CHRISTMAS CREEK FLORA AND VEGETATION ASSESSMENT

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Prepared for

Fortescue Metals Group Limited

Prepared by

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PERMITS

This flora and vegetation assessment was undertaken under the following licences issued by the Department of Environment and Conservation: SL009007 issued to Lewis Trotter and SL008930 issued to Matthew Love.

STATEMENT OF LIMITATIONS

Scope of Services

This environmental site assessment report ('the report') has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and ENV.Australia Pty Ltd (ENV) ('scope of services'). In some circumstances the scope of services may have been limited by factors such as time, budget, access and/or site disturbance constraints.

Reliance on Data

In preparing the report, ENV has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ('the data'). Except as otherwise stated in the report, ENV has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. ENV will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to ENV.

Environmental Conclusions

In accordance with the scope of services, ENV has relied on the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, express or implied, is made.

Report for Benefit of Client

The report has been prepared for the benefit of the Client and for no other party. ENV assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including, without limitation, matters arising from any negligent act or omission of ENV or for any loss or damage suffered by any other party relying on the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions, and should make their own enquiries and obtain independent advice in relation to such matters.

Other Limitations

ENV will not be liable to update or revise the report to take into account any events or circumstances occurring or facts becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to or ownership of the properties, buildings and structures referred to in the report, nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.

EXECUTIVE SUMMARY

ENV.Australia Pty Ltd (ENV) was commissioned by Fortescue Metals Group (FMG) in July 2010 to undertake a flora and vegetation assessment of the Christmas Creek survey area.

The purpose of the assessment is to provide supporting documentation for Environmental Impact Assessment documentation for submission to the Western Australian Environmental Protection Authority.

The objectives of the flora and vegetation assessment were to:

- conduct a comprehensive database/literature review of background information relevant to the survey area;
- provide an inventory of vegetation types and flora occurring in the survey area, incorporating recently published and unpublished records;
- provide an inventory of flora of biological and conservation significance recorded or potentially occurring within the survey area and surrounds; and
- verify, expand and map previously described vegetation types occurring within the survey area.

No species listed under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth),* or gazetted as Declared Rare Flora under the *Wildlife Conservation Act 1950 (WA)* were recorded in the survey area.

No vegetation associations representing Threatened Ecological Communities under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*, or as Environmentally Sensitive Areas under the *Environmental Protection Act 1986 (WA)* were recorded in the survey area.

Six species listed as Priority Flora by the Department of Environment and Conservation were recorded in the survey area: *Eremophila spongiocarpa* (Priority 1), *Tecticornia* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) (Priority 1), *Tecticornia* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) (Priority 1), *Atriplex flabelliformis* (Priority 3), *Tecticornia* sp. Roy Hill (H. Pringle 62) (Priority 3) and *Rhagodia* sp. Hamersley (M. Trudgen 17794) (Priority 3).

Eleven vegetation types were mapped in the survey area during previous flora and vegetation assessments. Six additional vegetation types were mapped during the current flora and vegetation assessment, increasing the total of vegetation types in the survey area to 17. Vegetation mapping of the survey area and the surrounding region during current and previous surveys described a total of 35 vegetation types.

Vegetation condition ranged from Excellent to Good, with most of the survey area described as Excellent. Disturbances to vegetation within the survey area include fire and grazing stress.

Six vegetation types (22, 26, 31, 32, 34 and 35) are locally significant and are associated with the Fortescue Marsh Priority Ecological Community (Priority 1) listed by the Department of Environment and Conservation.

Three vegetation types (3, 4 and 10) are associated with locally significant Mulga (*Acacia aneura*) and sheet flow.

Eight vegetation types (type 1, 13, 22, 26, 31, 32, 34 and 35) with potentially varying degrees of groundwater dependence are present.

1 INTRODUCTION

1.1 OBJECTIVES

ENV.Australia Pty Ltd (ENV) was commissioned by Fortescue Metals Group (FMG) in July 2010 to undertake a flora and vegetation assessment of the Christmas Creek iron ore mine area (here on referred to as the 'survey area').

The purpose of the assessment is to provide supporting documentation for Environmental Impact Assessment (EIA) documentation for submission to the Western Australian Environmental Protection Authority (EPA).

The objectives of the flora and vegetation assessment were to:

- conduct a comprehensive database/literature review of background information relevant to the survey area;
- provide an inventory of vegetation types and flora occurring in the survey area, incorporating recently published and unpublished records;
- provide an inventory of flora taxa of biological and conservation significance recorded or potentially occurring within the survey area and surrounds; and
- verify, expand and map previously described vegetation types occurring within the survey area.

1.2 LOCATION

The survey area is located approximately 110 kilometres (km) north of the townsite of Newman in the Pilbara region. The survey area is 49,353 hectares (ha) and is immediately adjoined to the west by the Cloudbreak mine site area (Figure 1).

1.3 ENVIRONMENTAL ATTRIBUTES

1.3.1 Climate

The survey area is located in the Pilbara region of Western Australia. The nearest accessible climate data to the survey area is available from the Bureau of Meteorology (BoM) Newman Aero weather station located approximately 10 km from the Newman township.

The Pilbara has an arid-tropical climate with two distinct seasons, a hot summer from October to April and a mild winter from May to September. The area experiences a wide range of temperatures, with an average temperature of 32°C (1996-2010). In summer, maximum temperatures may reach 47°C, whilst in winter, minimum night time temperatures may reach -2°C (BoM 2010).

Rainfall in the Pilbara is often sporadic, and can occur in summer and winter. The Newman area has average annual rainfall of 322.7 mm (1971-2010) (BoM 2010) with the majority of rainfall occurring during the summer months (Figure 2). Summer rainfall is typically associated with tropical storms in the north, or tropical cyclones that cross the coast and move inland. Winter rainfall is commonly the result of cold fronts moving north-easterly across the State.

For the three months preceding the survey, Newman received 66.2 mm of rainfall (April to June 2010), compared with the long term average of 51.9 mm (1971-2010) for the same period (BoM 2010).

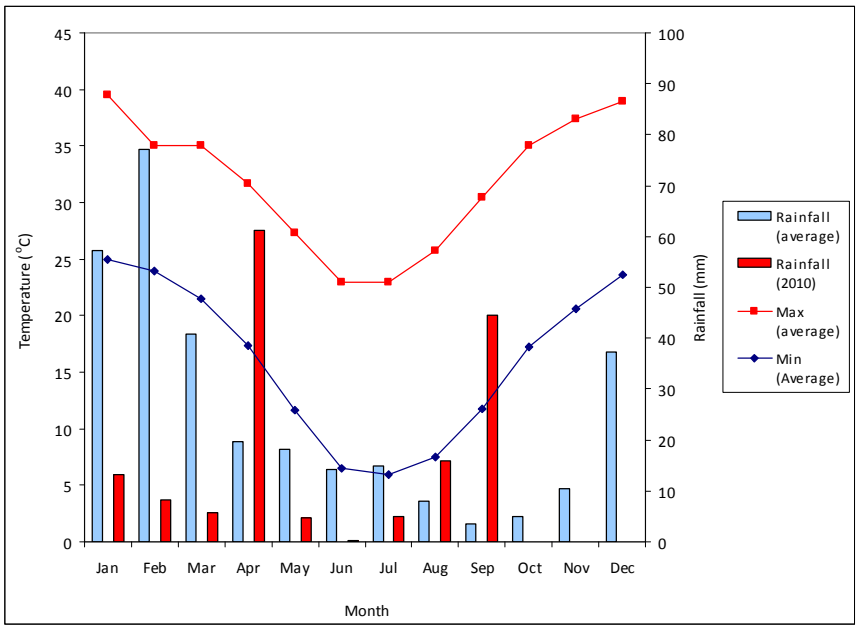

Figure 2: Average Monthly Rainfall and Maximum and Minimum Temperatures at Newman from 1995-2003 (BoM 2010)

1.3.2 Interim Biogeographic Regionalisation for Australia

The Interim Biogeographic Regionalisation for Australia (IBRA) divides Australia into 85 bioregions based on major biological and geographical/geological attributes (Thackway & Cresswell 1995). These bioregions were subdivided into 404 subregions, as part of a refinement of the IBRA framework (Department of the Environment, Water, Heritage & the Arts [DEWHA] 2010a).

The survey area is located on the border of the Chichester and Fortescue subregions of the Pilbara bioregion. The Chichester subregion is characterised by plains with a shrub steppe of *Acacia inaequilatera* over *Triodia wiseana* hummock grassland and *Eucalyptus leucophloia* tree steppes on rangelands (Kendrick 2001).

The Fortescue subregion is characterised by alluvial plains with *Acacia aneura* over grass communities and *Eucalyptus camaldulensis* woodlands fringing drainage lines (Kendrick 2001).

1.3.3 Land Systems

Land system mapping is based on regional patterns in topography, soils and vegetation. The most recent land system mapping of the Pilbara bioregion, in which the current survey area is located, was completed by van Vreeswyk *et al.* (2004). Seven land systems occur within the survey area (Table 1).

Table 1: Land Systems of the Survey Area

Land System	Description	Extent within Pilbara Region	Proportion of the Pilbara Region (%)
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft Spinifex grasslands.	7,748 km^2	4.30
Cowra	Plains fringing the Marsh land system and supporting snakewood and mulga shrublands with some halophytic undershrubs.	203 km^2	0.10
Jamindie	Stony hardpan plains and rises supporting groved Mulga shrublands, occasionally with Spinifex understorey.	2,074 km^2	1.10
Marsh	Lake beds and flood plains subject to regular inundation supporting samphire shrublands, salt water couch grasslands and halophytic shrublands.	977 km^2	0.50
Newman	Rugged jaspilite plateaux, ridges and mountains; support hard Spinifex grasslands.	14,580 km^2	8.00
Turee	Stony alluvial plains with gilgaied and non-gilgaied surfaces supporting Tussock grasslands and grassy shrublands.	581 km^2	0.30
Warri	Low calcrete platforms and plains supporting mulga and cassia shrublands.	305 km^2	0.20

1.3.4 Geology

The survey area comprises landforms including low hills, drainage lines and broad plains. Thorne and Tyler (1997) mapped the geology of the survey area as comprising seven units, as listed below:

Table 2: Geological Types and Descriptions within the Survey Area

Geological Code	Geological Description
Afj	Jeerinah Formation: pelite, chert, and thin-bedded meta-sandstone; intruded by meta-dolerite sills in the Hamersley Range; occurs on low hills
Ahm	Marra Mamba Iron Formation: chert, banded iron-formation and pelite; occurs on low hills
Qa	Alluvium: unconsolidated silt, sand and gravel; occurs in drainage channels and adjacent floodplains
Qc	Colluvium: unconsolidated quartz and rock fragments in soil; occurs in small pockets on hills
Qw	Alluvium and colluvium: red-brown sandy and clayey soil; occurs on low slopes and plains
Czc	Colluvium: partly consolidated quartz and rock fragments in soil: occurs in small pockets on hills
Czr	Hematite-goethite deposits on banded iron-formation and adjacent scree deposits; occurs in small pockets associated with the base of hills and drainage lines.

1.3.5 Vegetation Mapping

Vegetation mapping of the Pilbara region was completed on a broad scale (1:1,000,000) by Beard (1975). The survey area is located in the Hamersley Plateau in the Eremaean Botanical Province of Western Australia (Beard 1975). Four vegetation associations were mapped by Beard (1975) (Table 3).

Table 3: Vegetation Associations within the Survey Area as Mapped by Beard (1975):

Beard Code	Vegetation Description
a_1Lp:	Sparse Low Mulga Woodland, discontinuous in scattered groups
a_2Sr.t^1_3Hi	Hummock grasslands, shrub steppe; kanji over soft Spinifex & *Triodia wiseana* on basalt

Beard Code	Vegetation Description
$e_{16}Lr.t_3Hi$ / a_1Li	Mosaic of low Mulga woodland in valleys, and open low *Eucalyptus leucophloia* (Snappy gum) tree-steppe and Hummock grasslands of *Triodia wiseana*
K3Ci	Succulent steppe, Samphire

1.4 ECOLOGICAL OVERVIEW OF THE SURVEY AREA

1.4.1 Fortescue Marshes

The Fortescue Marshes are recognised as occurring in two main parts – the western, 100 km long by 2-3 km wide, and the eastern, 100 km long by 5-10 km wide (Environment Australia 2001). The Marshes are located within the upper reaches of the Fortescue Botanical District as part of the Eremaean Botanical Province (Beard 1990), and occupy a section of the Fortescue River Valley that lies between the Chichester and Hamersley Ranges.

The Marshes are listed on the Australian Heritage Commission Register of the National Estate as an "Indicative Place", and as a 'Nationally Important Wetland' in the Directory of Important Wetlands in Australia (Environment Australia 2001). Assessment of both of these databases lists threats to the flora, vegetation and ecology of the Fortescue Marshes, including the introduction of exotic fodder trees and pollution and disruption to surface water sheet flow and associated Mulga vegetation from nearby mining infrastructure (Environment Australia 2001).

The Fortescue Marsh system includes the following wetland types (Environment Australia 2001):

- Riverine floodplains; includes river flats, flooded river basins, seasonally flooded grassland, savanna and palm savanna; and
- Seasonal/intermittent freshwater lakes (> 8 ha), floodplain lakes.

The listing of the Marshes as a Nationally Important Wetland is based on four criteria (Department of Environment and Water Resources 2007):

- they are a good example of a wetland type occurring within a Biogeographic region in Australia;
- they play an important ecological or hydrological role in the natural functioning of a major wetland system/complex;

- they are important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail; and
- the wetland is of outstanding historical or cultural significance

The vegetation associated with the Fortescue Marshes has developed in response to hydrological regimes as determined by local topography and soils. Changes to water flow, drainage patterns, water quality or soils could potentially change the distribution and composition of the flora and vegetation of the Fortescue Marshes (Mattiske 2007).

Consequently, 213,049 ha of the Marshes' extent has been proposed by the Department of Environment and Conservation (DEC) for incorporation into the conservation estate following expiration of pastoral leases in 2015.

1.4.2 Mulga Vegetation and Sheet Flow

The Mulga (*Acacia aneura*) vegetation located at the foot slopes of the Chichester Ranges and to the northern and southern flanks of the Fortescue Marshes is considered to be near to the northern limit of Mulga in Western Australia, and is considered by the DEC to form significant vegetation communities as it:

- is highly morphologically variable;
- appears to play an important role in water and nutrient capture, and is thus important to ecosystem function;
- supports a range of Priority flora; and
- is highly susceptible to disturbance from fire, grazing and development of infrastructure.

Mulga is characterised by having shallow root systems and a strong reliance on sheet flow run-on to aid in the replenishment of soil water (Williams 2002). In major storm events, sheet flow can become an important source of inflow into the Fortescue Marshes (Gilbert and Associates, 2009).

Previous biological surveys conducted in the survey area noted Mulga occurring as groves over Broad plains and Flats throughout the survey area (Mattiske 2005; 2007).

1.4.3 Groundwater Dependent Ecosystems

Groundwater dependent ecosystems (GDEs) are a common feature of low-rainfall regions, where they are supported by shallow groundwater aquifers. The term 'groundwater dependent ecosystem' does not imply that all species making up such a community are dependent on groundwater, but are often dominated or defined by the presence of phreatophytes; plants that obtain and rely on water from a permanent groundwater supply or from the water table (Sommer and Froend 2010).

Eucalyptus camaldulensis and *Eucalyptus victrix* are associated with creeklines and drainage lines entering the Marshes from the Chichester Range. They are considered to be facultative phreatophytes; species which can utilise groundwater opportunistically at times when water availability is limited. (Froend 2009)

In addition, the Samphire (*Tecticornia* spp.) vegetation previously recorded by Mattiske Consulting (2007) fringing the Fortescue Marshes is considered likely to have varying degrees of reliance on ground water as a source of moisture. Samphire vegetation typically occurs in areas where saline or sub-saline groundwater is close to the surface (Mattiske 2005).

Plant physiologists currently believe that some Samphire species may be highly sensitive to modifications in hydrology that change salinity and waterlogging regimes (Astron 2010). It is therefore considered that water drawdown through mining processes is considered likely to affect species reliant on groundwater below the 407 m elevation contour and possibly to species in areas of high elevation (suggesting a significant distance between surface and groundwater) (Astron 2010).

The water use dynamics of Samphire vegetation on the fringe of the Fortescue Marshes is currently being researched, the results should become available in 2011 (Veneklaas and Colmer, 2010).

1.5 PREVIOUS BIOLOGICAL STUDIES

Early systematic flora studies of the Pilbara region were undertaken by Burbidge (1959) and Beard (1975). More recently, the Department of Agriculture (van Vreeswyk *et al.* 2004) conducted inventory and condition survey of the Pilbara. This report provides a regional inventory of flora and a description of land resources.

In recent decades, a boom in large-scale regional resource development surveys has resulted in a significant amount of site-specific biological survey work being carried out in the region, most of which is undertaken to obtain environmental approvals. A comprehensive bibliography of biological survey work undertaken in the Pilbara is available at the DEC website (DEC 2010a).

A comprehensive and systematic field review of the Pilbara regional flora is in preparation by the DEC (DEC in prep).

Those studies most relevant to the current survey are:

- *Christmas Creek Mine Area Flora Ground Truthing Assessment* (ENV.Australia 2009);
- *Flora and Vegetation Assessment for the Cloudbreak to Christmas Creek Rail Corridor* (Coffey Environments 2008);
- *Flora and Vegetation Near Fortescue Marshes* (Mattiske Consulting 2007);

- *Proposed Cloudbreak Access Road Vegetation Assessment – Eastern End* (ATA Environmental 2006);
- *Flora and Vegetation on the Cloudbreak and White Knight Leases* (Mattiske Consulting 2005);
- *Vegetation and Flora survey of the proposed FMG Stage A Rail Corridor* (Biota Environmental Sciences 2004a); and
- *Fortescue Metals Group Stage B Rail Corridor, Christmas Creek, Mt Lewin, Mt Nicholas and Mindy Mindy Mine Areas* (Biota Environmental Sciences 2004b).

Other biological surveys conducted in the vicinity (*i.e.* within 50 km) of the survey area include those undertaken for the Hope Downs (ecologia Environment 1997) and Roy Hill (ecologia Environment 2009) surveys.

1.6 LEGISLATION AND POLICY

1.6.1 Protection of Flora and Vegetation

Flora is protected formally and informally by various legislative and non-legislative measures, which are summarised below.

