water conveyance infrastructure within water injection zones and several pipeline corridors linking dewatering and injection areas is approved under Ministerial Statement 707, the EPA considers that it should assess the location of this infrastructure.

The EPA notes that the vegetation assessment undertaken by ENV Australia (2010) states that '*undertaking DRF and Priority Flora searches was not an objective of the field survey. It is likely that additional DRF and Priority Flora populations occur within the survey area. Additional survey for Threatened and Priority Flora is recommended for areas subject to direct impact'*. The EPA further notes the proponent's intention to undertake ground-truthing surveys prior to vegetation clearing to identify the locations of any significant flora. The EPA has recommended condition 5 to ensure that DRF or Priority One and Two taxa are protected.

Vegetation

The EPA notes that Mulga dominant communities are not expected to be impacted by groundwater drawdown as these communities are considered to be predominantly surface water or sheetflow dependent.

The EPA further notes that mounding of groundwater is predicted to rise to within 2 m of MB1 potentially impacting on 173 ha of Mulga. This impact is only predicted to occur 5% of the time and only during wet conditions. The proponent has also advised that it has the capabilities to redistribute surplus groundwater to prevent undesired mounding from occurring. The EPA is of the view that mounding should not result in the groundwater rising to be within 2 m of the surface where baseline levels allow this, in Mulga dominated communities. The EPA has recommended condition 6 to achieve this outcome.

The design of the water conveyance infrastructure, management and monitoring that the proponent has proposed to minimise impacts to Mulga from changes in sheetflow is considered acceptable by the EPA.

The EPA notes that the predicted impact to River Red Gum and Coolibah vegetation from dewatering is 82 ha which equates to 3.6% of the mapped community. The EPA considers that this impact is not significant.

Samphire species are not expected to be impacted by groundwater drawdown as the predicted impact is not expected to reach the Fortescue Marsh. Impacts from reinjection of the surplus water are also not expected to be significant as the change in water level at the edge of the marsh is predicted to increase by 1 m from 3 m to 2 m below ground level during a dry climate sequence. This is within the natural variation of the water table and therefore within natural tolerance limits of Samphire Communities. Furthermore, Samphire communities at the marsh are unlikely to be largely dependent on groundwater, as the Fortescue Marsh is predominantly a surface water feature, not dependent on groundwater recharge. The EPA has recommended condition 7 to ensure that the predicted change in the groundwater level does not result in unacceptable inundation of the Samphire communities associated with the Fortescue Marsh.

While the EPA notes that the predicted impacts on flora and vegetation are not considered to be significant, the EPA considers that the proponent should undertake vegetation monitoring in combination with groundwater and surface

water monitoring to validate the predictions. The EPA recommends condition 8 to achieve this.

Water quality

A key concern with regard to water quality is the risk of affecting freshwater aquifers through the injection of saline water. Impacts to groundwater due to the migration of the saline transition zone are considered unlikely as altered salinity will occur predominantly in the deeper aquifers near mining areas. The introduction of saline water into the fresh-brackish Tertiary Detritals is not expected as this zone is isolated from the saline water by a clayey aquitard overlying the Oakover Calcrete. In addition to the protective effects of the clayey aquitard, the Tertiary Detritals are resistant to saline water intrusion due to the Detritals' low permeability and high water storage properties.

The EPA accepts that there is a low risk that water quality will be significantly impacted and the EPA notes that the Department of Water is able to manage this issue through the proponent's approved Groundwater Operating Strategy. Therefore, the EPA is of the view that the impact on groundwater quality can be readily managed.

Discharge to environment

The EPA considers that the discharge of water to the environment should only be undertaken if there is no other alternative. The proponent should implement other contingency options such as reducing volumes of water going to the affected areas by redirecting water to other injection areas; redirecting disposal to transfer ponds; redirecting disposal to infiltration ponds; and redirecting disposal to mine pits (where available) prior to releasing surplus water to the environment. The EPA considers that the existing Dewatering Discharging Contingency Procedure is appropriate to manage this issue.

Summary

Having particular regard to the:

- proponent's design and management to minimise impacts from changes in sheetflow;
- proponent's ability to redistribute water to prevent mounding; and
- water quality can be managed by the Department of Water under the proponent's Groundwater Operating Strategy;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that the recommended conditions for the protection of DRF and Priority 1 and 2 flora species, protection of Mulga communities and Samphire communities associated with the Fortescue Marsh from groundwater mounding, and vegetation health monitoring to validate predicted impacts are implemented.

4.2 Fauna and habitat

Description

The proposal has the potential to impact fauna and through of habitat, trenching and vehicle mortalities.

A number of fauna studies have been conducted within and adjacent to the proposal area. These include:

- Targeted Night Parrot surveys (Bamford 2006, 2007, 2008, 2009, 2010);
- Stygofauna sampling plans (Ecologia 2006; Ecowise 2007);
- Desktop assessment of stygofauna (Bennelongia 2008; 2010a);
- Desktop assessment of troglofauna (Bennelongia 2010b);
- Terrestrial fauna surveys and studies (Biota 2005); and
- Desktop fauna assessment (Ecologia 2010).

Habitat

Four broad habitats have been identified within the proposal area. These are low halophytic shrubland, low Mulga and other acacia woodland, Spinifex-covered hills and ranges, and creeklines and wells with shrubland and/or eucalypt open woodland. The halophytic shrubland occurs within the boundary of the Fortescue Marsh, with area of hummock grassland on the edge of the marsh, moving into low Mulga woodland on alluvial flats, followed by the Spinifex-covered hills and ranges. Running north-south into the Fortescue Marsh are creek and drainage lines supporting either acacia shrubland or eucalypt woodland. These habitats are broadly reflected by both the land system and vegetation mapping (FMG, 2011).

Terrestrial Fauna

Fifteen reptile species were recorded from the project area. No frog species were recorded. Six species of mammals were recorded including numerous active and inactive Western Pebble-mound Mouse Mounds within the project area. Nineteen species of bat occur in the Pilbara region, however no bats were recorded in the project area. Fifty-six bird species were recorded in the project area (FMG, 2011).

The Northern Quoll (*Dasyurus hallacatus*) and the Night Parrot (*Pexoporus occidentalis*) which are listed as 'Endangered' under the *Environment Protection and Biodiversity Act 1999* (EPBC Act) and under Schedule 1' of the *Wildlife Conservation Act 1950* (WC Act) have the potential to occur, however they were not recorded during the surveys.

The following migratory species were recorded in or near the project area. These are the White-bellied Sea-eagle (*Haliaeetus leucogaster*), Rainbow Bee-eater (*Merops ornatus*), Great Egret (*Ardea alba*), Wood Sandpiper (*Tringa glareola*), Common Greenshank (*Tringa nebularia*), and the Peregrine Falcon (*Falco peregrinus*).

The following Priority species were recorded in or near the project area. These are the Priority 4 species of the Western Pebble-mound Mouse (*Pseudomys chapmani*), Short-tailed Mouse (*Leggadina lakedownensis),* Australian Bustard (*Ardeotis australis*) and the Bush Stone-curlew.