Legislative Protection

- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*);
- *Wildlife Conservation Act 1950 (WC Act)*; and
- *Environmental Protection Act 1986* (*EP Act*).

Non-Legislative Protection

- Western Australian DEC Priority lists for flora and vegetation; and
- Recognition of locally significant populations by the DEC.

A short description of these Acts is given below, and definitions of the species conservation codes and ecological community categories used, and those used by the DEC, are provided in Appendix A.

EPBC Act

The *EPBC Act* aims to protect matters of national environmental significance, which are detailed in Appendix A.

Under the *EPBC Act*, the Commonwealth DEWHA lists threatened species and Threatened Ecological Communities (TECs) in certain categories determined by criteria set out in the Act (*www.environment.gov.au/epbc/index.html*). Surveys likely to cause a significant impact on matters of national environmental significance should be referred to DEWHA for assessment under the *EPBC Act*.

The Fortescue Marsh is listed on the Register of the National Estate (the Register) based on its natural heritage values. Since being frozen as a consequence of amendments to EPBC Act and the *Australia Heritage Council Act 2003* in February 2007, the Register has effectively been replaced by a National Heritage List and a Commonwealth Heritage List; both of which are administered under the EPBC Act.

WC Act

The Western Australian DEC lists flora taxa under the provisions of the *WC Act* as protected according to their need for protection (see Appendix A).

Flora is given Declared Rare status when their populations are geographically restricted or are threatened by local processes. In addition, under the *WC Act*, by Notice in the Western Australian Government Gazette of 9 October 1987, all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) is protected throughout the State.

EP Act

Declared Rare Flora (DRF) and TECs are given special consideration in environmental impact assessments, and areas covered by TECs have special status as Environmentally Sensitive Areas (ESAs) under the *EP Act* and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

The protection of ESAs is a 'clearing principle' for assessing applications for permits to clear native vegetation, where exemptions for a clearing permit do not apply.

DEC Priority Lists

The DEC lists 'Priority' flora that have not been assigned statutory protection under the *WC Act*, but which are under consideration for declaration as DRF. Species assessed as Priorities 1-3 (see Appendix A) are in urgent need of further survey, whilst Priority 4 species require monitoring every 5-10 years (see Appendix A for definitions).

In addition, the DEC maintains a list of Priority Ecological Communities (PECs) which identifies those communities that need further investigation before possible nomination for TEC status.

Once listed, a community is a PEC, but only when endorsed by the Western Australian Minister of Environment does it become a TEC, and therefore protected as an ESA under

Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (see Appendix B).

Informal Recognition of Threatened Flora and Vegetation

Certain populations or communities may be of local significance or interest because of their patterns of distribution and abundance. For example, flora may be locally significant because they are range extensions to the previously-known distribution or are newly discovered taxa (and therefore have the potential to be of more than local significance). In addition, many species are in decline as a result of threatening processes (primarily land clearing), and relict populations of such species assume local importance for the DEC. It is uncommon for the DEC to make comment on these species of interest.

2 METHODOLOGY

2.1 BACKGROUND TO SURVEY METHODOLOGY

2.1.1 EPA Guidance Statement No. 51

A flora and vegetation assessment for environmental impact assessment should at the very least provide a comprehensive list of species in a given area. There are two levels of flora survey as delineated by the EPA:

Level One: a 'desktop' study to collate historical knowledge conducted in conjunction with a reconnaissance survey (site inspection); and

Level Two: an intensive survey that incorporates a detailed and comprehensive survey to characterise the flora present, combined with a Level One survey.

Where the scale and nature of the proposed impact is moderate to high, a Level Two survey will be required in most areas of the State, and is typically required for resource development surveys. The expectations of the EPA are set out in *Guidance Statement No. 51* (EPA 2004). Specifically, it details the extent, design and intensity of field surveys for environmental assessments in Western Australia.

The methodology of the current survey, a Level Two survey, has been developed to be compliant with the requirements of EPA *Guidance Statement No. 51*. This level of survey work is required because of the high level of disturbance to the flora proposed for the survey area.

2.2 SURVEY METHODOLOGY

The survey was carried out in a manner designed to be compliant with EPA requirements for the environmental surveying and reporting for flora and vegetation in Western Australia, as set out in the following documents:

- *Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation with Particular Reference to Agricultural Areas. Position Statement No.2* (EPA 2000);
- *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3* (EPA 2002); and
- *EPA Guidance for the Assessment of Environmental Factors: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia No. 51* (EPA 2004).

The methodology for the current work involved the following key steps.

2.2.1 Desktop Survey

A desktop survey was undertaken to gather background information on the survey areas and the flora and vegetation present. This involved a search of the following sources:

- DEC combined biological database NatureMap (DEC 2010b);
- DEC Threatened and Priority Flora database (DEC 2010c); and
- previous flora surveys (refer to section 1.5).

A request for a database search was submitted to the DEC [22° 22' - 22° 38' S and 119° 31' - 119° 51' E] to ascertain whether any Declared Rare or Priority species or any Threatened or Priority Ecological Communities had been recorded in the survey area and surrounding areas. In addition, a literature review was conducted, together with a review of records of flora for the survey area. These sources were used to compile a list of expected Declared Rare or Priority species, and Threatened or Priority Ecological Communities that may occur on the landforms in the survey area.

2.2.2 Previous Field Survey Methodology

The most comprehensive vegetation surveys of the Fortescue Marsh to date have been completed by Biota Environmental Sciences and Mattiske Consulting.

Biota Environmental Sciences

Biota was commissioned by FMG in 2004 to undertake a flora and vegetation survey of the proposed rail corridor and Mindy Mindy, Christmas Creek, Mt. Lewin and Mt Nicholas mine site areas during Stage B of the Chichester Operation Project (Biota 2004).

The field survey was undertaken to record and describe the flora and vegetation of the survey areas. The survey recorded flora diversity, vegetation condition and structure and assessed vegetation condition through the use of quadrat data and traverses of the survey area.

Field staff collected flora information using 50 m x 50 m vegetation survey quadrats, as preferred by DEC (pers. comm. S. van Leeuwen, DEC) and opportunistic collections. A total of 206 quadrats were assessed and a total of 81 broad vegetation types were defined for the survey areas.

Mattiske Consulting

Mattiske Consulting was commissioned by FMG in 2004 and 2005 to undertake a flora and vegetation survey of the Cloudbreak and White Knight mine site areas. Mattiske

Consulting was further commissioned to undertake a flora and vegetation survey of the Fortescue Marshes associated with the Christmas Creek and Cloudbreak mine site areas in 2006.

The field surveys were undertaken to record and describe the flora and vegetation of the survey areas. The survey recorded flora diversity, vegetation condition and structure and assessed vegetation condition through the use of quadrat data and traverses of the survey area.

Field staff collected flora information using 50 m x 50 m vegetation survey quadrats, as preferred by DEC (pers. comm. S. van Leeuwen, DEC) and opportunistic collections. Survey plots were selected based on differences in floristic features and composition.

A total of 56 quadrats were assessed during the assessment of the Cloudbreak and White Knight survey areas during the 2004 and 2005 assessments, resulting in the description of 18 vegetation types.

A total of 52 additional quadrats were assessed during the 2006 survey of the Fortescue Marsh vegetation associated with the Christmas Creek and Cloudbreak mine site areas. Survey plots were selected so as to sample all vegetation types along the northern margins of the Fortescue Marshes. An additional 11 vegetation types were described during the 2006 survey.

A total of 29 vegetation types were described by Mattiske Consulting during 2004, 2005 and 2006 flora and vegetation assessments of the Christmas Creek, Cloudbreak and White Knight survey areas.

2.2.3 ENV Field Survey

The ENV survey was undertaken over two trips, from the 15–19 July 2010 and 2–6 August 2010, with 20 person-days invested in the survey.

The field survey was undertaken to record and describe the flora and vegetation of the survey area to assist in the verification, extension and completion of vegetation types previously mapped by Mattiske Consulting (Figure 3). The vegetation type mapping was completed to ensure complete vegetation coverage of the survey area was obtained.

The survey recorded flora diversity, vegetation condition and structure and assessed vegetation condition through the use of quadrat and relevé data and traversing the survey area. Field staff collected flora information using 50 m x 50 m vegetation survey plots, as preferred by DEC (pers. comm. S. van Leeuwen, DEC), relevés and opportunistic collections.

A total of 21 quadrats were surveyed within the survey area, with 5 quadrats established on the jaspilite ridges and mountains and 16 established on lake beds and flood plains of the Fortescue Marshes in those areas previously unmapped (Figure 4).

An additional 16 relevés were surveyed within the survey area to assist in the verification and expansion of vegetation mapping previously mapped by Mattiske Consulting (2007). The quadrats and relevés were selected as being representative of the flora and vegetation of the survey areas (see Appendix D for flora survey quadrat and relevé photographs).

Data was recorded using standardised field sheets. The information noted at each site included landscape features, soils, bare ground and disturbance levels (Condition Scales presented in Appendix E). Each species of plant at each quadrat and relevé was recorded, including information on height and percentage cover (Data Sheets are presented in Appendix D). This enabled more accurate vegetation mapping to be undertaken, and provided greater detail of the species present. The opportunistic collections focused mainly on the location of new flora taxa not recorded in the quadrats, introduced species, and in particular, Declared Rare and Priority Flora, and flora not well known or not currently described.

2.2.4 Taxonomic Identification

Where field identification of plant taxa was not possible, specimens were collected systematically for later identification by taxonomists utilising the resources of the Western Australian Herbarium (WAH), through use of identification keys and comparison with the reference collection.

The species list for the survey areas was checked against FloraBase (WAH 2010) to determine whether any of the species are listed as DRF, Priority or introduced species. Declared Rare and Priority flora were also checked against the *EPBC Act* listing of threatened species to determine to determine whether any are federally listed.

2.2.5 Vegetation Mapping

Vegetation communities were described based on their structure and species composition, as defined by quadrat and relevé data, and field observations. Locations of quadrats and relevés were selected using aerial photographs and existing vegetation mapping and were positioned to cover possible variations in vegetation.

Quadrat and relevé vegetation descriptions were used to delineate vegetation types in the survey areas, and were compared to vegetation types described by Mattiske (2005, 2007) to verify and extend vegetation mapping.

Vegetation mapping was undertaken in the field and finalised in the office once vegetation type analysis had been completed. Field mapping was carried out using GPS (Garmin and Magellan) and GIS (OziExplorer and Microstation V7.0) hardware and software.

The boundaries of the vegetation types were drawn over an aerial photograph with the aid of GPS coordinates taken throughout the field survey, and existing boundaries

drawn by Mattiske Consulting (2005, 2007) were extended where applicable. Previously undescribed vegetation types were described and mapped accordingly.

The vegetation communities were digitised and produced as electronic mapping data using Microstation V7.0. ESRI shape files were created with ARCGIS 9.3.

Once the vegetation types were determined, they were checked against the listing of State and Federal TECs and PECs. The vegetation types were also checked against regional databases, such as Beard (1975), Shepherd *et al.* (2001) and Comprehensive Adequate and Representative (CAR) Reserve Analysis (DAFWA 2007), to determine their regional representation.

3 RESULTS

3.1 LIMITATIONS AND CONSTRAINTS

It is important to note the variables associated with individual surveys, which are often difficult to predict, as is the extent to which they influence survey outcomes. Variables of the flora and vegetation surveys are detailed in Table 4.

Table 4: Variables Associated with the Field Survey

Variable	Impact on Survey Outcomes
Access Problems	All areas were accessible and adequately surveyed.
Experience levels	The botanists who conducted the surveys were practitioners suitably qualified in their respective fields. • Co-ordinating Botanist: Lewis Trotter (Leading Botanist); • Field Staff: Matthew Love (Senior Biologist); • Taxonomy: Peter Jobson (Taxonomist); and • Data Interpretation and Reporting: Lewis Trotter.
Timing[1], weather, season.	Flora composition changes over time, with flora having specific growing periods, especially annuals and ephemerals (some plants lasting for a markedly brief time, some only a day or two). Therefore, the results of further botanical surveys in this location may differ from the results of this survey. The survey was undertaken over two trips, from the 15 – 19 July 2010 and 2 – 6 August 2010. In the three months leading up to the survey (April – June), the Newman townsite had received an average of 66.2 mm of rain. The long-term (1971-2010) average rainfall for the same period is 51.9 mm (BoM 2010).

[1] EPA Guidance Statement No, 51 (2004) stipulates that flora and vegetation surveys should be undertaken following the season that contributes the greatest rainfall in the region. In the Northern Province, this is after summer. In the Eremaean Province, rainfall is sporadic, and in the South-west Province the main rain is in winter, requiring surveys to be undertaken in spring. Short-term variations in normal weather patterns (e.g. drought) may necessitate supplementary survey work at other times of year or in later years to take into account temporal changes in diversity.

Variable	Impact on Survey Outcomes
Scope: Life forms	Since the survey was undertaken in a period of relatively low rainfall, some perennial species lacked identifiable parts (i.e. flowers and fruits). In particular, some perennial grasses were particularly difficult to identify in the field. Annual species were also likely to have been absent due to the timing of the surveys, and dry conditions. A significant portion of the northern section of the survey area had been recently burnt, resulting in a very small flora presence causing difficulty in determining vegetation type. Vegetation communities likely to represent the burnt community were targeted nearby. Where possible, unburnt and intact vegetation was targeted for assessment.
Sources of information	At the bioregion level, the Pilbara has been relatively well studied in recent years. Numerous flora and vegetation assessment surveys have been undertaken in the area as part of Environmental Impact Assessment processes. Those most relevant to the current study are listed in section 1.5.
Completeness	Prior to the current flora and vegetation assessment, approximately 20% of the survey area required survey and vegetation mapping. Completion of the current survey extended the vegetation mapping of the survey area to 49,359 ha (100%). An additional six vegetation types were observed and described during the current assessment, above those described and mapped by Mattiske Consulting. These additional vegetation types were mostly located on the Fortescue Marsh. A total of 73 taxa consisting of 20 families and 33 genera were recorded during the current survey. This total is a subset of the 727 taxa from 63 families and 209 genera recorded in previous surveys by Biota Environmental Sciences (2004a, 2004b) and Mattiske Consulting (2005, 2006).

3.2 FLORA

3.2.1 Flora

A total of 73 taxa (including species, subspecies and varieties) were recorded from the survey area during the current survey. These 73 taxa consist of 20 families and 33 genera. This total is a subset of the 727 taxa from 63 families and 209 genera which has been recorded in previous surveys by Biota Environmental Sciences (2004a, 2004b) and

Mattiske Consulting (2005, 2006). Refer to Appendix F for the flora list and Appendix G for the species matrix.

The plant families most frequently recorded from the survey were; Mimosaceae (17 taxa), Chenopodaceae (13 taxa) and Poaceae (10 taxa). The most frequently recorded genera were; *Acacia* (17 taxa), *Tecticornia* (7 taxa) and *Triodia* (5 taxa).

Of the total recorded taxa, 14 genera and 18 taxa were recorded on the fringes of the Fortescue Marshes in the survey area.

3.2.2 Flora of Conservation Significance

From previous surveys conducted in the area and database searches, one *EPBC Act* and DRF taxon and 17 Priority taxa were identified as potentially occurring in the area (Appendix A).

One *EPBC Act* listed / DRF potentially occurs within the survey area, *Lepidium catapycnon* (Hamersley Lepidium). *Lepidium catapycnon* is a woody perennial herb or shrub that grows to 0.3 m high, and is typically recorded on skeletal soils on hill slopes (WAH 2010).

No Threatened species pursuant to the *EPBC Act* were recorded within the survey area.

No plant taxa gazetted as Declared Rare Flora (DRF) pursuant to the *WC Act* were recorded in the survey area.

Six species listed as Priority Flora by the DEC were recorded in the survey area (Table 5); these being *Eremophila spongiocarpa* (Priority 1), *Tecticornia* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) (Priority 1), *Tecticornia* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) (Priority 1), *Atriplex flabelliformis* (Priority 3), *Tecticornia* sp. Roy Hill (H. Pringle 62) (Priority 3) and *Rhagodia* sp. Hamersley (M. Trudgen 17794) (Priority 3).

The locations of the Priority Flora recorded are presented in Appendix H and Figure 5.

Table 5: Priority Flora Recorded in the Survey Area

Taxa	Conservation Status
Eremophila spongiocarpa	P1
Tecticornia sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063)	P1
Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055)	P1
Atriplex flabelliformis	P3
Tecticornia sp. Roy Hill (H. Pringle 62)	P3
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3

Eremophila spongiocarpa (Priority 1)

Eremophila spongiocarpa is a compact, succulent-leaved shrub, to 1 m with white flowers in May and September. It is known to occur on weakly saline alluvial plains on the margins or marches. It is known from sixteen records from the Western Australian Herbarium (WAH 2010). This species was recorded at one site in vegetation type 33 (descriptions of these vegetation types provided in Section 3.3.2). The locations of *Eremophila spongiocarpa* are presented in Appendix H and Figure 5.

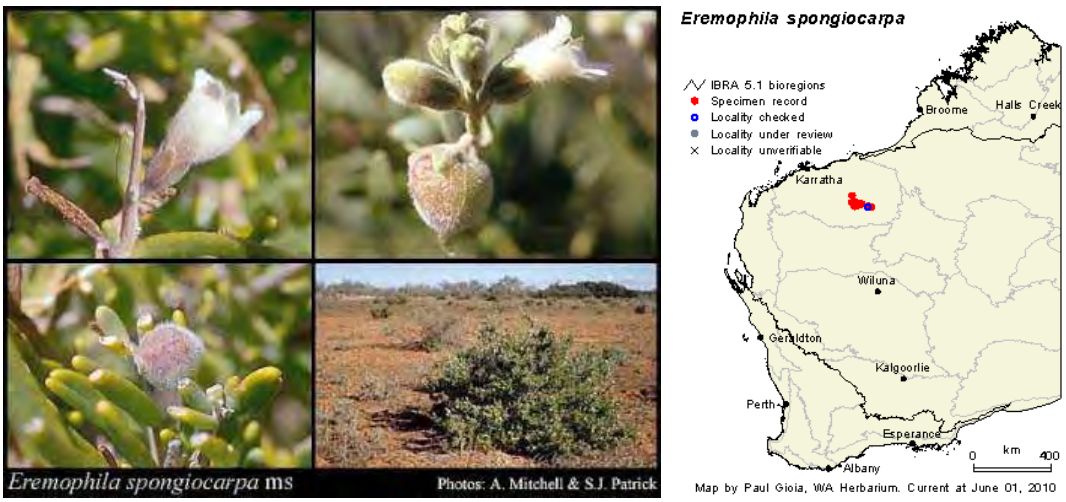

Plate 1 *Eremophila spongiocarpa*

Tecticornia sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) (Priority 1)

Tecticornia sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) is an erect, spreading shrub to 0.6 m with red to green foliage. It is known to occur on samphire flats in association with salt lakes. It is known from ten records from the Western Australian Herbarium (WAH 2010). This species was recorded at eight sites in vegetation types 31 and 35 (descriptions of these vegetation types provided in Section 3.2.4). The locations of *Tecticornia* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) are presented in Appendix H and Figure 5.

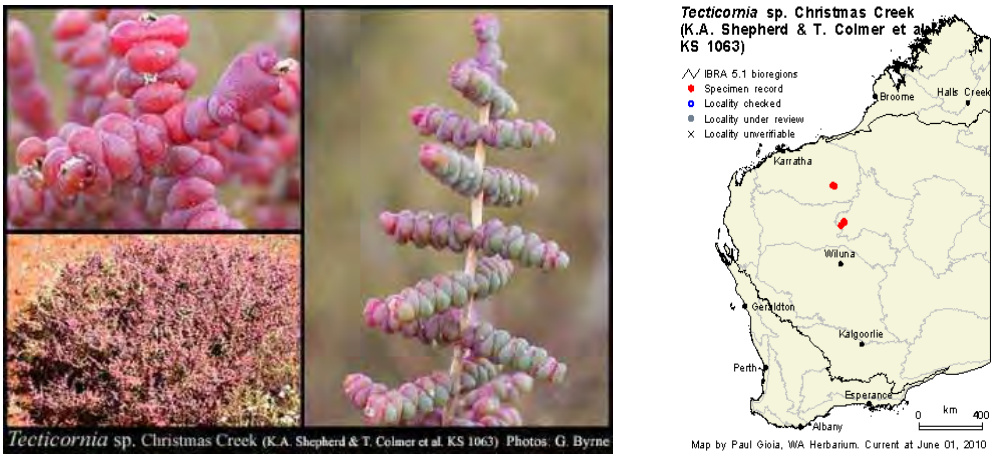

Plate 2 *Tecticornia* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063)

Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) (Priority 1)

Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) is a low shrub up to 1.5 m. Its fleshy leaves are almost circular in appearance and about 1-2mm in diameter. During drier periods, only the upper two leaves remain on the small branchlets giving the appearance of two red balls cupped on the branchlet tips. The flowers are much reduced and not easily observed, but are green to green-yellow. This species favours heavy clays on the margins of salt lakes and salt marshes. This species was recorded at three sites in vegetation types 31 and 35 (descriptions of these vegetation types provided in Section 3.2.4). The locations of *Tecticornia* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) are presented in Appendix H and Figure 5.

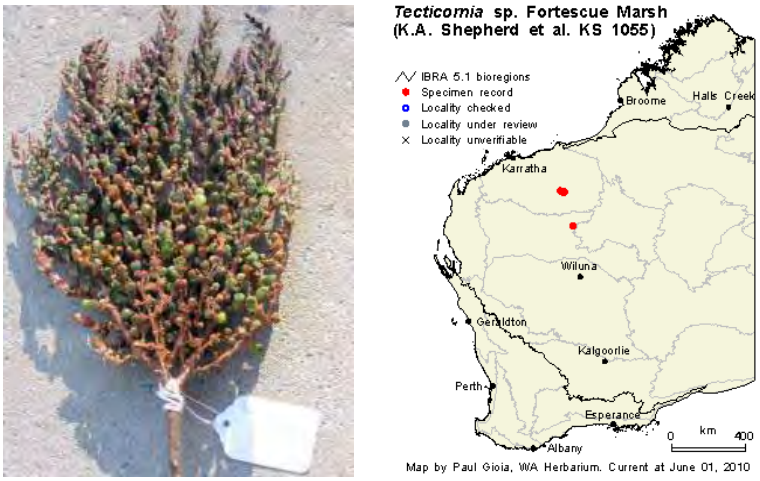

Plate 3 *Tecticornia* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055)

Atriplex flabelliformis (Priority 3)

Atriplex flabelliformis is a monoecious, erect, rounded perennial herb to 0.35 m. It is known to occur in clay-loams and loams on saline flats and marshes. It is known from seven records from the Western Australian Herbarium (WAH 2010). This species was recorded at one site in vegetation type 34 (descriptions of these vegetation types provided in Section 3.2.4). The locations of *Atriplex flabelliformis* are presented in Appendix H and Figure 5.

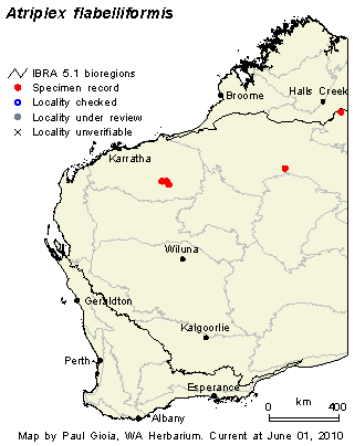

Plate 4 *Atriplex flabelliformis*

Tecticornia sp. Roy Hill (H. Pringle 62) (Priority 3)

Tecticornia sp. Roy Hill (H. Pringle 62) is an erect, yellow-green shrub to 1.2 m. It is known to occur in red, clayey sand on flat flood ways, lake beds, saline alluvial plains and drainage sumps. It is known from 18 records from the Western Australian Herbarium (WAH 2010). This species was recorded at five sites in vegetation types 31, 34 and 35 (descriptions of these vegetation types provided in Section 3.2.4). The locations of *Tecticornia* sp. Roy Hill (H. Pringle 62) are presented in Appendix H and Figure 5.

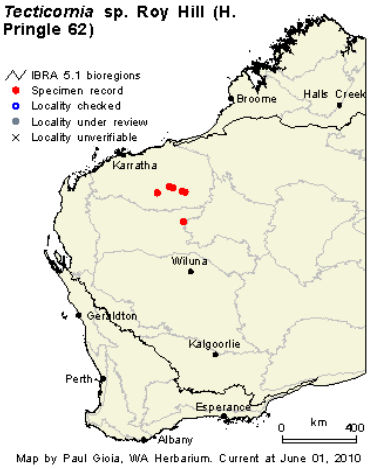

Plate 5 *Tecticornia* sp. Roy Hill (H. Pringle 62)

Rhagodia sp. Hamersley (M. Trudgen 17794) (Priority 3)

Rhagodia sp. Hamersley (M. Trudgen 17794) is a perennial erect shrub to 1.4 m with red, pink flowers. This species was recorded at one site in vegetation type 4 (description of vegetation communities provided in section 3.2.4). The locations of *Rhagodia* sp. Hamersley (M. Trudgen 17794) are presented in Appendix H and Figure 5.

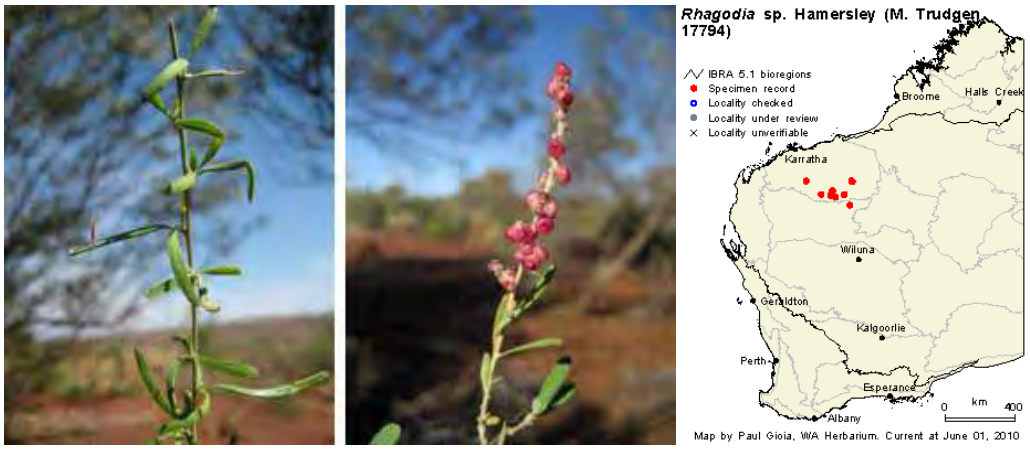

Plate 6 *Rhagodia* sp. Hamersley (M. Trudgen 17794)

Seventeen Priority Flora potentially occur in the survey area from the DEC database search and literature review. Of these 17 Priority Flora, and with the exclusion of *Eremophila spongiocarpa, Tecticornia* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063), *T.* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055), *Atriplex flabelliformis, Tecticornia* sp. Roy Hill (H. Pringle 62) and *Rhagodia* sp. Hamersley (M. Trudgen 17794), only four additional species have been recorded during previous surveys within the survey area (Figure 5):

Phyllanthus aridus (Priority 3)

Phyllanthus aridus is an erect, much-branched shrub to 0.25 m with cream to green flowers. It is known from twenty-three records from the Western Australia Herbarium (WAH 2010). This species was recorded during previous surveys in vegetation types 1, 2, 3, 4 and 17 (description of vegetation communities provided in section 3.2.4). The locations of *Phyllanthus aridus* are presented in Figure 5.

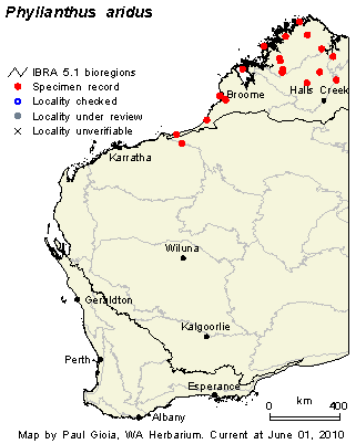

Plate 7 *Phyllanthus aridus*

***Rostellularia adscendens* var. *latifolia* (Priorty 3)**

Rostellularia adscendens var. *latifolia* is a prostrate shrub to 0.3 m with blue, purple and violet flowers from April to May. It is known from twelve records from the Western Australia Herbarium (WAH 2010). This species was recorded within the survey area in vegetation type 4 and in the region surrounding the survey area in vegetation type 17 during previous surveys (Fortescue Metals Group 2010) (descriptions of these vegetation types provided in Section 3.2.4). The locations of *Rostellularia adscendens* var. *latifolia* are presented in Figure 5.

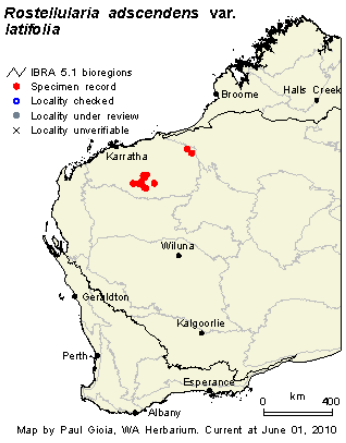

Plate 8 *Rostellularia adscendens* var. *latifolia*

Themeda sp. Hamersley Station (M.E. Trudgen 11431) (Priority 3)

Themeda sp. Hamersley Station (M.E. Trudgen 11431) is a perennial grass to 1.8 m. It is known from thirteen records from the Western Australia Herbarium (WAH 2010). This species was recorded within the survey area in vegetation type 9 during previous surveys (Biota 2005) (descriptions of these vegetation types provided in Section 3.2.4). The locations of *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) are presented in Figure 5.

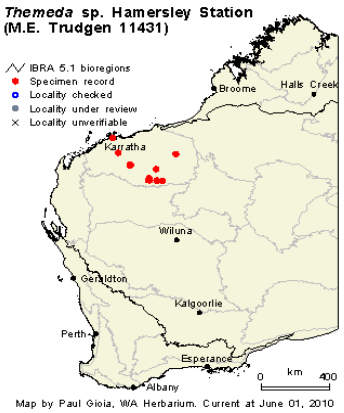

Plate 9 *Themeda* sp. Hamersley Station (M.E. Trudgen 11431)

Goodenia nuda (Priority 4)

Goodenia nuda is an erect to ascending herb to 0.5 m with yellow flowers. It is known from twenty records from the Western Australia Herbarium (WAH 2010). This species was recorded within the survey area in vegetation type 2, 3, 4 and 30 during previous surveys (Biota 2005, Fortescue Metals Group 2010) (descriptions of these vegetation types provided in Section 3.2.4). The locations of *Goodenia nuda* are presented in Figure 5.

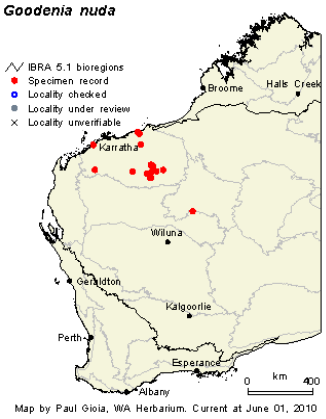

Plate 10 *Goodenia nuda*

An additional seven species previously recorded near the vicinity of the survey area may potentially occur:

- *Nicotiana heterantha* (Priority 1) (Mattiske 2007);
- *Eremophila pilosa* (Priority 1) (Biota 2004b);
- *Helichrysum oligochaetum* (Priority 1) (Biota 2004b);
- *Myriocephalus scalpellus* (Priority 1) (Biota 2004b);
- *Peplidium sp.* Fortescue Marsh (S. van Leeuwen 4865)(Priority 1);
- *Stylidium weeliwolli* (Priority 2); and
- *Eremophila youngii* subsp. *lepidota* (Priority 4) (Mattiske 2005, 2007).

3.3 VEGETATION

3.3.1 Vegetation of Conservation Significance

No known TECs occur in the survey area (DEC 2010d).

Two PECs in the vicinity of the survey area; the Fortescue Marsh community (Priority 1) and the Fortescue Valley Sand Dunes community (Priority 3) (DEC 2010d; Figure 10).

The Fortescue Marsh (Priority 1) PEC is described as:

> "Endemic *Eremophila* species and several near endemic and new to science samphires. Recorded locality for night parrot and bilby and several restricted aquatic invertebrates. Specific vegetation types are found on Mulga Downs, only around the marsh and an unusual system occurs downstream. Located east of Mulga Downs, on Marillana and Roy Hill Stations (DEC 2010d)".

The Fortescue Marsh PEC buffer was located within the survey area (Figure 10). The Fortescue Marsh is listed in the directory of important wetlands for Australia and is listed as a wetland of national significance under the EPBC act. It is an area of high environmental and conservation significance at a regional and national scale.

The Fortescue Valley Sand Dunes (Priority 3) PEC is described as:

> "Red linear sand dune communities that lie at the junction of the Hamersley Range and Fortescue Valley, between Weeli Wolli Creek and the low hills to the west. A small number are vegetated with *Acacia dictyophleba* scattered tall shrubs over *Crotalaria cunninghamii* and *Trichodesma zeylanicum* var. *grandiflorum* open shrubland (DEC 2010d)."

This PEC buffer is located within 25 km of the survey area boundary. The Sand Dunes are regionally rare, small and fragile and are highly susceptible to threatening processes (DEC 2010d).

One additional PEC that was not located during the DEC database search, but is associated with the Fortescue River occurs near the survey area; the Freshwater Claypans of the Fortescue Valley (Priority 1) community.

The Freshwater claypans of the Fortescue Valley PEC are described as:

> "Freshwater Claypans downstream of the Fortescue Marsh - Goodiadarrie Hills on Mulga Downs Station. Important for waterbirds, invertebrates and some poorly collected plants. *Eriachne* and *Eragrostis* species. Grasslands with few Coolabah. Unique community (DEC 2010d)."

The Freshwater claypans of the Fortescue Valley PEC buffer is approximately 100 km west of the survey area.

3.3.2 Vegetation Types

Mattiske Consulting described a total of 29 vegetation types within four broad floristic formations during previous flora and vegetation assessments of the Christmas Creek, Cloudbreak and White Knight survey areas (Mattiske 2005; 2007).

Six additional vegetation types were described during the current survey, increasing the total number of vegetation types to 35.

Of these 35 vegetation types, 17 occur within the Christmas Creek survey area and 29 occur regionally, with 21 occurring in the adjoining Cloudbreak area and 8 on the White Knight tenement.

The vegetation types previously described by Mattiske are listed and described on the following pages, followed by descriptions of additional vegetation types described during the current survey.

These are followed by descriptions of the vegetation types that occur regionally on the Cloudbreak and White Knight survey areas.

Creekline and Drainage Lines

1 Open Woodland of *Eucalyptus victrix, Eucalyptus camaldulensis* with pockets of *Acacia coriacea* subsp. *pendens* over *Grevillea wickhamii* subsp. *aprica, Petalostylis labicheoides* and *Acacia tumida* over *Triodia longiceps, Chrysopogon fallax, Themeda triandra* and *Aristida* species.

2 Low Woodland to Low Open Forest of *Acacia aneura* var. *aneura, Acacia citrinoviridis, Acacia pruinocarpa* over *Acacia tetragonophylla* and *Psydrax*

latifolia over *Chrysopogon fallax, Stemodia viscosa, Blumea tenella, Themeda triandra* and species of *Triodia* and *Aristida* .

8 Closed Scrub to Tall Shrubland of *Acacia pruinocarpa, Acacia tumida, Acacia ancistrocarpa, Acacia maitlandii, Acacia kempeana, Acacia tetragonophylla* with occasional *Eucalyptus gamophylla* and *Corymbia deserticola* over *Triodia epactia, Themeda triandra* and *Aristida* species.

Flats and Broad Plains

3 Low Woodland to Low Open Forest of *Acacia aneura* var. *aneura, Acacia pruinocarpa, Acacia tetragonophylla, Acacia tenuissima, Grevillea wickhamii* subsp. *aprica, Psydrax latifolia* over *Dodonaea petiolaris* and species of *Triodia* and *Aristida.*

4 Low Open Woodland of *Acacia aneura* var. *aneura, Acacia pruinocarpa, Acacia xiphophylla, Acacia victoriae* over *Acacia tetragonophylla, Psydrax latifolia* and *Psydrax suaveolens* over *Ptilotus obovatus* and mixed species of *Maireana* and *Sclerolaena.*

10 Low Open Woodland of *Acacia xiphophylla, Acacia victoriae, Acacia aneura* var. *aneura* over *Acacia tetragonophylla, Ptilotus obovatus, Senna* species and mixed species of *Maireana* and *Sclerolaena.*

Ranges, Hills and Hillslopes

16 Hummock Grassland of *Triodia basedowii* with pockets of *Triodia epactia* and *Triodia lanigera* with emergent patches of *Eucalyptus leucophloia, Corymbia deserticola* over *Acacia ancistrocarpa, Acacia hilliana, Acacia acradenia, Acacia pyrifolia, Hakea lorea* subsp. *lorea* over *Goodenia stobbsiana* and mixed *Senna* species.