Subterranean Fauna

At least seven stygofauna surveys have been conducted in the vicinity of the proposal area. These surveys have found that a moderately rich stygofauna community occurs, with 68 species belonging to 13 higher taxonomic groups recorded.

The community around the proposal area is characterised by widespread species, with only 10 of the 68 species potentially having restricted distributions. Despite the occurrence of a moderately rich community in the vicinity, only six species of stygofauna have been collected from within the impact area of the proposal area. All six species of stygofauna within the impact area (the nematode Nematode sp. 1, the worm *Enchytraeus Pilbara* sp. 2, and the copedods *Diacyclops humphreysi s*. str. X *unispinosus*, D .h. *spinosus*, *Fiercyclops supersensus, Parastenocaris jane*) are widespread species that are known to occur beyond the vicinity of the proposal area (FMG, 2011).

A desktop assessment of troglofauna concluded that it is 'very likely' that troglofauna species occur within the Christmas Creek area. Troglofauna likely to occur, are those recorded in nearby surveys and include the following species, pseudoscorpions, schizomids, palpigrads, spiders, isopods, millipedes, centipedes, pauropods, symphylans, diplurans, silverfish, cockroaches, bugs, beetles and fungus gnats (FMG, 2011).

Proposed management

The fauna management actions proposed include:

- maintain large mature habitat trees, where practicable;
- all significant fauna burrows (active and inactive) shall be retained where possible;
- all significant fauna habitat to be spatially identified and where appropriate demarcated on site;
- rehabilitate disturbed areas not required to remain clear for operation;
- bury or raise water pipelines at regular intervals to prevent fauna movement being impeded;
- vehicle speeds are to be restricted as sign-posted, with driving to be at speeds appropriate to conditions at all times;
- driving off roads or on restricted access routes will be prohibited other than for emergency situations or where express permission has been obtained; and
- clearing shall not be undertaken outside authorised areas.

Assessment

The EPA's environmental objective for this factor is to maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement in knowledge.

The EPA notes that the Rainbow Bee-eater was recorded within the project area. The EPA considers that it is unlikely that the Rainbow Bee-eater would be significantly impacted by the proposal as it occupies numerous habitats throughout the Pilbara. The EPA also considers that it is unlikely that the

Peregrine Falcon would be significantly impacted by the proposal as it is a nomadic species that is widespread throughout Australia and inhabits a wide range of habitats.

The impact to the Australian Bustard is likely to be negligible due to the nomadic nature of the species and the wide extent of suitable habitat. The EPA notes that the Bush Stone-curlew has been found in a variety of habitats and requires permanent water to become a resident. As the project area does not contain a permanent water source it is expected that the Bush Stone-curlew only uses the area for foraging. It is unlikely that the Western Pebble-mound Mouse would be significantly impacted due to numerous recordings throughout the Pilbara and the widespread distribution of suitable habitat. This species is also protected within the Karijini National Park.

The impact to the Night Parrot is unlikely to be significant due to the relatively small size of the impact area, the nomadic nature and the large home ranges of the parrot and the extensive areas of similar habitat surrounding the proposal area. The rocky habitat preferred by the Northern Quoll does not occur in the vicinity of the dewatering infrastructure or injection zones and will not be affected by the proposal. The proposal will not result in significant disturbance to Spinifex-covered hillslope habitat and therefore the EPA considers that impacts to the Short-tailed Mouse are also unlikely to be significant.

The White-bellied Sea-eagle, Wood Sandpiper, and the Common Greenshank species may occasionally forage along the marsh and creeklines when they contain water. While clearing of creek crossings for the pipeline and access road will result in a small reduction in foraging area available to these species, similar habitat is well represented outside the proposal area and therefore no significant impact to these species is expected. The Great Egret may be impacted by change in availability and quality of surface water within the Fortescue Marsh. The proposal is unlikely to have any significant effect on surface water quality or quantity. Modelling predicted a drawdown or mounding response in the order of 1 to 1.5 m under the marsh. This is not expected to have a significant impact on Great Egret habitat as it is within the natural variations of groundwater movement.

The EPA notes that six stygofauna species were recorded within the proposal area. The EPA further notes that all six of these species are considered widespread as they were all recorded outside the area of impact and therefore considers the impact to this species is unlikely to be significant.

The EPA understands that the results of the field survey of troglofauna for this proposal are not currently available. However, the proponent has undertaken a desktop study to determine the risk to potential species. The EPA notes that the desktop assessment estimates that a total volume of potential troglofauna habitat lost to mounding is up to 19% of the total volume of habitat in the local area. The EPA is aware that it is difficult to predict the impact of dewatering on soil humidity within potential troglofauna habitat. The desktop assessment expects the changes in humidity to be minimal. The connectivity and size of habitat volume along the Fortescue valley and footslopes of the Chichester

range make it unlikely that any troglofauna species is restricted to the area. The EPA therefore concludes that the risk to troglofauna species is low.

The EPA acknowledges that some sections of pipelines will be buried. Where the pipeline is constructed below ground fauna deaths would be reduced by the implementation of recommended condition 8 which ensures that fauna trapped in trenches are removed in a timely manner.

The number and frequency of vehicle movements for the proposal is not anticipated to significantly increase from that proposed for the original Christmas Creek project. Therefore, no additional fauna impacts from vehicle movements are anticipated as a result of the proposal.

Summary

Having particular regard to the:

- potential minor loss of habitat to threatened, specially protected and priority fauna;
- stygofauna being widespread outside the project area; and
- troglofauna habitat being widespread outside the proposal area;

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that the recommended condition for the removal of fauna from trenches is implemented.

5. Recommended conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by Fortescue Metals Group Ltd to increase dewatering rate up to 50 GL/a and injection of surplus water at the Christmas Creek Mine is approved for implementation. These conditions are presented in Appendix 2.

6. Other advice

The Christmas Creek operations are located adjacent to and in proximity of the environmentally important Fortescue Marsh. The EPA is aware that the proponent intends to refer an expansion project for the Christmas Creek mine towards the end of 2011.

The EPA has identified that there is a potential for the expansion project, in combination with other mines along the northern flank of the Fortescue Marsh, to potentially clear large areas of vegetation and, alter surface water and groundwater flows to the Marsh. The EPA expects that the proponent will provide timely, robust and comprehensive information that demonstrates that the local and regional impacts to flora, vegetation, fauna, and groundwater, in particular those associated with the Fortescue Marsh, can be managed. In addition, the mining operations are located within the 2015 exclusion areas. The 2015 exclusion areas identify areas of land to be excluded from pastoral leases for "public purposes" when the majority of pastoral leases are renewed in 2015. The exclusions of Mulga Down, Hillside, Marillana and Roy Hill were

approved in 2004 by the Minister for Planning and Infrastructure and endorsed by State Government for the establishment of a conservation reserve. Any expansion potentially affects the representation of important environmental values in areas proposed as future conservation estate.

The proponent will be required to clearly define the project and provide a maximum clearing footprint for each component of the mine expansion project prior to referral to the EPA. The EPA is also of the view that in order for the expansion assessment to be undertaken, the proponent should ensure that all surveys and investigations are completed and mitigation measures identified prior to submitting the first draft of the environmental review document. The EPA expects the proponent to consult with the appropriate decision-making authorities to ensure that all surveys, investigations and assessments, including assessments of cumulative impacts, are undertaken to acceptable standards.