17 Hummock Grassland of *Triodia basedowii* with pockets of *Triodia epactia* and *Triodia lanigera* with emergent patches of *Eucalyptus leucophloia, Corymbia deserticola* over *Acacia ancistrocarpa, Acacia pyrifolia, Hakea lorea* subsp. *lorea* over *Goodenia stobbsiana* and mixed *Senna* and *Ptilotus* species.

Fringes of Samphire Flats

13 Low Halophytic Shrubland of *Tecticornia auriculata, T. indica* subsp. *leiostachya, T. halocnemoides* subsp. *tenuis* with patches of *Frankenia* species.

22 Low Shrubland of *Tecticornia indica* subsp. *bidens* and *Nicotiana occidentalis* over grasses with occasional stands of *Sesbania cannabina* and *Cullen cinereum*.

26 Low Shrubland of *Muellerolimon salicorniaceum* and *Tecticornia indica* subsp. *bidens.*

Six additional vegetation types as described during the current survey are listed and described below.

Flats and Broad Plains

30 High open Shrubland of *Acacia synchronicia* with *Senna glaucifolia* over *Aristida* sp.

Fringes of Samphire Flats

31 Low Shrubland of *Tecticornia indica* subsp. *bidens*, *T. auriculata* and *T. indica* subsp. *leiostachya* with *T.* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063), *T.*sp. Denny's Crossing, *T.* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) and *T.*sp. Roy Hill (H. Pringle 62).

32 Low Shrubland of *Muellerolimon salicorniaceum* over *Tecticornia indica* subsp. *bidens* and *T. indica* subsp. *leiostachya* with *T.*sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) (K.A. Shepherd & T. Colmer et al. KS 1063) and *T.* sp. Dennys Crossing (K.A. Shepherd & J. English KS 552) with *Euphorbia* sp.

33 Low Shrubland of *Tecticornia indica* subsp. *bidens* and *Scaevola spinescens* with *Acacia synchronicia*.

34 Low Shrubland of *Muellerolimon salicorniaceum* over *Tecticornia* indica subsp. *bidens* and *T.auriculata* with *Heliotropium curassavicum* and *Atriplex flabelliformis*.

35 Low Shrubland of *Muellerolimon salicorniaceum* over *Tecticornia auriculata*, *T.* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063), *T.* sp. Dennys Crossing (K.A. Shepherd & J. English KS 552) and *T.*sp. Roy Hill (H. Pringle 62) with *Euphorbia* sp.

Eighteen vegetation types described by Mattiske Consulting during previous surveys of the regional Cloudbreak and White Knight survey areas are listed below.

Creekline and Drainage Lines

9 Closed Scrub to Shrubland of *Acacia ancistrocarpa, Acacia maitlandii, Acacia kempeana, Acacia monticola* with occasional *Eucalyptus gamophylla* and *Corymbia deserticola* over *Senna* species, *Triodia basedowii* and *Aristida* species.

Flats and Broad Plains

5 Low Woodland of *Acacia aneura* var. a*neura, Acacia pruinocarpa* over *Acacia tetragonophylla, Psydrax latifolia* and *Psydrax suaveolens* over *Ptilotus obovatus* and mixed Chenopodiaceae and Poaceae species.

6 Low Woodland of *Acacia aneura* var. *aneura, Acacia pruinocarpa* over *Acacia tetragonophylla, Psydrax latifolia* and *P. suaveolens* over *Ptilotus obovatus* and *Triodia epactia* and Poaceae species.

15 Low Open Woodland of *Acacia victoriae, Acacia xiphophylla* over *Ptilotus obovatus, Senna* species and mixed species of *Maireana* and *Sclerolaena.*

Fringes of Samphire Flats

11 Hummock Grassland of *Triodia angusta* with patches of *Acacia victoriae, Acacia aneura* var. *aneura, Acacia xiphophylla* over *Atriplex codonocarpa, Eremophila cuneifolia* and mixed Chenopodiaceae species.

12 Low Halophytic Shrubland of *Tecticornia auriculata* and *T. indica* subsp. *leiostachya* with associated *Maireana* species and *Atriplex flabelliformis* with *Muehlenbeckia florulenta* with patches of *Acacia victoriae* and *Acacia sclerosperma* subsp. *sclerosperma.*

14 Hummock Grassland of *Triodia angusta* with patches of *Acacia victoriae* over *Atriplex codonocarpa* and mixed Chenopodiaceae and Poaceae species.

19 Scrub of *Acacia xiphophylla* over **Cenchrus ciliaris, Dissocarpus paradoxus* and *Tecticornia indica* subsp. *bidens.*

20 Scrub of *Acacia sericophylla* over *Muellerolimon salicorniaceum, Nicotiana occidentalis* and *Mimulus gracilis.*

21 Scrub of *Acacia ampliceps* over *Muellerolimon salicorniaceum, Tecticornia indica* subsp. *bidens, Nicotiana occidentalis* and *Frankenia ambita.*

23 Low Shrubland of *Frankenia ambita, Tecticornia bidens* subsp. *leiostachya* and *Eragrostis dielsii* with emergent *Acacia sericophylla.*

24 Low Shrubland of *Tecticornia bidens* subsp. *leiostachya* with *Eragrostis dielsii.*

25 Low Shrubland of *Tecticornia auriculata, T. indica* subsp. *bidens* and *Frankenia ambita* over *Eragrostis dielsii.*

27 Low Shrubland of *Maireana carnosa, Atriplex codonocarpa* and *Sclerolaena cuneata* over *Eragrostis dielsii* and *Trianthema turgidifolia.*

28 Hummock Grassland of *Triodia angusta* with *Eremophila spongiocarp*a and *Tecticornia indica* subsp. *bidens.*

29 Hummock Grassland of *Triodia angusta* with *Tecticornia bidens* subsp. *leiostachya, Cullen cinereum, Eragrostis dielsii* and emergent *Acacia synchronicia.*

Ranges, Hills and Hillslopes

7 Hummock Grassland of *Triodia basedowii* with emergent patches of *Eucalyptus gamophylla, Eucalyptus leucophloia, Corymbia deserticola* over *Acacia ancistrocarpa, Acacia sclerosperma* subsp. *sclerosperma, Acacia kempeana, Acacia arida, Grevillea berryana, Grevillea wickhamii* subsp. *aprica, Calytrix carinata* over *Goodenia stobbsiana* and mixed Poaceae species.

18 Hummock Grassland of *Triodia angusta* with emergent patches of *Eucalyptus leucophloia* over *Acacia ancistrocarpa, Acacia pyrifolia, Hakea lorea* subsp. *lorea* over *Goodenia stobbsiana* and mixed *Senna* and *Ptilotus* species.

3.3.3 Spatial Extent of Vegetation Types

The spatial extent of the vegetation types as defined in Section 3.2.4 and shown in Figure 8 is summarised in Table 6.

Table 6: Spatial Extent of Vegetation Types in the Survey Area

Vegetation Type	Percentage in Survey Area	Area (ha)
1	1.9	938.05
2	9.92	4897.11
3	18.52	9138.29
4	11.29	5572.05
8	0.78	383.45
10	0.1	50.39
13	7.21	3557
16	0.02	10.91
17	12.29	6069.8
22	4.53	2234.54
26	8.34	4113.8
30	3.33	1641.34
31	7.2	3555.33
32	3.09	1525.63
33	0.42	205.51
34	0.42	207.99
35	0.35	171.39
Bare-ground	3.16	1556.89
Burnt	5.19	2565.81
Infrastructure	1.94	957.87
Total	100	49353.16

Vegetation types 3, 4 and 17 comprise the largest vegetation types within the survey area, occupying 9,138.29, 5,572.05 and 6,069.80 ha respectively.

3.3.4 Exclusion Zone

Portions of pastoral leases in the region have been nominated for exclusion for public purposes in 2015, when the leases come up for renewal. The submissions are from the DEC, with the intention of adding these nominated areas to the conservation estate in order to provide a comprehensive, adequate and representative reserve system (Biota 2004).

The area of the proposed DEC pastoral lease exclusion zone occupies a total of 213,049 ha. Of this, 63,211 ha has been the subject of vegetation mapping from previous and current surveys, with the remaining 149,837 ha of the exclusion zone unmapped (Table 7).

Table 7: Extent of Vegetation Types within the Combined Survey, Regional and Exclusion Zone Areas

Vegetation Types	Extent of Vegetation within Survey and Regional Areas			
	Within Exclusion Zone		Outside Exclusion Zone	
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
1	414.2	0.66	1934.34	1.88
2	3653.31	5.78	11731.53	11.39
3	10313.96	16.32	24188.01	23.76
4	4429.14	7.01	16590.27	16.11
5	0	0	289.78	0.29
6	0	0	466.96	0.45
7	19.88	0.03	1382.67	1.34
8	461.32	0.73	1598.52	1.55
9	358.47	0.57	881.6	0.86
10	4346.25	6.88	13933.06	13.53
11	712.87	1.13	115.23	0.11
12	415.62	0.66	69.08	0.06
13	5414.92	8.57	421.99	0.41
14	0.102	0	62.34	0.06
15	199.8	0.32	31.48	0.03
16	891.96	1.41	1906.08	1.85
17	1958.67	3.1	16001.1	15.54
18	0	0	3.15	0
19	1.02	0	363.87	0.35
20	4.1468	0.01	0.41	0
21	0.01	0	231.4	0.23
22	6109.51	9.67	1478.9	1.44
23	97.66	0.15	50.86	0.05
24	0	0	16.69	0.02
25	183.84	0.29	0	0
26	14788.46	23.4	2553.58	2.48
27	52.14	0.08	0	0
28	0	0	152.13	0.15
29	44.81	0.07	0	0
30	0	0	2492.96	2.42
31	3555.33	5.62	0	0
32	1525.63	2.41	0	0

Vegetation Types	Extent of Vegetation within Survey and Regional Areas			
	Within Exclusion Zone		Outside Exclusion Zone	
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
33	205.51	0.33	0	0
34	207.99	0.33	0	0
35	171.39	0.27	0	0
Bare-ground	1556.9	2.46	0	0
Burnt	0	0	2565.81	2.49
Infrastructure	737.45	1.17	1143.38	1.11
Water	379.18	0.6	316.27	0.31
Total	63211.44	100	102973.45	100

The extent of vegetation mapped during previous and current flora and vegetation assessments of the survey area and surrounding region covers an area of 166,185 ha from thirty-five vegetation types. Of this, 63,211 ha from thirty vegetation types occur within the exclusion zone. The remaining 102,973 ha occurs outside the exclusion zone (Table 7).

In addition, vegetation types 26, 3 and 22 comprise the largest vegetation types within the total exclusion zone area, occupying 14,788, 10,314 and 6,109 ha respectively. Vegetation types 26, 3 and 22 cover an area of 17,342, 34,502 and 7,588 ha in total respectively.

The largest vegetation types within the survey area and surrounding region outside of the exclusion zone comprise vegetation types 3, 17 and 10, occupying 24,188, 16,001 and 13,933 ha respectively. Vegetation types 17 and 10 cover an area of 18,279 and 17,256 ha in total respectively.

The extent of vegetation mapped during previous and current flora and vegetation assessments occupies a total of 49,353 ha within the survey area. The area of the proposed DEC pastoral lease exclusion zone within the survey area occupies a total of 22,785 ha from 15 vegetation types, with the remaining 26,568 ha of the survey area occurring outside of the exclusion zone (Table 8).

Table 8: Extent of Vegetation Types within the Christmas Creek Survey and Exclusion Zone Areas.

Vegetation Type	Extent of Vegetation within the Christmas Creek Survey Area			
	Within Exclusion Zone		Outside Exclusion Zone	
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
1	0.122	0	937.9260	3.5
2	1179.85	5.18	3717.2600	13.99
3	4114.85	18.06	5023.4399	19.91
4	264.08	1.16	5307.9800	19.98
8	64.8	0.28	318.6460	1.2
10	32.91	0.14	17.4887	0.07
13	3557	15.61	0	0
16	0	0	10.9095	0.04
17	0	0	6069.7998	22.84
22	2234.54	9.81	0	0
26	4113.8	18.06	0	0

Vegetation Type	Extent of Vegetation within the Christmas Creek Survey Area			
	Within Exclusion Zone		Outside Exclusion Zone	
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
30	0	0	1641.3400	6.18
31	3555.33	15.6	0	0
32	1525.63	6.7	0	0
33	205.51	0.9	0	0
34	208	0.91	0	0
35	171.4	0.75	0	0
Bare-ground	1556.89	6.83	0	0
Burnt	0	0	2565.8101	9.66
Infrastructure	0	0	957.8660	3.6
Total	22784.71	100	26568.45	100

Based on the extent of vegetation mapped during previous and current flora and vegetation assessments within the survey area exclusion zone, vegetation types 3, 26, 13 and 31 comprise the largest vegetation types, occupying 4,115, 4114, 3,557 and 3,555 ha respectively. Vegetation type 3 comprises 9,138 ha within the total survey area, whilst vegetation types 26, 13 and 31 only occur within the survey area exclusion zone (Table 8).

Additionally, vegetation types 17, 4, 3 and 2 comprise the largest vegetation types outside of the survey area exclusion zone, occupying 6,070, 5,308, 5,023 and 3,717 ha respectively (Table 8). Vegetation types 4, 3 and 2 covers 5,572, 9138 and 4897 ha within the total survey area respectively, whilst vegetation type 17 only occurs within the survey area exclusion zone.

3.3.5 Vegetation Condition

The condition of the vegetation within the survey area ranged from Excellent to Good. The majority of the 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.

Fire age within the survey areas ranged from Recent (less than one year since last fire) to Very Old (eight to twelve years since last fire). Significant disturbance from recent fire was evident in the northern area of the Christmas Creek survey area (Figure 8).

Approximately 5% (2,566 ha) of the survey area was significantly burnt due to a recent fire that occurred in 2009.

4 DISCUSSION

4.1 THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

No vegetation types observed or described during current or previous flora and vegetation assessment resemble any of the TECs listed by the DEC (2007d).

No vegetation types observed or described during current or previous flora and vegetation assessment of the survey area resemble the Freshwater claypans of the Fortescue Valley (Priority 1) community. This community occurs approximately 100 km west of the survey area boundary.

The Fortescue Valley Sand Dunes (Priority 3) PEC buffer is located within 25 km of the survey area. This PEC is located between Weeli Wolli Creek and the low hills to the west, approximately 50 km west of the survey area. No vegetation types observed or described during current or previous flora and vegetation assessments of the survey area resemble the Fortescue Valley Sand Dunes community.

The Fortescue Marsh PEC has recently been classified as a Priority 1 PEC and comprises an area from east of Mulga Downs to Marillana and Roy Hill Stations. The Fortescue Marsh PEC buffer is located within the survey area boundary (Figure 10).

The Fortescue Marsh PEC is characterised by the presence of endemic and new to science *Eremophila* and *Tecticornia* species occurring on the fringe of the Fortescue Marshes.

Samphire (*Tecticornia* spp.) vegetation types 22, 26, 31, 32, 33, 34 and 35 recorded during current and previous surveys can be considered to be associated with this PEC due to the presence of varying endemic and significant species including *Eremophila spongiocarpa* (Priority 1)*, Tecticornia* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) (Priority 1), *Tecticornia* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) (Priority 1) and *Tecticornia* sp. Roy Hill (H. Pringle 62) (Priority 3).

Based on the presence of endemic and new to science *Eremophila* and *Tecticornia* spp. in vegetation types 22, 26, 31, 32, 33, 34 and 35 on the Marshes fringe, in addition to the occurrence of the PEC buffer within the survey area (Figure 10), it is suggested that the Fortescue Marsh (Priority 1) PEC occurs within the survey area.

4.1.1 Samphire Vegetation Types

In addition to the association with the Fortescue Marsh (Priority 1) PEC, the Samphire vegetation types are considered to be unique in the Pilbara region and are locally restricted to the Marsh (Fisher *et al.* 2004). The Samphire vegetation forms part of the locally and nationally significant marshes (Kendrick 2001).

Samphire vegetation consists of salinity and waterlogging tolerant plants (Astron 2010). These species belong to the most salt tolerant group of angiosperms and inhabit coastal and inland salt marsh habitats of arid inland Australia (Astron 2010). Despite being considered to be important reservoirs during flood events in areas where groundwater is shallow, samphires remain poorly studied (Astron 2010).

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 (Coleman 2001).

Samphires recorded at the Fortescue Marsh during current and previous flora and vegetation assessments (excluding the Priority species recorded during the current survey) include *Tecticornia auriculata*, *Tecticornia indica* subsp. *bidens* and *Tecticornia indica* subsp. *leiostachya* (Mattiske 2007). *Tecticornia indica* is recognised as highly tolerant to salinity and waterlogging (English 2004).

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 samphire populations for several months, suggesting some dependence on groundwater for moisture (Astron 2010).

Furthermore, preliminary studies on the species at the Marsh have indicated differences in the drought tolerance of species according to the positioning of these species at the Marsh (Astron 2010). This is believed to contribute to the zonation of species in the samphire community from the outer fringes to the interior of the Marsh, although differences in salinity tolerance, waterlogging tolerance and tolerance to inundation are likely to be the major determinants of zonation patterns on the Marsh (Astron 2010).

Additionally, although there is uncertainty pertaining to ecophysiological information on Samphire species of the Fortescue Marsh, preliminary studies have suggested that groundwater dependence may vary between Samphire species (Astron 2010). The variation in dependence between Samphire species is based on changes in elevation (and therefore depth to groundwater), with species in areas of relatively low elevation considered likely to be groundwater dependent and species in areas of relatively high elevation considered to be possibly dependent on groundwater (Astron 2010).

Whilst further studies are currently being undertaken regarding the extent of groundwater dependency, scientists are of the belief that samphires are potentially groundwater dependent (Ed Barrett-Lennard 2010, pers. comm.; Kelly Shepherd, DEC, pers. comm. in Astron 2010). Furthermore, studies by English (2004) also indicate that some samphire species are potentially groundwater dependent, particularly at early development stages (Astron 2010).