The EPA is concerned that for the current assessment, the proponent was unable to identify whether there will be a quantum shift in the water requirements for the expansion project to above the 50 GL/annum proposed and considered by the EPA in this assessment. A key principle of environmental impact assessment (EIA) for the EPA is ensure that the total and cumulative effects of using or altering community environmental assets receive due consideration (WA Government 2010). Principle 4 of EIA for the proponent states that the onus is on proponents to describe the environmental impacts of their proposals, and to use their best endeavours to demonstrate that the unavoidable impacts are environmentally acceptable, taking into account cumulative impacts in the region (WA Government 2010). Accordingly, the EPA expected the proponent to identify the cumulative impacts of its own future proposals to the maximum extent practicable. Where the proponent did not adequately address cumulative impacts for this proposal, the EPA expects that the proponent will have a detailed understanding of the cumulative impacts to the relevant environmental values, such as, but not limited to, flora, fauna, groundwater, and surface water when the expansion project is assessed by the EPA.

Impacts from dewatering and reinjection will also need to be investigated. Proposed management, including detailed information on mine planning, backfilling, the recreation of landforms, rehabilitation measures, and completion criteria will need to be provided to demonstrate that the Fortescue Marsh will not be unacceptably impacted.

The Proposed Conservation Reserve (PCR) was specifically established to protect the Fortescue Marsh area and fringing mulga woodland due to its significant conservation value that is unique at the State level, and not represented in the existing conservation reserve system. The EPA expects that the proponent will clearly articulate the cumulative impacts of the proposal on the environmental values of the PCR and provide comprehensive information to demonstrate that mining has avoided and minimised impacts on the PCR to the greatest extent practical. Detailed rehabilitation and closure measures including objectives, actions, timing, and completion criteria, will need to be provided.

In order to establish if further reservations are required as a result of the cumulative impact to the PCR the EPA would also expect that regional information on the cumulative impacts, in particular in relation to mulga woodland but also to significant flora, vegetation and fauna be provided. This will be an important issue for the consideration of any expanded proposal. In this regard the EPA notes that the proponent has committed to establishing mitigation strategies, including an offset proposal, in consultation with the DEC to address the impacts of the CCWMS proposal to the PCR. It is expected that the proponent will also have early discussions with the DEC to establish mitigating strategies in relation to the PCR from any expanded proposal.

The EPA is also aware that other studies regarding the Fortescue Marsh are currently being undertaken. The result of these studies should be considered and included in the proponent's environmental review of its expansion project.

Impact to other mines

The EPA notes that there is potential for the proposed reinjection of water into the eastern injection zone to impact on the Roy Hill Project being undertaken by Hancock Prospecting Pty Ltd. The EPA expects the proponents to have discussions and develop a collaborative strategic approach to water management in the area. The EPA has recommended condition 10 to ensure these discussions will take place.

7. Conclusions

The EPA has considered the proposal by Fortescue Metals Group Ltd to increase the dewatering rate up to 50 GL/a and inject surplus water into groundwater aquifers at the Christmas Creek Mine.

The EPA notes that the predicted changes to groundwater levels are unlikely to have significant impact on flora, vegetation, fauna and habitat. The groundwater levels below the Fortescue Marsh or Samphire vegetation are expected to be altered by 1 to 1.5 m (mounding and dewatering) and this is within the natural variation of groundwater levels. Modelling predicted that 173 ha within Mulga dominated communities may see groundwater to rise to within 2 m of the surface. Through the implementation of the recommended conditions, the EPA considers that the potential for groundwater mounding to impact on vegetation can be managed. A drawdown of 5 m may potentially impact upon communities dominated by River Red Gum and Coolibah with 82 ha potentially being impacted. The EPA considers that this would result in a loss of 3.6% of this community and concludes that this is unlikely to be significant.

There is no expected impact to the surface water regime of the Fortescue Marsh and sheetflow dependent species, such as Mulga, given the proponent's proposed design and management of its infrastructure.

Goundwater quality is also not expected to be adversely impacted and the EPA considers that this can be managed by the Department of Water.

Impacts to terrestrial fauna in the area are unlikely to be signficant as the potential loss of threatened, specially protected and priority fauna species habitat is minimal. The stygofauna species are also widespread as the species recorded within the proposal area have been found outside the impact zone. Troglofauna habitat is also widespread and the EPA therefore considers the risk to troglofauna as being low.

The EPA has therefore concluded that the proposal can be managed to meet the EPA's environmental objectives, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2. Matters addressed in the conditions include the protection of DRF and Priority 1 and 2 flora species, protection of Mulga communities from groundwater mounding, vegetation health monitoring to validate predicted impacts, removal of trapped fauna from trenches, and minimising impacts to other approved mine operations.

8. Recommendations

The EPA submits the following recommendations to the Minister for Environment:

1. That the Minister notes that the proposal being assessed is for an increase in the dewatering rate up to 50 GL/a and injection of surplus water into groundwater aquifers at the Christmas Creek Mine;
2. That the Minister considers the report on the key environmental factors as set out in Section 3;
3. That the Minister notes that the EPA has concluded that the proposal can be managed to meet the EPA's environmental objectives, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 2; and
4. That the Minister imposes the conditions and procedures recommended in Appendix 2 of this report.

Appendix 1

References

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Muller C 2005, *Water Flow in Mulga areas adjoining Fortescue Marsh,* Unpublished report for Fortescue Metals Group Ltd, January 2005.

Appendix 2

Identified Decision-making Authorities
and
Recommended Environmental Conditions

Identified Decision-making Authorities

Section 44(2) of the *Environmental Protection Act 1986* (EP Act) specifies that the EPA's report must set out (if it recommends that implementation be allowed) the conditions and procedures, if any, to which implementation should be subject. This Appendix contains the EPA's recommended conditions and procedures.

Section 45(1) requires the Minister for Environment to consult with decision-making authorities, and if possible, agree on whether or not the proposal may be implemented, and if so, to what conditions and procedures, if any, that implementation should be subject.

The following decision-making authorities have been identified for this consultation:

Decision-making Authority	Approval
1. Minister for Water	Water extraction licence
2. Department of Environment and Conservation	Works Approval and Licence
3. Shire of East Pilbara	Planning approval
4. Minister for Mines and Petroleum	Mining Act 1978
5. Minister for State Development	Iron Ore (FMG Chichester Pty Ltd) Agreement Act 2006
6. Department of Mines and Petroleum	Mining Act 1978
7. Minister for Environment	*Wildlife Conservation Act 1950*

Note: In this instance, agreement is only required with DMA #1, 4, 5 and 7 since these DMAs are Ministers.

Recommended Environmental Conditions

RECOMMENDED ENVIRONMENTAL CONDITIONS

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED
(PURSUANT TO THE PROVISIONS OF THE
ENVIRONMENTAL PROTECTION ACT 1986)

CHRISTMAS CREEK WATER MANAGEMENT SCHEME
PILBARA REGION

Proposal: The proposal is to increase the mine dewatering rate up to 50 gigalitres per annum and to inject surplus water into two brackish and one saline injection zones at the Christmas Creek Mine.

The proposal is further documented in schedule 1 of this statement.

Proponent: Fortescue Metals Group Ltd

Proponent Address: Level 2, 87 Adelaide Terrace,
EAST PERTH WA 6004

Assessment Number: 1873

Previous Assessment Number: 1520

Report of the Environmental Protection Authority: Report 1402

Associated Report of the Environmental Protection Authority: Report 1202

Associated Statement Number: 0707 (Published on 16 December 2005)

The proposal referred to in the above report of the Environmental Protection Authority may be implemented. The implementation of that proposal is subject to the following conditions and procedures:

1 Proposal Implementation

1-1 The proponent shall implement the proposal as documented and described in schedule 1 of this statement subject to the conditions and procedures of this statement.

2 Proponent Nomination and Contact Details

2-1 The proponent for the time being nominated by the Minister for Environment under sections 38(6) or 38(7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal.

2-2 The proponent shall notify the Chief Executive Officer of the Office of the Environmental Protection Authority of any change of the name and address

of the proponent for the serving of notices or other correspondence within 30 days of such change.

3 Time Limit of Authorisation

3-1 The authorisation to implement the proposal provided for in this statement shall lapse and be void five years after the date of this statement if the proposal to which this statement relates is not substantially commenced.

3-2 The proponent shall provide the Chief Executive Officer of the Office of the Environmental Protection Authority with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement.

4 Compliance Reporting

4-1 The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority.

4-2 The proponent shall submit to the Chief Executive Officer of the Office of the Environmental Protection Authority the compliance assessment plan required by condition 4-1 at least six months prior to the first compliance report required by condition 4-6, or prior to ground disturbing activities, whichever is sooner.

The compliance assessment plan shall indicate:

1 the frequency of compliance reporting;

2 the approach and timing of compliance assessments;

3 the retention of compliance assessments;

4 the method of reporting of potential non-compliances and corrective actions taken;

5 the table of contents of compliance assessment reports; and

6 public availability of compliance assessment reports.

4-3 The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.

4-4 The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the Chief Executive Officer of the Office of the Environmental Protection Authority.

4-5 The proponent shall advise the Chief Executive Officer of the Office of the Environmental Protection Authority of any potential non-compliance within seven days of that non-compliance being known.

4-6 The proponent shall submit to the Chief Executive Officer of the Office of the Environmental Protection Authority the first compliance assessment report fifteen months from the date of issue of this Statement addressing the twelve month period from the date of issue of this Statement and then annually from the date of submission of the first compliance assessment report.

The compliance assessment report shall:

1 be endorsed by the proponent's Chief Executive Officer or a person, approved in writing by the Chief Executive Officer of the Office of the Environmental Protection Authority, delegated to sign on the Chief Executive Officer's behalf;

2 include a statement as to whether the proponent has complied with the conditions;

3 identify all potential non-compliances and describe corrective and preventative actions taken;

4 be made publicly available in accordance with the approved compliance assessment plan; and

5 indicate any proposed changes to the compliance assessment plan required by condition 4-1.

5 Flora

5-1 The proponent shall ensure that construction of the infrastructure and implementation and operation of the proposal does not cause the loss of Declared Rare Flora, Priority 1 Flora and Priority 2 Flora unless otherwise approved by the Chief Executive Officer of the Office of the Environmental Protection Authority on advice of the Department of Environment and Conservation.

5-2 Prior to ground disturbing activities the proponent shall undertake targeted surveys of the area proposed for water conveyance infrastructure in accordance with Guidance Statement 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia to identify the locations of any Declared Rare Flora, Priority 1 Flora and Priority 2 Flora species.

5-3 The proponent shall record and provide the Australian Map Grid co-ordinates and population details for each occurrence of Declared Rare Flora, Priority 1 Flora and Priority 2 Flora species to the Chief Executive Officer of the Office of the Environmental Protection Authority and the Chief Executive Officer of

the Department of Environment and Conservation within three months of completion of the surveys required by condition 5-2.

6. Groundwater Mounding

6-1 The proponent shall manage the injection of surplus water to ensure that mounding of the groundwater level within the impact zones but outside the exclusion area, as delineated by Australian Map Grid co-ordinates provided in Schedule 2 and Schedule 3 does not result in groundwater levels rising within 2 metres of the surface, unless the prior written authorisation of the Chief Executive Officer of the Office of the Environmental Protection Authority has been received.

6-2 To verify that the requirements of condition 6-1 are being met the proponent shall:

1. undertake baseline monitoring of the groundwater levels at locations determined in consultation with the Department of Water and the Department of Environment and Conservation; and

2. monitor groundwater levels monthly at a minimum at the locations identified in condition 6-2 (1); and

6-3 The proponent shall submit annually the results of monitoring required by condition 6-2 to the Chief Executive Officer of the Office of the Environmental Protection Authority.

6-4 In the event that the monitoring required by condition 6-2 indicates that the requirements of condition 6-1 are not being met, the proponent shall:

1. report such findings to the Chief Executive Officer of the Office of the Environmental Protection Authority within 7 days of an unacceptable change in water levels being identified;

2. provide evidence which allows determination of the root cause of the unacceptable change in water levels within 21 days of an unacceptable change in water levels being identified; and

3. if determined to be a result of water injection, state the actions and associated timelines proposed to remediate the groundwater levels within 21 days of an unacceptable change in water levels being identified.

6-5 The proponent shall on approval of the Chief Executive Officer of the Office of the Environmental Protection Authority, in consultation with the Department of Water and the Department of Environment and Conservation, implement the actions identified in 6-4 (3) and continue to implement such actions until the Chief Executive Officer of the Office of the Environmental Protection Authority determines that the remedial actions may cease.

6-6 The proponent shall make the monitoring reports required by condition 6-2 publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority.

7. Fortescue Marsh

7-1 The proponent shall manage the injection of surplus water to ensure that groundwater levels do not rise more than 1.5 metres at MB1 and 1 metre at MB2, MB3 and MB4 from the baseline groundwater level.

7-2 To verify that the requirements of condition 7-1 are being met the proponent shall:

1. undertake baseline monitoring to establish trigger groundwater levels at MB1, MB2 MB3 and MB4 having regard for seasonal variation. Locations MB1, MB2, MB3 and MB4 are identified in Table 1 of Schedule 4; and

2. monitor groundwater levels monthly at a minimum at locations identified in condition 7-2(1).

7-3 The proponent shall submit annually the results of monitoring required by condition 7-2 to the Chief Executive Officer of the Office of the Environmental Protection Authority.

7-4 In the event that the monitoring required by condition 7-2 indicates that the requirements of condition 7-1 are not being met, the proponent shall:

1. report such findings to the Chief Executive Officer of the Office of the Environmental Protection Authority within 21 days of any unacceptable change in water levels as required by condition 7-1 being identified;

2. provide evidence which allows determination of the root cause of the unacceptable change in water levels; and

3. if determined to be a result of water injection, state the actions and associated timelines proposed to remediate the groundwater levels.

7-5 The proponent shall on approval of the Chief Executive Officer of the Office of the Environmental Protection Authority, implement the actions identified in 7-4 (3) and continue to implement such actions until the Chief Executive Officer of the Office of the Environmental Protection Authority determines that the remedial actions may cease.