The role of groundwater in the water use dynamics of the Fortescue Marsh samphire vegetation remains unclear (Equinox Environmental 2009). However, it cannot be ruled out as an important source of water at certain times during the flooding and drying cycles of the Marsh.

As a result, Samphire vegetation types 22, 26, 31, 32, 33, 34 and 35, which comprise 32% of the survey area, may potentially be affected in varying degrees by water drawdown as a result of prolonged mining processes (Astron 2010). This is based on the potential reliance on groundwater levels from samphire vegetation. These vegetation types occur around the fringe of the Fortescue Marsh, and may potentially occur outside of the survey area (Figure 9).

Furthermore, vegetation types 22, 26, 31, 32, 33, 34 and 35 can be considered locally significant due to the presence of Priority Flora.

4.2 SIGNIFICANT ECOLOGICAL COMMUNITIES

Two vegetation communities occurring within the survey area are considered to play varying roles in the ecology of the Marshes, namely the Mulga vegetation types associated with the Flats and Broad Plains north of the Marshes and the groundwater dependent vegetation associated with creekline and drainage vegetation types running into the Marshes.

These vegetation types are discussed in detail below.

4.2.1 Mulga Vegetation Types

Mulga vegetation associated with the Chichester Range area and within the survey area is considered significant as it is the northern extent of Mulga in Western Australia. Mulga is abundant in the low open woodlands and shrublands on Flats and Broad Plains within the survey area. Mulga vegetation borders the Marshes and extends north up the flanks of the uplands.

Mulga is a species complex with up to 10 recognised varieties and several other very closely related species, which share a high proportion of morphological (Miller *et al.* 2002) and molecular similarities (Andrew *et al*. 2003; Miller & Bayer 2003; Brown *et al.* 2008). In the field, these varieties are distinguished by the shapes of phyllodes, habit and pod morphology (Astron 2009).

Mulga generally occurs in groves or distinct patches and can produce a banding pattern across the landscape, as occurs in vegetation types 3, 4 and 10 (Figure 9). These groves act as a sink for water and nutrients and intercept sheet flow, thus increasing soil moisture and nutrient availability for plant uptake; due to high biological activity Mulga vegetation creates fertile patches in the landscape that is generally impoverished in terms of soil nutrients (Ludwig & Tongway 1990).

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 sheet flow characteristics. This can occur through the following (Astron 2010):

- Ponding water upslope from roads and rail formations;
- Starving areas down slope from this infrastructure;
- Eroding channel and banks of natural surface drainage lines; and
- Contracting or expanding natural drainage lines and changes to drainage routes.

Mulga is considered to be dependent on sheet flow water for functioning and survival. It is a relatively productive vegetation type and provides valuable ecological services. Therefore, any loss of Mulga is likely to have repercussions for the surrounding habitats, ranging from the loss of individual plants as a result of water starvation to widespread loss of vegetation and habitat resulting in further adverse effects upon associated vegetation types (Astron 2010).

Additionally, it is believed that the Fortescue Marsh may be impacted by changes to surface water flow and water quality, as the Marsh is believed to be a product of surface water runoff (EPA 2009).

Based on the importance of Mulga and sheet flow in relation to the Marshes, vegetation types 3, 4, and 10 can be considered locally significant due to their association with Mulga. These vegetation types make up the majority of the survey area, covering 14,760 ha (29.9%).

Impacts to Mulga vegetation may need to be managed carefully. Change to surface hydrology has the potential to adversely affect both Mulga vegetation types and, ultimately, the vegetation of the Fortescue Marshes which is dependent on the sheet flow from the Mulga vegetation.

4.2.2 Groundwater-Dependent Vegetation Types

Open woodlands of *Eucalyptus camaldulensis* and *Eucalyptus victrix* were recorded in the creeklines entering the Marshes to the north via the Chichester Range. These species are considered to be partially phreatophytic (groundwater dependent), with a partial dependence on groundwater to meet their physiological moisture requirements through the use of deep, aggressive root systems (Fisher *et al.* 2004). *Eucalyptus victrix* is frequently located adjacent to water courses, creeklines and wetlands (Froend 2009).

Scattered individuals of *Eucalyptus victrix* and occasional individuals of *Eucalyptus camaldulensis* were recorded in the survey area during the current and previous surveys in creekline and drainage vegetation type 1. Vegetation type 1 covers 938.05 ha (1.9%) of the survey area.

It is important to note that *Eucalyptus victrix* is not considered a true phreatophyte because it relies on water held in the vadose (unsaturated) zone above the water table for uptake, making it technically a vadophyte (Jones *et al*. 1990). It is widely characterised as a facultative phreatophyte, based on its limited or opportunistic use of groundwater (Froend 2009) and the extent to which it phreatophytic is dependent on the local groundwater condition each individual has become established under (Biota 2004).

Eucalyptus victrix has a root system that adapts to site-specific solum characteristics and water availability (Batini 2009). If alternative water sources are insufficient to meet plant requirements during root architecture development and overall plant growth and maintenance, *Eucalyptus victrix* roots are capable of exploring to these depths, provided soil strata do not impede root development (Batini 2009).

The depth of the water table from the ground surface of current groundwater levels in the survey area as stated in the Biota report (2004) are at 20 to 25 m below surface, which is likely to be the limit of the rooting depth of *Eucalyptus victrix.* As a result, it is reasonable to suggest that some individuals of *Eucalyptus victrix* within the survey area may potentially utilise groundwater for a component of their ecological water requirement if alternative water source decline is sudden (Muir Environmental 1995; Batini 2009).

Based on the ability of *Eucalyptus victrix* to utilise groundwater as a component of their water requirement, vegetation type 1 can be considered to be partially groundwater dependent.

4.3 FLORA OF CONSERVATION SIGNIFICANCE

No Threatened species pursuant to the *EPBC Act* were located within the survey area. In addition, no plant taxa gazetted as Declared Rare Flora pursuant to the WC Act were located in the survey area.

Six Priority species were recorded during the current survey. All Priority Flora were recorded on the fringe of the Fortescue Marshes, with the exception of *Rhagodia* sp. Hamersley (M. Trudgen 17794) which was recorded on the Flats and Broad Plains in vegetation type 4. Therefore, vegetation types 4, 31, 32, 34 and 35 can be considered to have additional significance due to the presence of Priority Flora.

Four additional species listed as Priority Flora were recorded in vegetation types 1, 2, 3, 4, 9, 10, 17, 22, 25, 26 and 30 within the survey area during previous surveys (Biota 2005; Fortescue Metals Group 2010): *Goodenia nuda; Phyllanthus aridus; Rostellularia adscendens* var*. latifolia*; and *Themeda* sp. Hamersley Station (M.E. Trudgen 11431). These were not recorded during the current survey. These vegetation types can be considered to be of significance due to the presence of Priority Flora.

It is important to note that the focus of the current field survey was to expand and complete vegetation mapping of the survey area. 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, particularly in vegetation types 2, 3, 4, 9, 10, 22, 25, 26, 31, 32, 34 and 35 due to the presence of Priority Flora during current and previous surveys.

4.4 VEGETATION TYPE MAPPING

Twenty nine vegetation types within four broad floristic formations were described by Mattiske Consulting (2007) within the Christmas Creek, Cloudbreak and White Knight survey areas (Mattiske 2005; 2007). Eleven of these vegetation types were recorded within the Christmas Creek study area, the remaining 18 occur regionally in the Cloudbreak and White Knight survey areas.

Six additional vegetation types were described during the current survey, increasing the total number of vegetation types within the survey area to 27 and the total number recorded by Mattiske from previous surveys to 35. Vegetation type 30 was located to the north of the Marsh on clay flats, and vegetation types 31, 32, 33, 34 and 35 were associated with the fringing vegetation of the Fortescue Marshes.

Additionally, the Flats and Broad Plains broad floristic formation, namely vegetation types 3, 4, 10 and 30 cover the highest area proportionally within the survey area, whilst the Samphire Flats vegetation types, namely 13, 22, 26, 31, 32, 34 and 35, cover the least amount of area proportionally.

4.5 PASTORAL LEASE EXCLUSION ZONE VEGETATION

The total area of the proposed DEC pastoral lease exclusion zone is 213,049 ha. Of this, 22,785 ha (46%) of 17 vegetation types occurs within the survey area. The remaining 26,568 ha (54%) of the survey area occurs outside of the proposed pastoral lease exclusion zone.

Vegetation types 13, 22, 26, 31, 32, 33, 34 and 35 only occur within the exclusion zone, whilst vegetation types 16, 17 and 30 do not occur within the exclusion zone at all.

The four broad floristic formations occurring in the total combined survey and regional areas as mapped during current and previous surveys (Mattiske 2007), namely Creekline and Drainage Lines, Broad Plains, Ranges, Hills and Hillslopes and Samphire Fringe Vegetation, occupy 21,033, 74,032, 22,163 and 32,383 ha respectively.

These four broad floristic formations occurring within the survey area occupy 6,219, 16,402, 6,081 and 15,571 ha respectively. Furthermore, these four broad floristic

formations occurring in the total survey area exclusion zone occupy 1,245, 4,412, 0 and 15,571 ha respectively.

4.5.1 Creeklines and Drainage Lines

The Creeklines and Drainage Lines broad floristic formation, which is comprised of vegetation types 1, 2 and 8 in the survey area, occupies an area of 19,793 ha in total. Furthermore, this broad floristic formation covers 6,219 and 1,245 ha within the survey area and within the survey area exclusion zone respectively. Therefore, 30% of the total mapped Creeklines and Drainage Line formation occurs within the survey area, and 6% occurs within the survey area exclusion zone.

In addition, the Creeklines and Drainage Lines vegetation types 1, 2, and 8 occupy 2,349, 15,385 and 2,060 ha of the total extent of mapped vegetation respectively. Based on this, vegetation types 1, 2 and 8 occurring in the survey area contain 40%, 32% and 19% of the total mapped area for these vegetation types respectively. Furthermore, vegetation types 1, 2 and 8 occurring in the survey area exclusion zone contain 0%, 8% and 3% of the total extent of area mapped for these vegetation types respectively (Table 8).

Vegetation types 1, 2 and 8 occurring within the survey area exclusion zone contain 0%, 24% and 17% of these vegetation types mapped within the survey area respectively (Table 8).

Approximately 40% of the total extent of vegetation type 1, which is considered to be partially groundwater-dependent (see section 4.2.2), is contained within the survey area, 0.01% of which is contained within the exclusion zone.

4.5.2 Ranges, Hills and Hill Slopes

The Ranges, Hills and Hill Slopes broad floristic formation, which is comprised of vegetation types 16 and 17 in the survey area, occupies 20,758 ha in total. Furthermore, this broad floristic formation covers 6,081 and 0 ha within the survey area and within the survey area exclusion zone respectively. Therefore, 29% of the total mapped Ranges, Hills and Hill Slopes broad floristic formation occurs within the survey area, none of which occurs within the survey area exclusion zone.

In addition, the Ranges, Hills and Hill Slopes vegetation types 16 and 17 occupy 2,798 and 17,960 ha of the total extent of mapped vegetation respectively. Based on this, vegetation types 16 and 17 occurring in the survey area contain 0.4 and 34% of the total mapped area for these vegetation types respectively (Table 8).

Vegetation types 16 and 17 do not occur within the exclusion zone.

4.5.3 Flats and Broad Plains

The Flats and Broad Plains broad floristic formation, which is comprised of vegetation types 3, 4, 10 and 30 in the survey area, is the largest broad floristic formation mapped in total, within the survey area, and within the exclusion zone, occupying 74,032, 16,402 and 4,412 ha respectively. Therefore, 22% of the total mapped Flats and Broad Plains broad floristic formation occurs within the survey area, and 6% occurs within the survey area exclusion zone.

In addition, the Flats and Broad Plain vegetation types 3, 4, 10 and 30 occupy 34,502, 21,019, 18,279 and 2,493 ha of the total extent of mapped vegetation respectively. Based on this, vegetation types 3, 4, 10 and 30 occurring in the survey area contain 26%, 27%, 0.3% and 1% of the total mapped area for these vegetation types respectively. Furthermore, vegetation types 3, 4, 10 and 30 occurring in the survey area exclusion zone contain 12%, 1.3%, 0.1% and 0% of the total extent of area mapped for these vegetation types respectively (Table 8).

Vegetation types 3, 4, 10 and 30 occurring within the survey area exclusion zone contain 45%, 5%, 65% and 0% of these vegetation types mapped within the survey area (Table 8).

Vegetation types 3, 4 and 10 are associated with Mulga (*Acacia aneura*) and sheet flow and cover a total of 33% of the survey area.

4.5.4 Fringes of Samphire Flats

The Fringes of Samphire Flats broad floristic formation, which is comprised of vegetation types 13, 22, 26, 31, 32, 33, 34 and 35, occupy 33,149 ha in total. Furthermore, this broad floristic formations covers 15,571 and 7,722 ha within the survey area and within the survey area exclusion zone respectively. Therefore, 47% of the total mapped Fringes of Samphire Flats broad floristic formation occurs within the survey area, and 23% occurs within the survey area exclusion zone.

In addition, the Fringes of Samphire Flats vegetation types 13, 22, 26, 31, 32, 33, 34 and 35 occupy 5,834, 7,588, 17,342, 3,555, 1526, 206, 208 and 171 ha of the total extent of mapped vegetation respectively. Based on this, vegetation types 13, 22, 26, 31, 32, 33, 34 and 35 occurring in the survey area contain 61%, 29%, 24%, 100%, 100%, 100% and 100% of the total mapped area for these vegetation types respectively.

Vegetation types 13, 22, 26, 31, 32, 34 and 35 are considered to be partially groundwater dependent (see section 4.2.2) and cover a total of 32% of the survey area. None of the vegetation types occur outside of the exclusion zone area within the survey area (Table 8).

4.6 POTENTIAL IMPACTS TO VEGETATION

The key areas where potential impacts may occur with regards to the survey area are:

- the locally and nationally restricted Samphire Flats (vegetation types 13, 22, 26, 31, 32, 34 and 35) as a result of disturbances to the ecology of the groundwater and sheet flow dependent vegetation types associated with the Fortescue Marshes;
- the Mulga vegetation types 3, 4, and 10 due to potential disturbances to sheet flow as a result of the establishment of linear rail, access road and other infrastructure;
- near the interface of vegetation type 1 and Samphire vegetation types 13, 22, 26, 31, 32, 34 and 35 as a result of the effect of drawdown impacting on groundwater dependent Samphire vegetation and species *Eucalyptus victrix* and *Eucalyptus camaldulensis*; and
- the Priority Flora recorded in vegetation types 1, 2, 3, 4, 9, 10, 17, 22, 25 and 26 during previous flora and vegetation assessments of the survey area.

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FIGURES

600000
700000
800000
900000
7600000
7500000
7400000

Newman
Railroad
Railway
Wittenoom
Karijini
National Park
Hamersley
Iron
Railway
Tom Price
Yandi 2
Yandi
Karijini
National Park
Great
Northern
Highway
Paraburdoo
West Angelas
Mine
Mt. Whaleback
Newman

Christmas Creek Survey Area

Location Map

Indian
Ocean
Broome
Port Hedland
Project Area
Western Australia
Geraldton
Perth

N

0 10 20 30 40 50
Kilometres

CLIENT
Fortescue Metals Group Limited

AUTHOR:
L. Trotter

DRAWN
S. Rho

SCALE
1:1,000,000 @ A3

JOB NO.
10.112

DATE
31-08-2010

PROJECTION
GDA 94 MGA 50

Regional Location

Christmas Creek Flora and Vegetation Assessment

FIGURE 1

770000
780000
790000
800000
7520000
7510000

Legend

- Christmas Creek Survey Area
- ENV Australia Survey and Mapping Area (2010)
- Mattiske Survey and Mapping Area (2006)

N

0 1 2 3 4 5
Kilometres

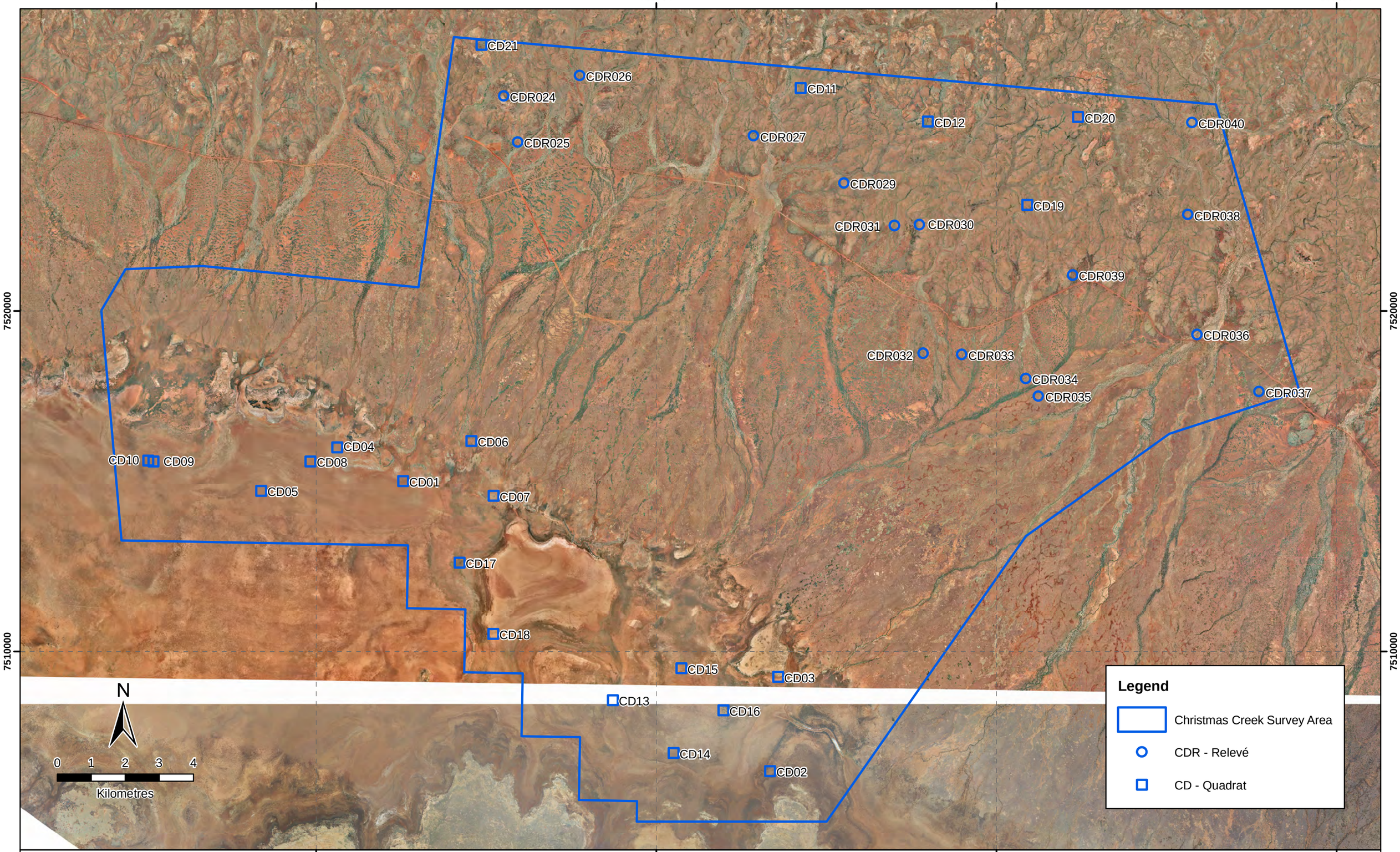
env Australia

CLIENT	Fortescue Metals Group Limited
JOB NO.	10.112
AUTHOR:	L. Trotter
DRAWN	S. Rho
DATE	31-08-2010
SCALE	1:100,000@ A3
PROJECTION	GDA 94 MGA 50