7-6 The proponent shall make the monitoring reports required by condition 7-3 publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority.

8. Vegetation Monitoring

8-1 The proponent shall manage groundwater abstraction and disposal (dewatering and injection) for the project in a manner that ensures:

1. there is no adverse impact on native vegetation communities attributable to the project outside the predicted impact areas; and

2. within the proposed impact areas there is no mortality of keystone plant species or significant changes in habitat characteristics attributable to the project.

8-2 Prior to the reinjection of surplus water and in consultation with the Department of Environment and Conservation, the proponent shall prepare a Vegetation Health Monitoring and Management Plan for the project area to the requirements of the Chief Executive Officer of the Office of the Environmental Protection Authority to verify and ensure that the requirements of Condition 8-1 shall be met.

8-3 The plan shall include the following:

1. identification of keystone plant species and habitat characteristics and limits of acceptable change in health and/or condition of these to be used as the basis for monitoring;

2. locations for predicted impact and reference monitoring sites (outside the predicted impact areas) for baseline and ongoing monitoring, with sites selected based on scientific rationale and to the satisfaction of the Department of Environment and Conservation;

3. results of baseline monitoring for vegetation health, species composition and habitat characteristics at both predicted impact and reference monitoring sites and groundwater levels and groundwater quality at agreed sites in proximity to the vegetation monitoring sites;

4. specifications for the monitoring program for vegetation health, species composition and habitat characteristics, including trigger levels for additional management actions to prevent further impacts and ensure compliance with Condition 8-1; and

5. specific management and contingency actions beyond reporting or initiating assessment.

8-4 The monitoring is to be carried out according to a method and schedule determined prior to the injection of surplus water to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority, and is to be carried out until such time as the Chief Executive Officer of the Office of the Environmental Protection Authority determines on advice from the Department of Environment and Conservation that monitoring may cease.

8-5 In the event that monitoring required by condition 8-3 indicates an exceedance of trigger levels determined as a result of the implementation of the groundwater abstraction and disposal (dewatering and injection):

1. the proponent shall report such findings to Chief Executive Officer of the Office of the Environmental Protection Authority within 7 days of the exceedance being identified;

2. the proponent shall provide evidence which allows determination of the cause of the exceedance within 21 days of the exceedance being identified;

3. if determined by the Chief Executive Officer of the Office of the Environmental Protection Authority to be a result of activities undertaken in implementing the proposal, the proponent shall submit actions to be taken to address the exceedance within 21 days of the determination being made to the Chief Executive Officer of the Office of the Environmental Protection Authority; and

4. the proponent shall implement actions to address the exceedance upon approval of the Chief Executive Officer of the Office of the Environmental Protection Authority and shall continue until such time the Chief Executive Officer of the Office of the Environmental Protection Authority determines that the remedial actions may cease.

8-6 The proponent shall implement the Vegetation Health Monitoring and Management Plan required by condition 8-1.

8-7 The proponent shall make the Vegetation Health Monitoring and Management Plan required by condition 8-1 publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority.

9. Removal of fauna from open trenches

9-1 The proponent shall ensure that open trenches associated with construction of the pipelines are cleared of trapped fauna by fauna-rescue personnel twice daily at a minimum. Details of all fauna recovered shall be recorded, consistent with condition 9-5. The first daily clearing shall take place by foot no later than three hours after sunrise and shall be repeated between the hours of 3:00 pm and 6:00 pm.

The open trenches shall also be cleared by fauna-rescue personnel on foot, and fauna details recorded, by fauna-rescue personnel no more than one hour prior to backfilling of trenches.

Note: “fauna-rescue personnel” means employees of the proponent whose responsibility it is to walk the open trench to recover and record fauna found within the trench.

9-2 The fauna-rescue personnel shall obtain the appropriate licenses as required for fauna rescue under the *Wildlife Conservation Act 1950* and be trained in the following:

1. fauna identification, capture and handling (including specially protected fauna and venomous snakes likely to occur in the area);

2. identification of tracks, scats, burrows and nests of conservation-significant species;

3. fauna vouchering (of deceased animals);

4. assessing injured fauna for suitability for release, rehabilitation or euthanasia;

5. familiarity with the ecology of the species which may be encountered in order to be able to appropriately translocate fauna encountered; and

6. performing euthanasia.

9-3 The length of open trench at the conclusion of each day shall not exceed a length capable of being inspected on foot and cleared by the available fauna-clearing personnel within the times required as set out in condition 9-1 and shall remain open no longer than 90 days without prior approval of the Chief Executive Officer of the Office of the Environmental Protection Authority.

9-4 Egress points and/or fauna refuges providing suitable shelter from the sun and predators for trapped fauna are to be placed in the trench at intervals not exceeding 50 metres.

9-5 The proponent shall submit a report on fauna management within 14 days of each calendar month during construction of the pipeline trench and a final report covering the entire pipeline construction period within 21 days of the completion of pipeline construction. The report shall include the following:

1. details on when sections of the trench (or the entirely thereof) were opened and closed;

2. details of all fauna inspections;

3. the number and type of fauna cleared from trenches;

4. fauna mortalities; and

5. all actions taken.

The report shall be provided to the Chief Executive Officer of the Office of the Environmental Protection Authority and the Department of Environment

and Conservation and shall be made publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority.

10. Reinjection impacts to other mines

10-1 The proponent shall manage the reinjection of surplus water to ensure that it does not cause a significant increase in dewatering requirements at other non-proponent approved mining operations.

10-2 To verify that the requirements of condition 10-1 are being met the proponent shall prepare a Stakeholder Consultation Reinjection Management Plan, to the satisfaction of the Chief Executive Officer of the Office of the Environmental Protection Authority prior to groundwater injection into the eastern brackish injection zone, as delineated by Australian Map Grid co-ordinates provided in Table 2 of Schedule 4, that includes the following:

1. potential issues resulting from the reinjection of the surplus water on other non-proponent mining operations, in consultation with the proponent of those affected mines, and proposed outcomes to ensure compliance with condition 10-1;

2. strategies, including trigger values, to address the potential issues and achieve the outcomes identified in condition 10-2 (1) in consultation with the proponent of any potentially affected mines;

3. detailed monitoring program to demonstrate that condition 10-2(2) is being met; and

4. specific management and contingency actions.

10-3 The monitoring as required by condition 10-2(3) is to be carried out until such time as the Chief Executive Officer of the Office of the Environmental Protection Authority determines that monitoring may cease.

10-4 In the event that monitoring required by condition 10-2(3) indicates an exceedance of trigger levels defined by condition 10-2(2):

1. the proponent shall report such findings to Chief Executive Officer of the Office of the Environmental Protection Authority within 7 days of the exceedance being identified;

2. the proponent shall provide evidence which allows determination of the cause of the exceedance within 21 days of the exceedances being identified;

3. if determined by the Chief Executive Officer of the Office of the Environmental Protection Authority to be a result of activities undertaken in implementing the proposal, the proponent shall submit

actions to be taken to address the exceedance within 21 days of the determination being made to the Chief Executive Officer of the Office of the Environmental Protection Authority; and

4. the proponent shall implement actions to address the exceedance upon approval of the Chief Executive Officer of the Office of the Environmental Protection Authority and shall continue until such time the Chief Executive Officer of the Office of the Environmental Protection Authority determines that the remedial actions may cease.

10-5 The proponent shall implement the Stakeholder Consultation Reinjection Management Plan required by condition 10-2.

10-6 The proponent shall make Stakeholder Consultation Reinjection Management Plan required by condition 10-2 publicly available in a manner approved by the Chief Executive Officer of the Office of the Environmental Protection Authority.

Notes

1. Where a condition states “on advice of the Office of the Environmental Protection Authority”, the Office of the Environmental Protection Authority will provide that advice to the proponent.

2. The Minister for Environment will determine any dispute between the proponent and the Office of the Environmental Protection Authority over the fulfilment of the requirements of the conditions.

3. The proponent is required to apply for a Works Approval and Licence for this project under the provisions of Part V of the *Environmental Protection Act 1986*.

4. Approval granted by the Chief Executive Officer of the Office of the Environmental Protection Authority in relation to any of the above conditions does not negate the requirement for other approvals under other relevant legislation.

Schedule 1

The Proposal (Assessment No. 1873)

The proposal is to increase dewatering rate up to 50 GL/a and injection of surplus water in two brackish and one saline injection zones at the Christmas Creek Mine.

The location of the various project components is shown in Figure 1.

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in sections 1 and 5 of the project's environmental review document, *Christmas Creek Water Management Strategy Environmental Review*, prepared by Fortescue Metals Group, Perth, Western Australia (May 2011).

Table 1: Summary of Key Proposal Characteristics

Element	**Description**
Project life:	Up to 5 years
Areas disturbed	Up to 600 hectares (of the 10,135.5 approved hectares in Ministerial Statement 707)
Dewatering Rate	Up to 50 Gigalitres per annum
Re-injection Rate	Up to 42.5 Gigalitres per annum

Figures

Figure 1 Location of project components. (See fig 2 above)

Schedule 2

AMG co-ordinates for predicted impact areas (MGA Zone 50)

Drawdown Impact Area	
Easting	**Northing**
778208.51	7516800
778400	7516831.28
778600	7516862.58
778800	7516904.27
779000	7516952.11
779145.18	7517000
779200	7517017.52
779400	7517087.98
779600	7517178.73
779638.65	7517200
779800	7517280.33
780000	7517393.74
780011.6	7517400
780200	7517475.23
780400	7517551.58
780554.26	7517600
780600	7517607.79
780800	7517612.48
781000	7517630.45
781200	7517619.69
781315.36	7517600
781400	7517580.72
781600	7517545.93
781800	7517496.52
782000	7517462.75
782200	7517426.61
782400	7517410.01
782461.13	7517400
782600	7517376.41
782800	7517342.14
783000	7517309.14
783200	7517277.13
783400	7517244.3
783600	7517216.19
783729.03	7517200
783800	7517190.97
784000	7517174.09
784200	7517154.71
784400	7517147.48
784600	7517134.15

Mounding Impact Area 1	
Easting	**Northing**
764349.38	7526600
765287.05	7526656.75
766329.41	7526559.03
767241.46	7526363.58
767800	7526108.49
767946.83	7526000
768000	7525970.67
768200	7525851.72
768271.53	7525800
768400	7525716.59
768587.62	7525600
768600	7525593.09
768800	7525563.63
769000	7525598.92
769004.43	7525600
769200	7525664.95
769400	7525705.38
769600	7525693.53
769800	7525651.72
770000	7525663.83
770200	7525714.71
770380.78	7525800
770400	7525815.61
770600	7525904.13
770800	7525938.39
771000	7525959.72
771200	7525963.98
771400	7525956.49
771600	7525940.48
771800	7525884.8
772000	7525804.65
772010.8	7525800
772200	7525715.4
772369.1	7525600
772400	7525580.56
772600	7525414.91
772616.11	7525400
772800	7525232.4
772830.84	7525200
772991.6	7525000

Mounding Impact Area 2	
Easting	**Northing**
790635.16	7508600
790800	7508654.58
791000	7508750.87
791065.71	7508800
791200	7508879.08
791385.5	7509000
791400	7509010.72
791600	7509142.16
791671.15	7509200
791800	7509301.64
791925.06	7509400
792000	7509457.16
792160.24	7509600
792200	7509636.74
792368.28	7509800
792400	7509831.32
792563.41	7510000
792600	7510038.01
792755.2	7510200
792800	7510247.7
792941.97	7510400
793000	7510461.73
793122.32	7510600
793200	7510684.44
793303.92	7510800
793400	7510895.96
793505.57	7511000
793600	7511085.46
793721.86	7511200
793800	7511274.33
793930.44	7511400
794000	7511467.2
794134.85	7511600
794200	7511663.99
794338.79	7511800
794400	7511859.98
794543.27	7512000
794600	7512055.32
794743.46	7512200
794800	7512258.82

784800	7517136.63	773000	7524987.28	794935.92	7512400
785000	7517154.53	773113.8	7524800	795000	7512466.16
785200	7517177.63	773168.67	7524600	795127.76	7512600
785301.77	7517200	773146.4	7524400	795200	7512675.81
785400	7517220.05	773120.28	7524200	795317.01	7512800
785600	7517280.66	773145.73	7524000	795400	7512889.05
785800	7517373.13	773182.71	7523800	795514.25	7513000
785865.2	7517400	773200	7523698.79	795600	7513084.61
786000	7517454.18	773219.08	7523600	795722.64	7513200
786200	7517565.76	773272.55	7523400	795800	7513271.25
786252.54	7517600	773274.61	7523200	795954.9	7513400
786400	7517678.7	773208.18	7523000	796000	7513437.62
786600	7517790.46	773200	7522860.87	796200	7513586.51
786615.19	7517800	773195.96	7522800	796220.14	7513600
786800	7517896.63	773158.06	7522600	796400	7513726.33
786964.35	7518000	773116.64	7522400	796511.5	7513800
787000	7518020.31	773068.39	7522200	796600	7513862.75
787200	7518147.84	773006.3	7522000	796773.9	7514000
787266.2	7518200	773000	7521983.25	796800	7514023.57
787400	7518297.09	772924.99	7521800	797000	7514178.29
787540.84	7518400	772823.01	7521600	797027.24	7514200
787600	7518442.77	772800	7521555.06	797200	7514344.57
787800	7518590.3	772701.61	7521400	797272.29	7514400
787810.15	7518600	772604.6	7521200	797400	7514496.05
787998.6	7518800	772600	7521187.68	797533.93	7514600
788000	7518801.77	772520.41	7521000	797600	7514650.5
788128.62	7519000	772443.97	7520800	797776.35	7514800
788200	7519126.04	772400	7520704.36	797800	7514822.25
788232.87	7519200	772330.26	7520600	797955.04	7515000
788316.12	7519400	772200	7520434.08	798000	7515046.5
788400	7519542.82	772169.62	7520400	798149.44	7515200
788429.47	7519600	772000	7520224.51	798200	7515246.23
788538.63	7519800	771972.04	7520200	798320.83	7515400
788600	7519913.36	771800	7520048.46	798400	7515492.22
788648.18	7520000	771744.47	7520000	798482.46	7515600
788693.5	7520200	771600	7519876.41	798593.21	7515800
788728.68	7520400	771514.26	7519800	798600	7515809.45
788600	7520558.01	771400	7519694.65	798667.53	7516000
788579.9	7520600	771287.6	7519600	798657.49	7516200
788476.24	7520800	771200	7519532.75	798631.82	7516400
788400	7520939.49	771000	7519403.86	798622.26	7516600
788359.36	7521000	770994.1	7519400	798624.84	7516800
788200	7521189.58	770800	7519265.41	798648.26	7517000
788183.9	7521200	770701.88	7519200	798671.15	7517200
788000	7521340.48	770600	7519126.82	798653.22	7517400