Christmas Creek Survey Area and Previous Surveys

Christmas Creek Flora and Vegetation Assessment

FIGURE **3**



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L. Trotter	S. Rho	10.112
SCALE	PROJECTION	DATE
1:100,000@ A3	GDA 94 MGA 50	01-09-2010

env Australia

Flora Survey Quadrat and Relevé Locations Christmas Creek Survey Area

Christmas Creek Flora and Vegetation Assessment

FIGURE 4

760000 770000 780000 790000 800000 810000

7530000 7520000 7510000 7500000

1:2,000

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1:1,000

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1:1,000

N

0 1 2 3 4 5 6

Kilometres

Legend

Christmas Creek Survey Area

ENV Australia 2010

- *Eremophila spongiocarpa* (P1)
- *Atriplex flabelliformis* (P3)
- *Tecticornia* sp. Roy Hill (H. Pringle 62) (P3)
- *Tecticornia* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) (P1)
- *Tecticornia* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) (P3)
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)

Biota 2005

- *Goodenia nuda* (P4)
- *Themeda* sp. Hamersley Station (M.E.Trudgen 11431) (P3)

Mattiske 2006

- *Eremophila spongiocarpa* (P1)

Fortescue Metals Group Database 2010

- *Goodenia nuda* (P4)
- *Phyllanthus aridus* (P4)
- *Rhagodia* sp. Hamersley (M. Trudgen 17794)
- *Rostellularia adscendens* var. *latifolia* (P3)

760000 770000 780000 790000 800000 810000

CLIENT
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DRAWN: S. Rho
JOB NO. 10.112
SCALE 1:150,000 @ A3
PROJECTION GDA 94 MGA 50
DATE 01-09-2010

env Australia

Location of Priority Flora

Christmas Creek Flora and Vegetation Assessment

FIGURE 5

760000 770000 780000 790000 800000 810000

7530000 7520000 7510000 7500000

8.03 8.07 8.11 8.15

8.01 8.04 8.08 8.12 8.18

8.02 8.05 8.09 8.13 8.17

8.06 8.1 8.14

Legend

Map Sheet

Christmas Creek Survey Area

N

0 2 4 6

Kilometres

760000 770000 780000 790000 800000 810000

CLIENT	**JOB NO.**		
Fortescue Metals Group Limited	10.112		
AUTHOR:	**DRAWN**	**DATE**	
L. Trotter	S. Rho	31-08-2010	
SCALE		**PROJECTION**	
1:150,000 @ A3		GDA 94 MGA 50	

env Australia

Vegetation Map Sheet Overview

Christmas Creek Flora and Vegetation Assessment

FIGURE 6

Legend

Creekline and Drainage Lines

1 - Open Woodland of *Eucalyptus victrix, Eucalyptus camaldulensis* with pockets of *Acacia coriacea* subsp. *pendens* over *Grevillea wickhamii* subsp. *aprica, Petalostylis labicheoides, Acacia tumida* over *Triodia longiceps, Chrysopogon fallax, Themeda triandra* and *Aristida* species.

2 - Low Woodland to Low Open Forest of *Acacia aneura* var. *aneura, Acacia citrinoviridis, Acacia pruinocarpa* over *Acacia tetragonophylla* and *Psydrax latifolia* over *Chrysopogon fallax, Stemodia viscosa, Blumea tenella, Themeda triandra* and species of *Triodia* and*Aristida* .

8 - Closed Scrub to Tall Shrubland of *Acacia pruinocarpa, Acacia tumida, Acacia ancistrocarpa, Acacia maitlandii, Acacia kempeana, Acacia tetragonophylla* with occasional *Eucalyptus gamophylla* and *Corymbia deserticola* over *Triodia epactia, Themeda triandra* and *Aristida* species.

Flats and Broad Plains

3 - Low Woodland to Low Open Forest of *Acacia aneura* var. *aneura, Acacia pruinocarpa, Acacia tetragonophylla, Acacia tenuissima, Grevillea wickhamii* subsp. *aprica, Psydrax latifolia* over *Dodonaea petiolaris* and species of *Triodia* and *Aristida*

4 - Low Open Woodland of *Acacia aneura* var. *aneura, Acacia pruinocarpa, Acacia xiphophylla, Acacia victoriae* over *Acacia tetragonophylla, Psydrax latifolia* and *Psydrax suaveolens* over *Ptilotus obovatus* and mixed species of *Maireana* and *Sclerolaena*.

10 - Low Open Woodland of *Acacia xiphophylla, Acacia victoriae, Acacia aneura* var. *aneura* over *Acacia tetragonophylla, Ptilotus obovatus, Senna* species and mixed species of *Maireana* and *Sclerolaena*.

30 - High open Shrubland of *Acacia synchronicia* with *Senna glaucifolia* over *Aristida* sp.

Ranges, Hills and Hillslopes

16 - Hummock Grassland of *Triodia basedowii* with pockets of *Triodia epactia* and *Triodia lanigera* with emergent patches of *Eucalyptus leucophloia, Corymbia deserticola* over *Acacia ancistrocarpa, Acacia hilliana, Acacia acradenia, Acacia pyrifolia, Hakea lorea* subsp. *lorea* over *Goodenia stobbsiana* and mixed *Senna* species.

17 - Hummock Grassland of *Triodia basedowii* with pockets of *Triodia epactia* and *Triodia lanigera* with emergent patches of *Eucalyptus leucophloia, Corymbia deserticola* over *Acacia ancistrocarpa, Acacia pyrifolia, Hakea lorea* subsp. *lorea* over *Goodenia stobbsiana* and mixed *Senna* and *Ptilotus* species.

Legend

Fringes of Samphine Flats

13 - Low Halophytic Shrubland of *Tecticornia auriculata, T. indica* subsp. *ielostachya, T. halocnemoides* subsp. *tenuis* with patches of *Frankenia* species.

22 - Low Shrubland of *Tecticornia indica* subsp. *bidens* and *Nicotiana occidentalis* over grasses with occasional stands of *Sesbania cannabina* and *Cullen cinereum*.

26 - Low Shrubland of *Muellerolimon salicorniaceum* and *Tecticornia indica* subsp. *bidens*

31 - Low Shrubland of*Tecticornia indica* subsp. *bidens, T. auriculata* and *T. indica* subsp. *ielostachya* with *T.* sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063), *T.*sp. Denny's Crossing, *T.* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) and *T.*sp. Roy Hill (H. Pringle 62).

32 - Low Shrubland of *Muellerolimon salicorniaceum* over *Tecticornia indica* subsp. *bidens* and *T. indica* subsp. *ielostachya* with *T.*sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) (K.A. Shepherd & T. Colmer et al. KS 1063) and *T.*sp. Denny's Crossing (K.A. Shepherd & J. English KS 552) with *Euphorbia* sp.

33 - Low Shrubland of *Tecticornia indica* subsp.*bidens* and *Scaevola spinescens* with *Acacia synchronicia*.

34 - Low Shrubland of *Muellerolimon salicorniaceum* over *Tecticornia indica* subsp. *bidens* and *T.auriculata* with *Heliotropium curassavicum* and *Atriplex flabelliformis*.

35 - Low Shrubland of *Muellerolimon salicorniaceum* over *Tecticornia auriculata, T.*sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) *T.*sp. Denny's Crossing (K.A. Shepherd & J. English KS 552) and *T.*sp. Roy Hill (H. Pringle 62). with *Euphorbia* sp.

Other

36 - Bare Ground

env Australia

CLIENT	JOB NO.
Fortescue Metals Group Limited	10.112
AUTHOR: / DRAWN / DATE	
L.Trotter / S. Rho / 01-09-2010	
SCALE / PROJECTION	
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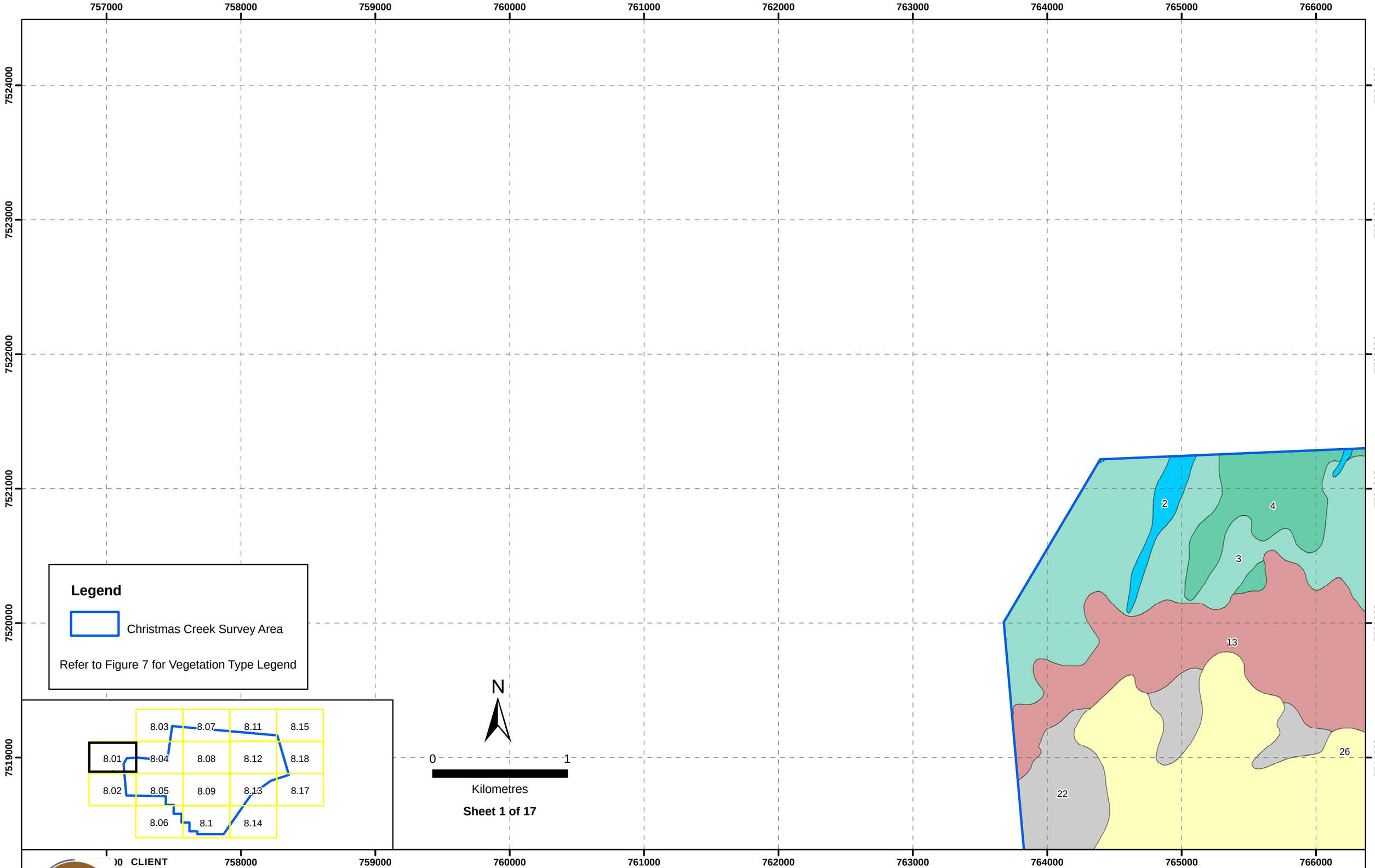
Vegetation Legend

Christmas Creek Flora and Vegetation Assessment

FIGURE 7



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L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	01-09-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.01**

757000 758000 759000 760000 761000 762000 763000 764000 765000 766000

7517000 7516000 7515000 7514000 7513000 7512000

22 26 32 36 31

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

8.01 8.02 8.03 8.04 8.05 8.06 8.07 8.08 8.09 8.1 8.11 8.12 8.13 8.14 8.15 8.18 8.17

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Kilometres

Sheet 2 of 17

CLIENT
Fortescue Metals Group Limited

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JOB NO. 10.112
SCALE 1:25,000 @ A3
PROJECTION GDA 94 MGA 50
DATE 01-09-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.02**

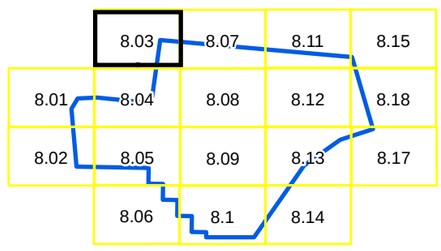
767000 768000 769000 770000 771000 772000 773000 774000 775000 776000

7531000
7530000
7529000
7528000
7527000
7526000

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend



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Kilometres

Sheet 3 of 17

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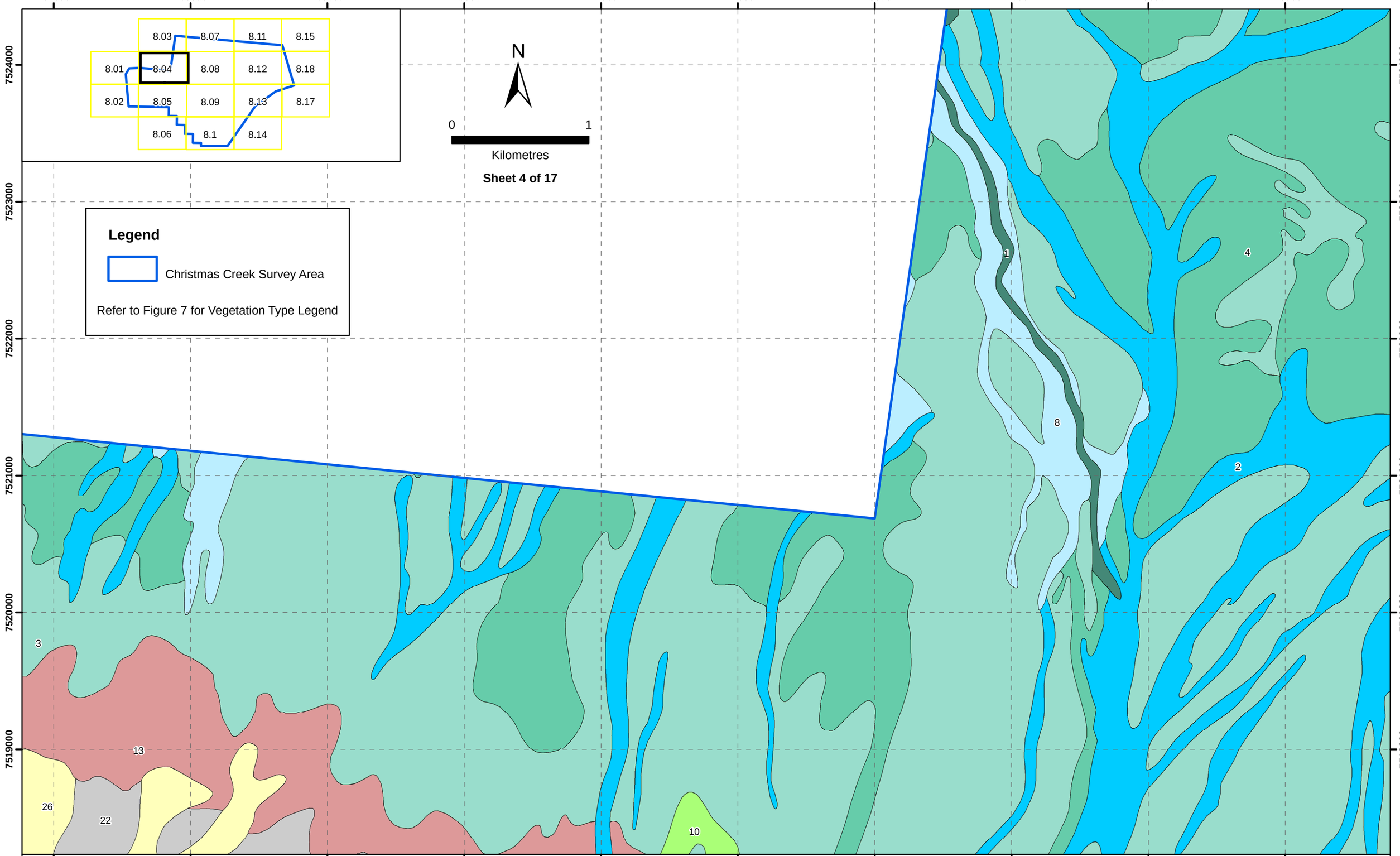
CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.03**