787931	7521400	770400	7519014.61	798606.36	7517600
787800	7521522.44	770371.65	7519000	798600	7517614.37
787716.23	7521600	770200	7518904.02	798472.49	7517800
787600	7521725.22	770022.58	7518800	798457.2	7518000
787531.04	7521800	770000	7518785.01	798400	7518184.52
787400	7521960.88	769800	7518677.45	798390.42	7518200
787367.36	7522000	769600	7518604.95	798201.33	7518400
787200	7522173.33	769578.42	7518600	798200	7518401.07
787174	7522200	769400	7518577.29	798000	7518521.55
787000	7522357.49	769200	7518573.41	797800	7518499.88
786951.5	7522400	769000	7518594.65	797600	7518470.1
786800	7522533.67	768956.06	7518600	797400	7518493.36
786722.16	7522600	768800	7518617.7	797200	7518550.71
786600	7522712.13	768600	7518636.82	797118.16	7518600
786525.82	7522800	768400	7518659.18	797000	7518662.3
786415.25	7523000	768200	7518664.59	796851.8	7518800
786400	7523033.04	768000	7518681.72	796800	7518842.2
786327.97	7523200	767800	7518701.23	796644.27	7519000
786271.85	7523400	767600	7518706.79	796600	7519040.01
786233.08	7523600	767400	7518683.55	796444.22	7519200
786203.65	7523800	767200	7518672.1	796400	7519239.27
786200	7523844.41	767000	7518658.44	796239.25	7519400
786188.08	7524000	766800	7518646.02	796200	7519433.48
786153.3	7524200	766600	7518663.41	796009.09	7519600
786111.97	7524400	766400	7518695.43	796000	7519608.22
786059.4	7524600	766200	7518736.01	795800	7519789.19
786000	7524780.3	766000	7518760.41	795790.85	7519800
785994.65	7524800	765800	7518797.88	795620.47	7520000
785907.71	7525000	765777.88	7518800	795600	7520022.05
785800	7525197.56	765600	7518816.06	795434.53	7520200
785798.5	7525200	765400	7518846.8	795400	7520227.98
785655.03	7525400	765200	7518871.81	795200	7520387.14
785600	7525460.81	765000	7518892.37	795186.33	7520400
785494.12	7525600	764800	7518908.5	795000	7520578.53
785400	7525686.32	764600	7518949.18	794981.39	7520600
785228.6	7525800	764400	7518948.32	794830.16	7520800
785200	7525824.61	764200	7518957.91	794800	7520842.17
785000	7525948.08	764000	7518948.16	794651.35	7521000
784890.09	7526000	763800	7518922.15	794600	7521052.14
784800	7526048.09	763600	7518919.68	794434.39	7521200
784600	7526113.27	763400	7518905.06	794400	7521227.68
784400	7526157.4	763200	7518902.78	794200	7521361.1
784200	7526189.42	763000	7518913.98	794124.95	7521400
784063.03	7526200	762800	7518948.74	794000	7521452.95
784000	7526206.37	762600	7518984.08	793800	7521526.89

783800	7526223.96	762543.77	7519000	793648.76	7521600
783600	7526202.43	762400	7519057.41	793600	7521627.46
783579.85	7526200	762200	7519155.1	793400	7521773.7
783400	7526188.17	762086.23	7519200	793351.7	7521800
783200	7526182.83	762000	7519237.79	793200	7521859.52
783000	7526149.41	761800	7519309.86	793000	7521971.61
782800	7526117.79	761600	7519385.84	792944.71	7522000
782600	7526075.85	761567.49	7519400	792800	7522062.71
782400	7526026.26	761400	7519486.83	792600	7522046.52
782242.82	7526000	761207.4	7519600	792400	7522016.12
782200	7525994.28	761200	7519604.06	792200	7522035.01
782000	7525964.98	761000	7519737.88	792000	7522050.24
781800	7525939.23	760922.34	7519800	791800	7522034.62
781600	7525934.62	760800	7519891.76	791600	7522028.82
781400	7525933.47	760665.14	7520000	791400	7522007.99
781200	7525934.14	760600	7520058.35	791200	7522004.73
781000	7525927.47	760443.2	7520200	791019.62	7522000
780800	7525967.1	760400	7520241.5	791000	7521999.66
780600	7525989.64	760249.7	7520400	790800	7521957.06
780565.12	7526000	760200	7520455.94	790600	7521937.84
780400	7526079.74	760051.98	7520600	790400	7521873.91
780200	7526134.68	760000	7520650.21	790200	7521822.33
780000	7526154.41	759839.03	7520800	790125.52	7521800
779800	7526157.79	759800	7520839.71	790000	7521761.84
779600	7526187.02	759648.39	7521000	789800	7521638.66
779400	7526193.63	759600	7521069.69	789730.39	7521600
779306.2	7526200	759518.99	7521200	789600	7521546.02
779200	7526208.99	759412.27	7521400	789400	7521418.26
779000	7526208.3	759400	7521427.55	789378.22	7521400
778915.81	7526200	759315.84	7521600	789200	7521245.37
778800	7526194.16	759202.52	7521800	789165.57	7521200
778600	7526154.38	759200	7521805.89	789018.96	7521000
778400	7526106.77	759102.98	7522000	789000	7520957.81
778200	7526112.4	759000	7522187.59	788943.35	7520800
778000	7526104.44	758994.37	7522200	788939.37	7520600
777800	7526115.35	758960.59	7522400	788967.86	7520400
777600	7526088.88	758945.23	7522600	788976.74	7520200
777400	7526026.13	758903.42	7522800	788954.86	7520000
777300.91	7526000	758836.85	7523000	788890.16	7519800
777200	7525979.27	758800	7523132.45	788839.64	7519600
777000	7525922.02	758783.79	7523200	788835.34	7519400
776800	7525863.91	758756.11	7523400	788800	7519275.19
776634.18	7525800	758719.53	7523600	788776.02	7519200
776600	7525789.84	758611.08	7523800	788764.59	7519000
776400	7525758.3	758600	7523823.35	788717.59	7518800