CLIENT 768000 769000

Fortescue Metals Group Limited

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L. Trotter	S. Rho	10.112
SCALE	PROJECTION	DATE
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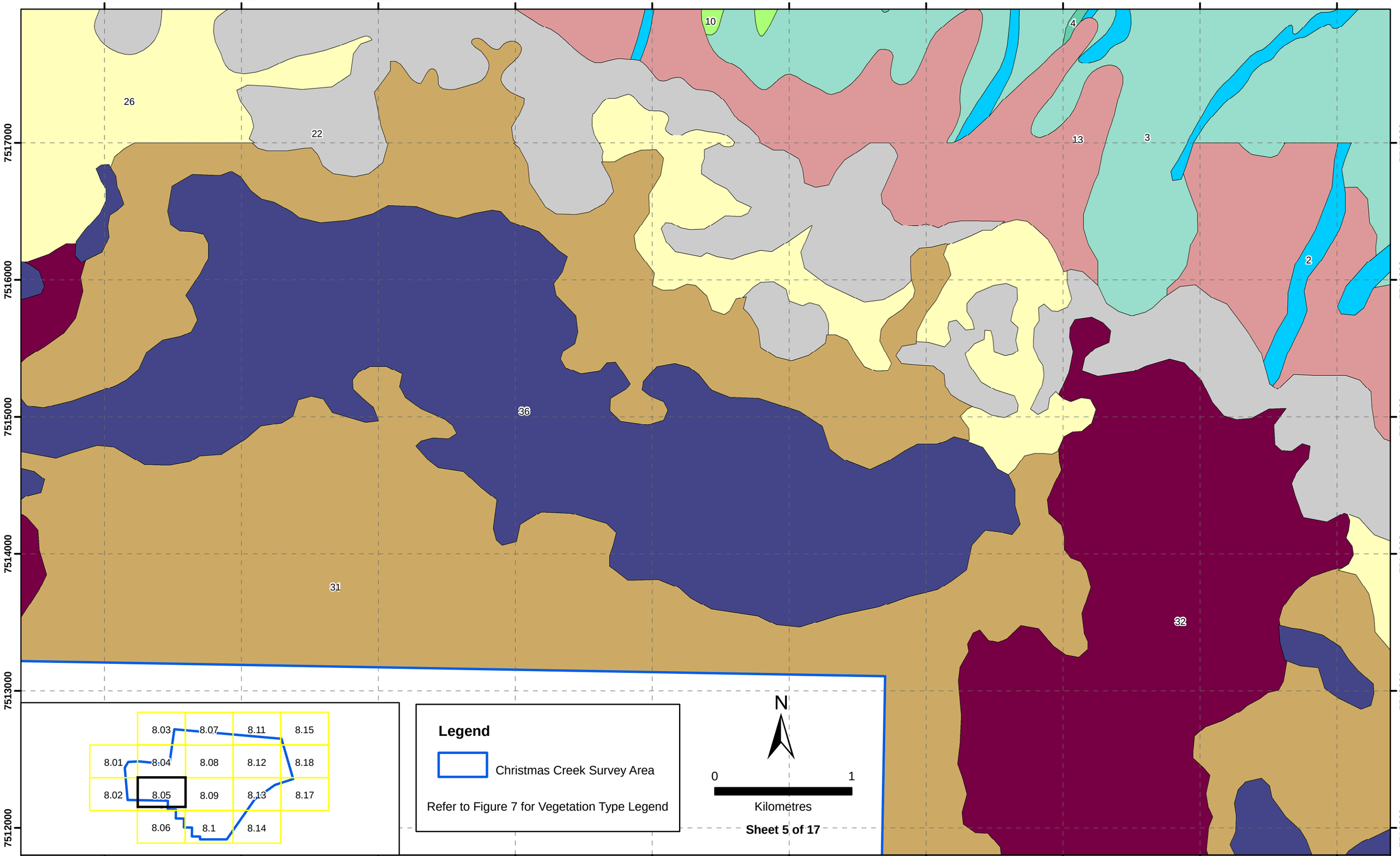
env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.04**



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L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	01-09-2010

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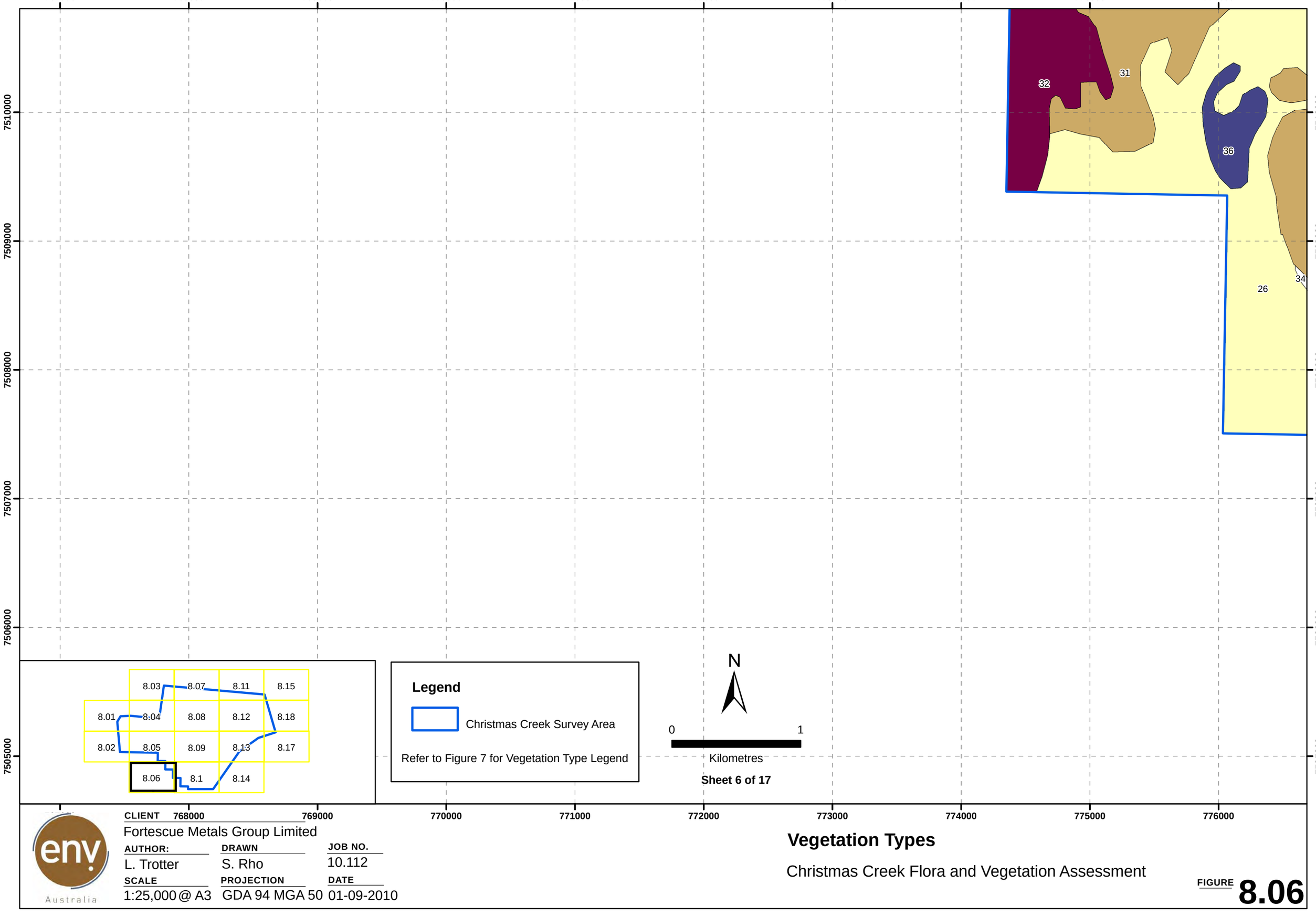
Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.05**



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DRAWN: S. Rho
JOB NO. 10.112
SCALE 1:25,000 @ A3
PROJECTION GDA 94 MGA 50
DATE 01-09-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.06**

777000 778000 779000 780000 781000 782000 783000 784000 785000 786000

7531000 7530000 7529000 7528000 7527000 7526000

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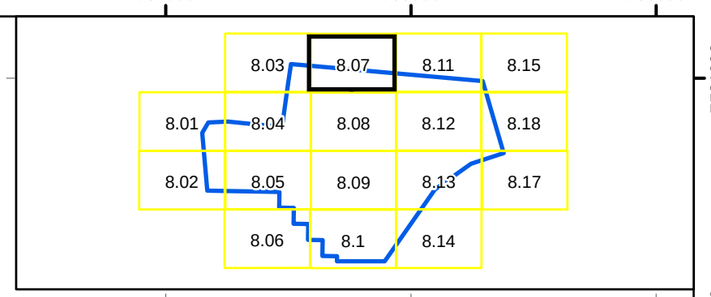
Kilometres

Sheet 7 of 17



Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

17

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777000 778000 779000 780000 781000 782000 783000 784000 785000 786000

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SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

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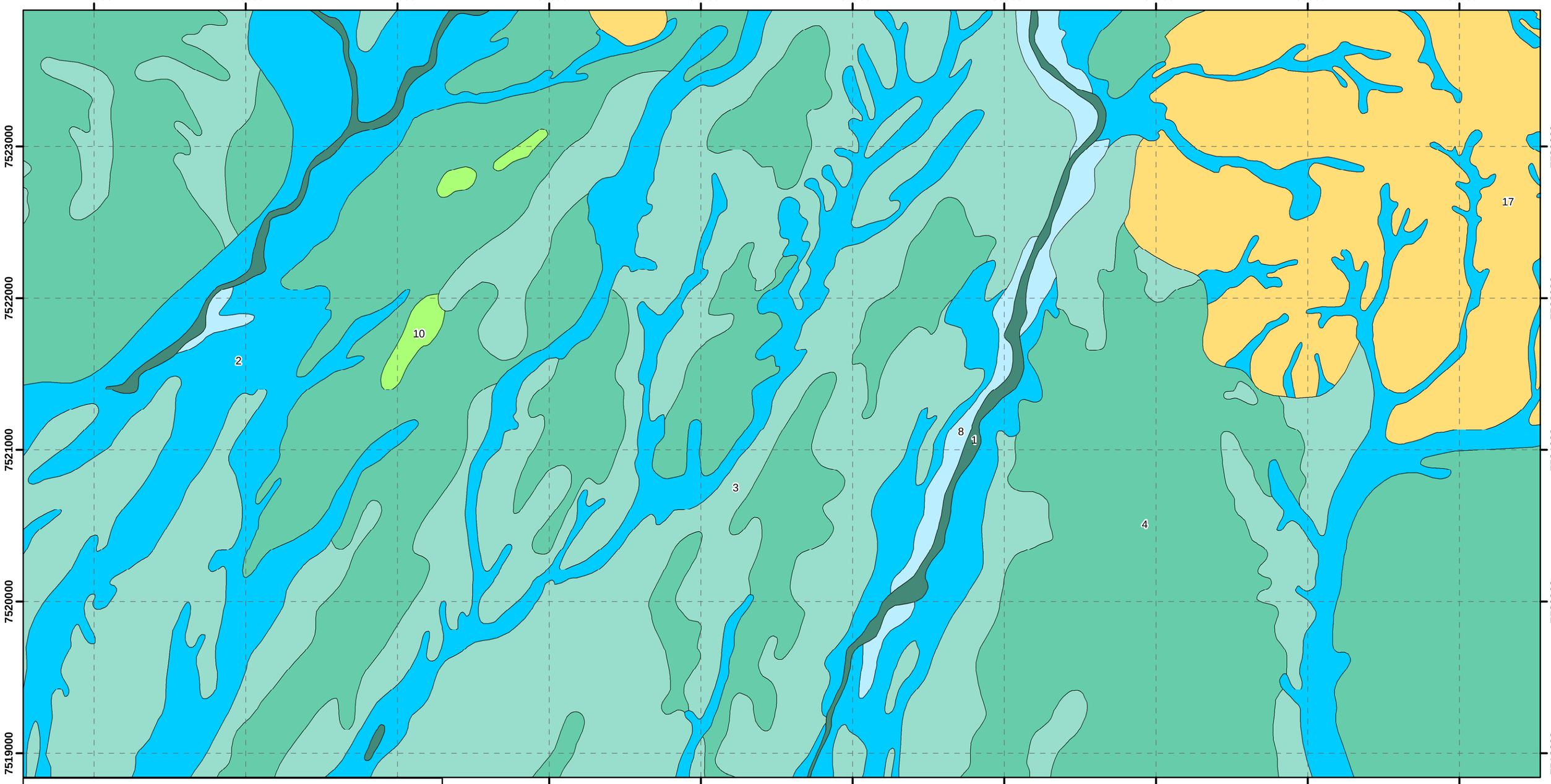
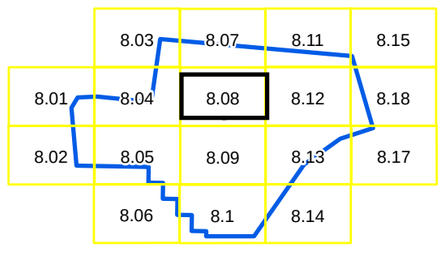
Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.07**





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Kilometres

Sheet 8 of 17

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

env Australia

CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	01-09-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE 8.08

777000 778000 779000 780000 781000 782000 783000 784000 785000 786000

7517000 7516000 7515000 7514000 7513000 7512000

1 4 8 3 2 33 13 22 26

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

0 1

Kilometres

Sheet 9 of 17

CLIENT
Fortescue Metals Group Limited

AUTHOR: L. Trotter
DRAWN: S. Rho
JOB NO. 10.112
SCALE 1:25,000 @ A3
PROJECTION GDA 94 MGA 50
DATE 14-10-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.09**

777000 778000 779000 780000 781000 782000 783000 784000 785000 786000

7510000 7509000 7508000 7507000 7506000 7505000

22 13 2 32 34 31 35 36 26 1

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

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Kilometres

Sheet 10 of 17

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

777000 778000 779000 780000 781000 782000 783000 784000 785000 786000

Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	01-09-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE 8.10

787000 788000 789000 790000 791000 792000 793000 794000 795000 796000

7531000
7530000
7529000
7528000
7527000
7526000

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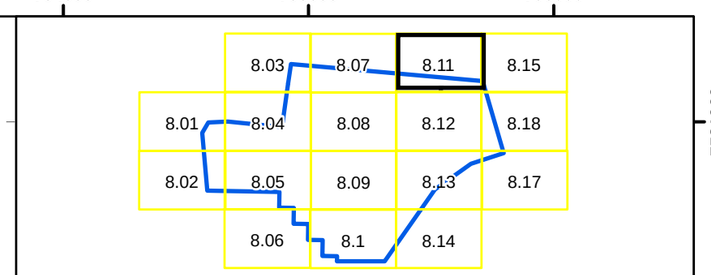
Kilometres

Sheet 11 of 17



Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

17
2
1
Burnt

CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	01-09-2010

env Australia

Vegetation Types

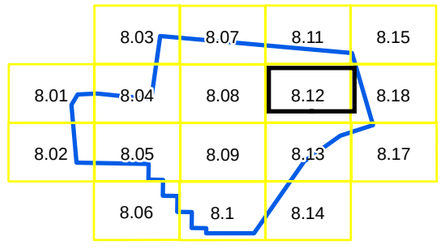
Christmas Creek Flora and Vegetation Assessment

FIGURE **8.11**

787000 788000 789000 790000 791000 792000 793000 794000 795000 796000

7524000 7523000 7522000 7521000 7520000

17 1 Burnt Infrastructure 2 3 4



790000 791000 792000 793000 794000 795000 796000

N

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Kilometres

Sheet 12 of 17

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	01-09-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE 8.12

787000 788000 789000 790000 791000 792000 793000 794000 795000 796000

7518000 7517000 7516000 7515000 7514000 7513000

4 1 2 30 3 8 13

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

0 1

Kilometres

Sheet 13 of 17

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

env Australia

CLIENT
Fortescue Metals Group Limited

AUTHOR: L. Trotter
DRAWN: S. Rho
JOB NO. 10.112
SCALE 1:25,000 @ A3
PROJECTION GDA 94 MGA 50
DATE 01-09-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.13**

787000 788000 789000 790000 791000 792000 793000 794000 795000 796000

7510000 7509000 7508000 7507000 7506000 7505000

3
13
4
2
26
10
22

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

0 1

Kilometres

Sheet 14 of 17

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

787000 788000 789000 790000 791000 792000 793000 794000 795000 796000

CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	01-09-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.14**

797000 798000 799000 800000 801000 802000 803000 804000 805000 806000

7531000
7530000
7529000
7528000
7527000
7526000

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

0 1

Kilometres

Sheet 15 of 17

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

1
17
2

CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.15**

797000 798000 799000 800000 801000 802000 803000 804000 805000 806000

7524000
7523000
7522000
7521000
7520000
7519000

Burnt

17
1
2
4
30

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

0 1

Kilometres

Sheet 16 of 17

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

env Australia

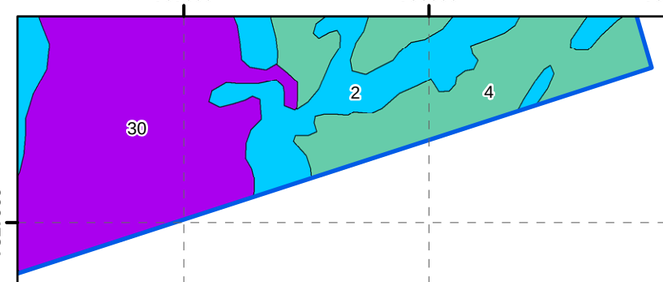
CLIENT
Fortescue Metals Group Limited

AUTHOR: L. Trotter
DRAWN: S. Rho
JOB NO. 10.112
SCALE 1:25,000 @ A3
PROJECTION GDA 94 MGA 50
DATE 01-09-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **8.16**



797000 798000 799000 800000 801000 802000 803000 804000 805000 806000

7517000 7516000 7515000 7514000 7513000 7512000

Legend

Christmas Creek Survey Area

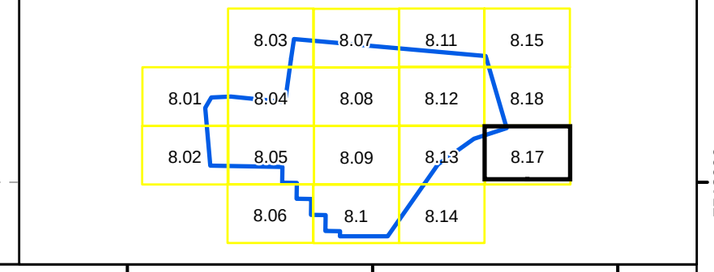
Refer to Figure 7 for Vegetation Type Legend

N

0 1

Kilometres

Sheet 17 of 17



CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	01-09-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE 8.17