776200	7525713.52	758527.77	7524000	788640.88	7518600
776000	7525644.89	758451.9	7524200	788600	7518522.44
775900.05	7525600	758400	7524331.77	788537.6	7518400
775800	7525560.6	758358.65	7524400	788441.65	7518200
775600	7525481.71	758255.04	7524600	788400	7518079.61
775447.06	7525400	758200	7524766.2	788371.98	7518000
775400	7525375.63	758184.73	7524800	788311.93	7517800
775200	7525289.06	758171.13	7525000	788200	7517628.51
775076.62	7525200	758168.84	7525200	788173.69	7517600
775000	7525144.01	758180.59	7525400	788080.96	7517400
774800	7525039.83	758200	7525446.84	788000	7517300.33
774741.96	7525000	758265.6	7525600	787898.55	7517200
774600	7524890.16	758392.24	7525800	787800	7517073.83
774455.52	7524800	758400	7525813.08	787736.77	7517000
774400	7524770.17	758546.75	7526000	787600	7516857.11
774200	7524643.69	758600	7526043.93	787530.7	7516800
774152.45	7524600	758800	7526198.34	787400	7516653.51
774000	7524425.13	758802.38	7526200	787343.65	7516600
773959.65	7524400	759000	7526315.31	787200	7516461.98
773939.23	7524200	759200	7526350.73	787132.93	7516400
773933.59	7524000	759400	7526228.31	787000	7516269.59
773929.91	7523800	759429.88	7526200	786892.54	7516200
773937.37	7523600	759600	7526028.84	786800	7516147.86
773983.52	7523400	759619.68	7526000	786600	7516013.65
774000	7523318.81	759800	7525851.25	786575.03	7516000
774019.18	7523200	759854.94	7525800	786400	7515909.43
774000	7523139.41	760000	7525696.36	786200	7515862.37
773941.51	7523000	760121.8	7525600	786000	7515846.08
773895.04	7522800	760200	7525542.32	785800	7515863.89
773910.33	7522600	760400	7525519.28	785600	7515923.08
773957.55	7522400	760600	7525585.08	785400	7515983.74
774000	7522290.49	760630.66	7525600	785364.26	7516000
774035.41	7522200	760800	7525757.18	785200	7516066.55
774123.31	7522000	760903.58	7525800	785000	7516115.52
774176.33	7521800	760977.26	7526000	784816.26	7516200
774192.08	7521600	761000	7526019.85	784800	7516205.99
774191.84	7521400	761200	7526128.08	784600	7516269.98
774161.95	7521200	761400	7526193.56	784400	7516315.4
774139.99	7521000	761425.85	7526200	784200	7516369.72
774156.51	7520800	761600	7526243.22	784110.28	7516400
774161.03	7520600	761800	7526295.31	784000	7516434.46
774160.22	7520400	762000	7526357.13	783800	7516480.11
774143.24	7520200	762196.89	7526400	783600	7516510.84
774124.49	7520000	762200	7526400.67	783400	7516547.78
774128.81	7519800	762400	7526439.55	783200	7516578.43

774165.29	7519600
774200	7519411.94
774202.33	7519400
774292.88	7519200
774400	7519068.67
774466.5	7519000
774600	7518887.16
774698.81	7518800
774800	7518708.06
774919.05	7518600
775000	7518537.15
775171.48	7518400
775200	7518356.61
775306.32	7518200
775400	7518043.67
775427.78	7518000
775600	7517809.38
775609.22	7517800
775774.08	7517600
775800	7517568.16
775972.54	7517400
776000	7517376.24
776200	7517214.84
776219.87	7517200
776400	7517078.44
776561.14	7517000
776600	7516981.26
776800	7516902.08
777000	7516852.04
777200	7516806.14
777258.18	7516800
777400	7516784.74
777600	7516778.22
777800	7516778.64
778000	7516783.16
778200	7516798.48
778208.51	7516800

762600	7526487.88
762800	7526524.93
763000	7526542.13
763200	7526547.34
763400	7526556.3
763600	7526558.23
763800	7526553.22
764000	7526560.76
764200	7526575.06
764349.38	7526600

783000	7516552.09
782800	7516575.34
782600	7516489.35
782401.43	7516400
782400	7516398.01
782256.66	7516200
782200	7516058.43
782180.06	7516000
782125.45	7515800
782095.38	7515600
782088.94	7515400
782080.31	7515200
782093.26	7515000
782114.96	7514800
782159.9	7514600
782200	7514491.88
782235.15	7514400
782301.91	7514200
782393.87	7514000
782400	7513987.75
782509.43	7513800
782600	7513639.95
782625.05	7513600
782758.92	7513400
782800	7513340.41
782918.79	7513200
783000	7513117.53
783131.49	7513000
783200	7512930.33
783336.73	7512800
783400	7512738.27
783558.59	7512600
783600	7512562.58
783800	7512414.23
783818.57	7512400
784000	7512259.33
784082.41	7512200
784200	7512091.42
784318.66	7512000
784400	7511942.2
784585.69	7511800
784600	7511789.94
784800	7511648.28
784872.56	7511600
785000	7511513.46

785194.42	7511400
785200	7511396.66
785400	7511287.39
785600	7511201.06
785602.19	7511200
785800	7511088.43
785949.79	7511000
786000	7510973.28
786200	7510871.16
786344.82	7510800
786400	7510773.86
786600	7510658.68
786690.37	7510600
786800	7510525.09
786997.39	7510400
787000	7510398.23
787200	7510283.25
787341.87	7510200
787400	7510164.83
787600	7510034.63
787650.43	7510000
787800	7509887.31
787934.15	7509800
788000	7509754.62
788200	7509644.55
788314.2	7509600
788400	7509566.25
788600	7509497.01
788800	7509433.5
788921.82	7509400
789000	7509380.63
789200	7509308.21
789400	7509229.24
789484.06	7509200
789600	7509151.34
789800	7509067.38
789908.55	7509000
790000	7508922.76
790130.84	7508800
790200	7508709.23
790327.73	7508600
790400	7508566.64
790600	7508576.5
790635.16	7508600

Schedule 3

AMG co-ordinates for exclusion area (MGA Zone 50)

Easting	Northing
763581.4	7521000
763600	7521042
763800	7521165
763873.3	7521200
764000	7521362
764045.2	7521400
764200	7521440
764400	7521611
764600	7521569
764700.6	7521400
764800	7521271
765000	7521254
765068.8	7521200
765200	7520994
765400	7521005
765600	7520844
765800	7520822
765997.7	7520853
766230.3	7520800
766343.7	7520600
766400	7520543
766600	7520511
766688.8	7520390
766600	7520380
766400	7520399
766000	7520535
765800	7520556
765400	7520533
765000	7520562
764800	7520568
764600	7520577
764400	7520562
764205.9	7520596
764000	7520578
763943.1	7520600
763800	7520710
763695.8	7520800
763614.7	7520861

Schedule 4

Table 1. AMG co-ordinates for monitoring bores (MGA Zone 50)

Monitoring Bore	Easting	Northing
MB1	764,370	7,519,827
MB2	770,239	7,517,777
MB3	776,985	7,514,952
MB4	785,760	7,510,150

Table 2. AMG co-ordinates for eastern brackish injection zone (MGA Zone 50)

Easting	Northing
788185.6	7521036
789816.1	7520703
791479.9	7520637
793181.1	7520416
792765.1	7518237
792257.7	7518287
791113.8	7518607
789183.8	7518673
787686.5	7519073