757000 758000 759000 760000 761000 762000 763000 764000 765000 766000

7524000 7523000 7522000 7521000 7520000 7519000

2 2 4 2 4 3 4 13 22 22 26 22

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

N

0 1

Kilometres

Sheet 1 of 17

757000 758000 759000 760000 761000 762000 763000 764000 765000 766000

env Australia

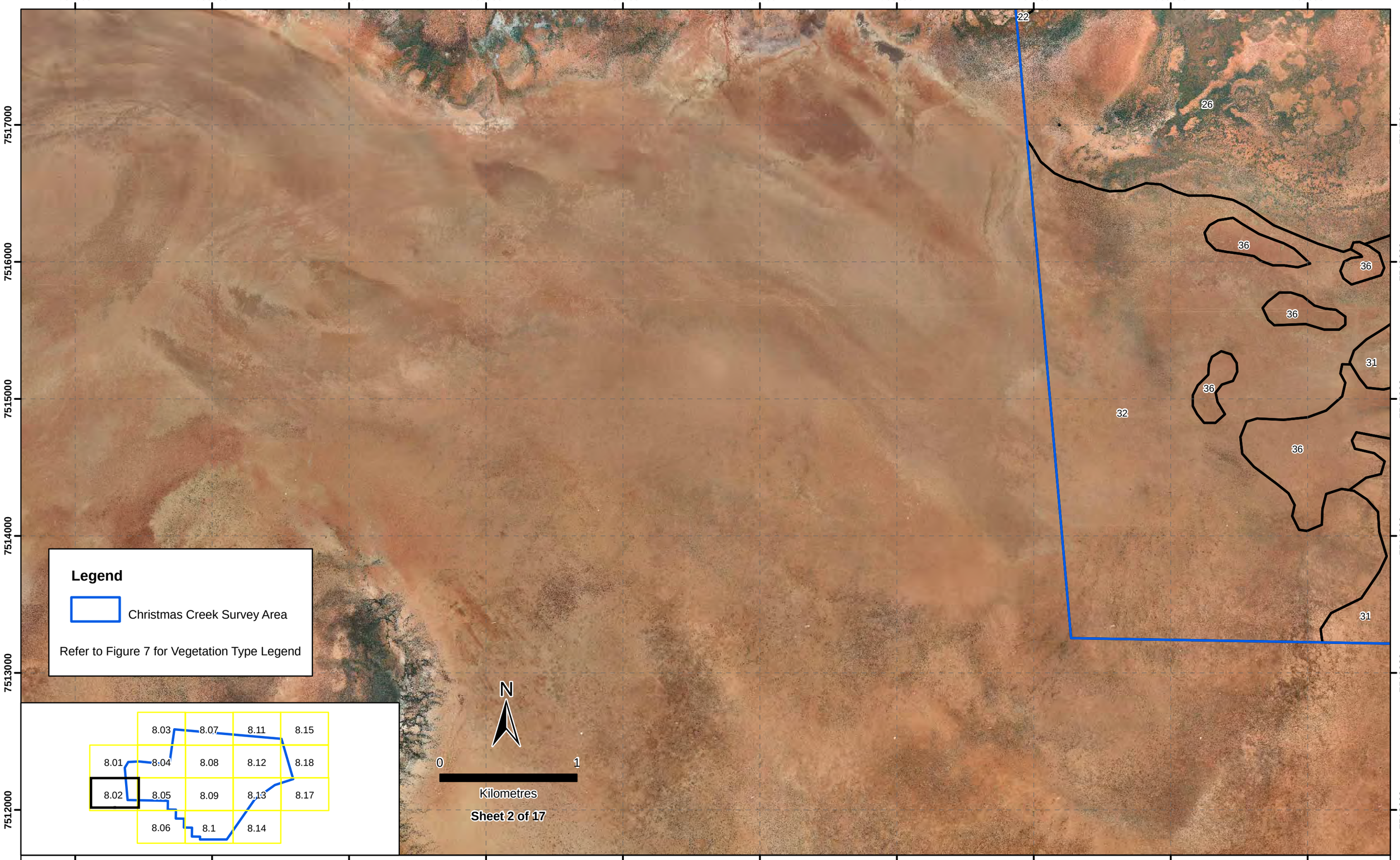
CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE 9.01



CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.02**

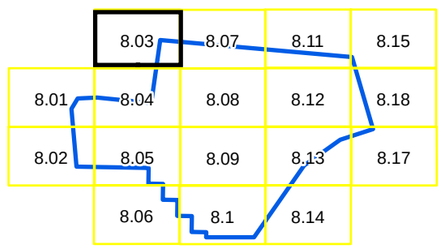
767000 768000 769000 770000 771000 772000 773000 774000 775000 776000

7531000
7530000
7529000
7528000
7527000
7526000

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend



N

0 1

Kilometres

Sheet 3 of 17

16
2
1
17
2
1
2
2
17
2
17
2
3
4
4
2
4
2

767000 768000 769000 770000 771000 772000 773000 774000 775000 776000

CLIENT
Fortescue Metals Group Limited

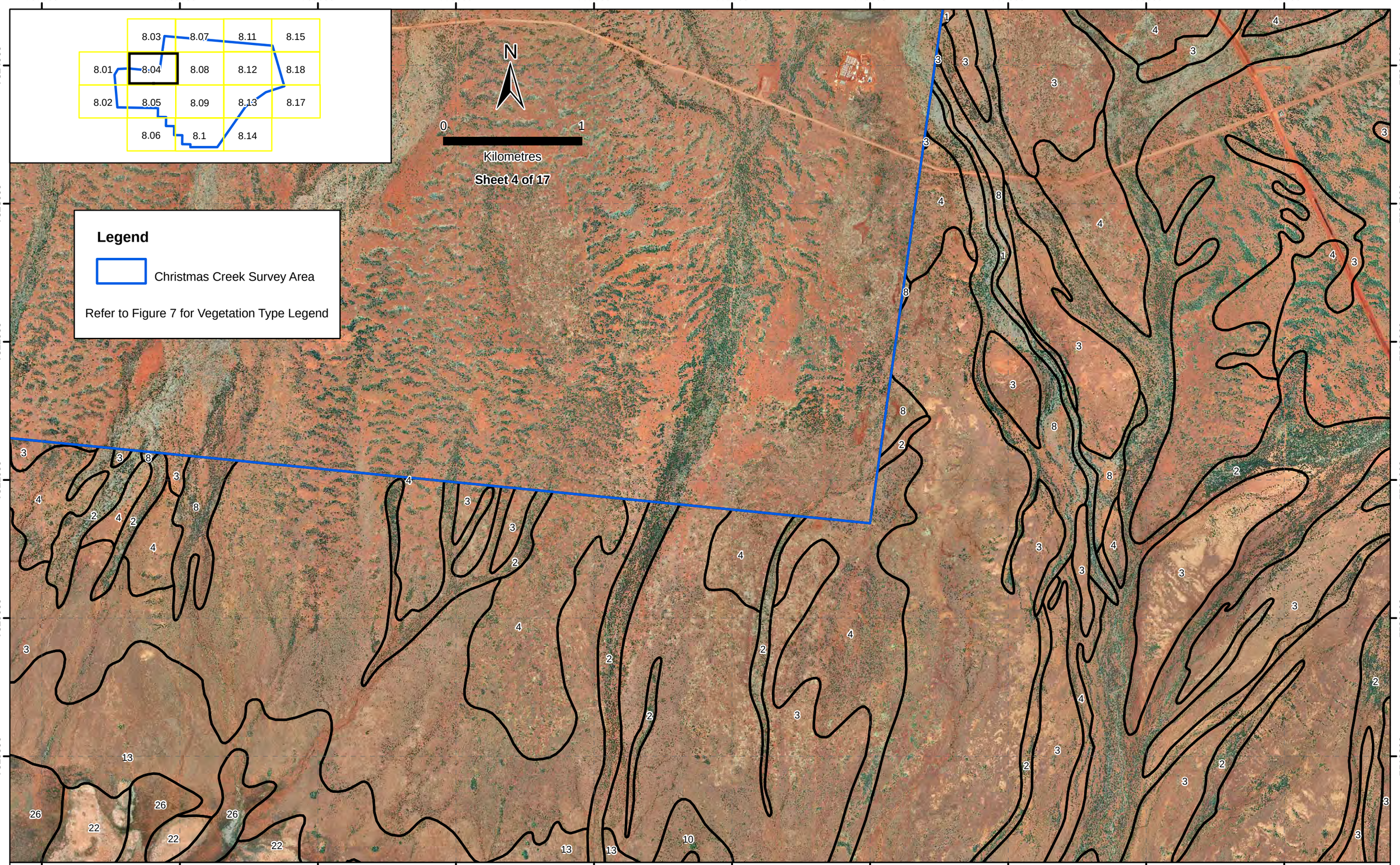
AUTHOR: L. Trotter
DRAWN: S. Rho
JOB NO. 10.112
SCALE 1:25,000 @ A3
PROJECTION GDA 94 MGA 50
DATE 14-10-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.03**



CLIENT 768000

Fortescue Metals Group Limited

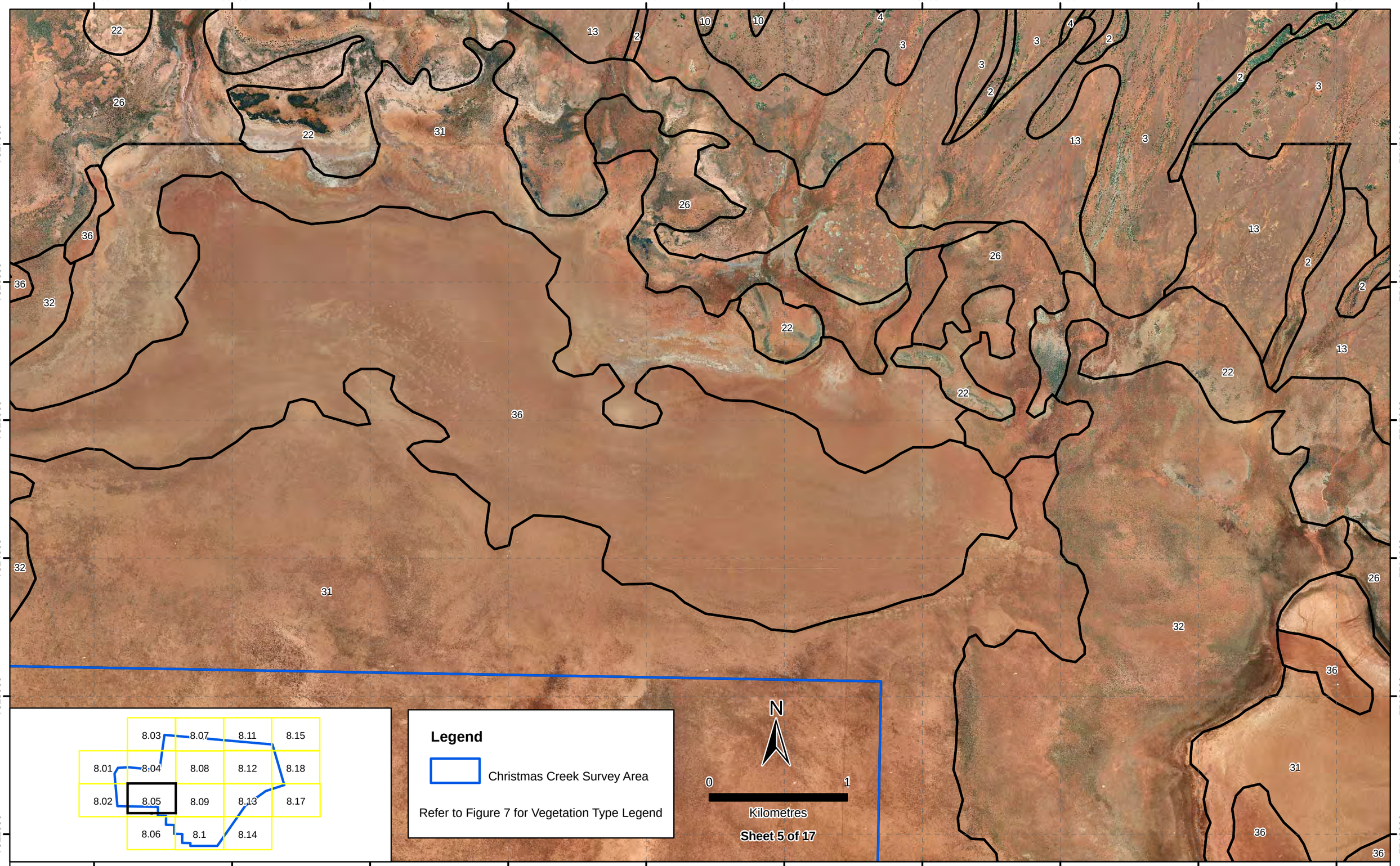
AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.04**



CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.05**

767000 768000 769000 770000 771000 772000 773000 774000 775000 776000

7510000 7509000 7508000 7507000 7506000 7505000

32 31 31 36 31 34 26

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

0 1

Kilometres

Sheet 6 of 17

768000 769000 770000 771000 772000 773000 774000 775000 776000

CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.06**

777000 778000 779000 780000 781000 782000 783000 784000 785000 786000

7531000 7530000 7529000 7528000 7527000 7526000

N

0 1

Kilometres

Sheet 7 of 17

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

Infrastructure

777000 778000 779000 780000 781000 782000 783000 784000 785000 786000

CLIENT
Fortescue Metals Group Limited

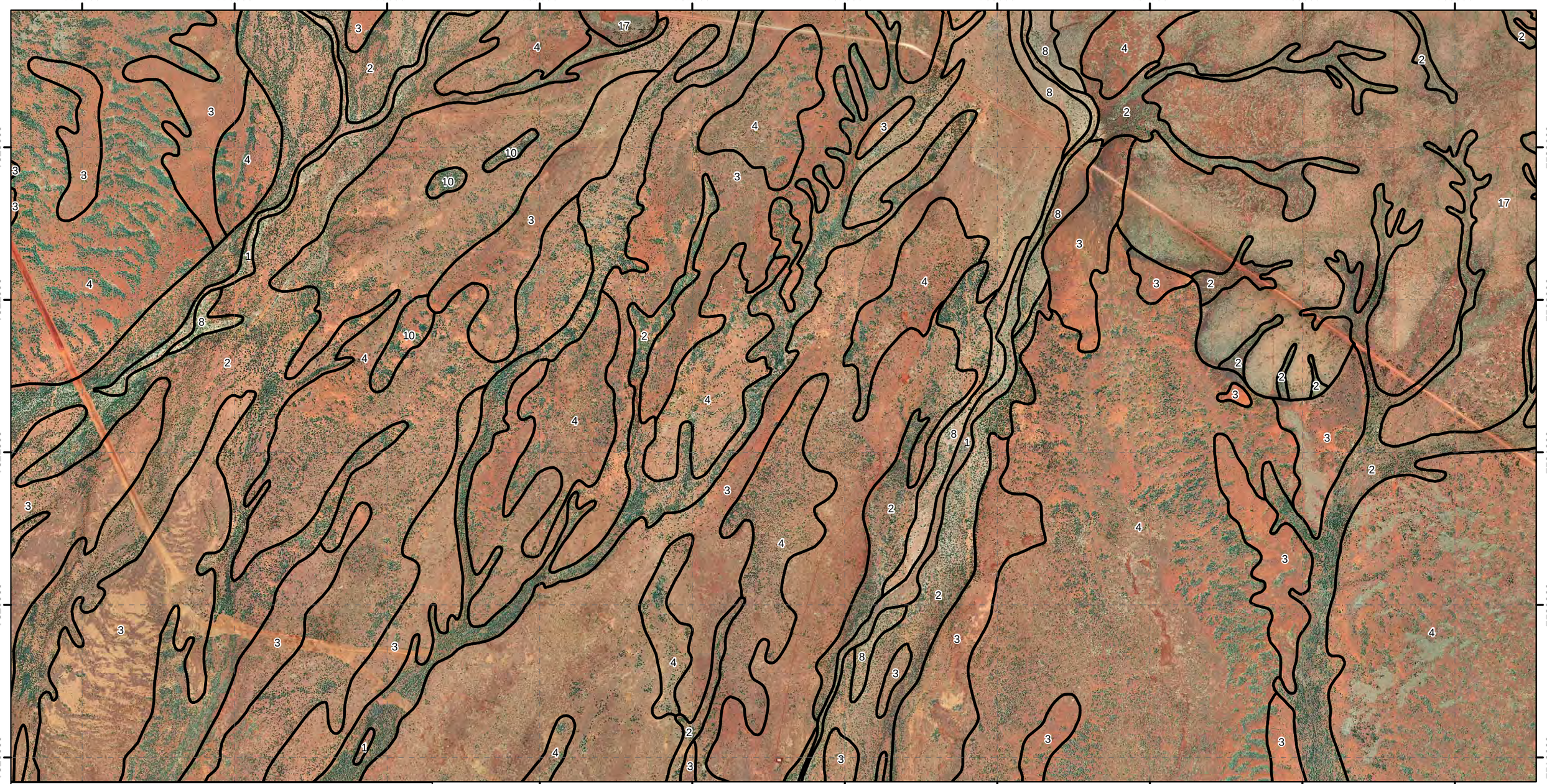
AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	PROJECTION	DATE
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

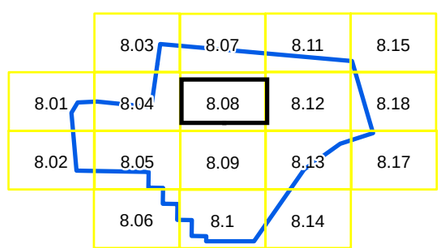
env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.07**





N

0 1

Kilometres

Sheet 8 of 17

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE 9.08

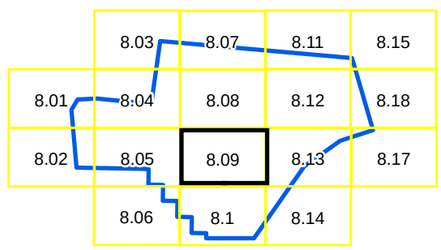
777000 778000 779000 780000 781000 782000 783000 784000 785000 786000

7517000 7516000 7515000 7514000 7513000 7512000

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend



N

0 1

Kilometres

Sheet 9 of 17

CLIENT		
Fortescue Metals Group Limited		
AUTHOR:	**DRAWN**	**JOB NO.**
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE 9.09

777000 778000 779000 780000 781000 782000 783000 784000 785000 786000

7510000 7509000 7508000 7507000 7506000 7505000

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

0 1 Kilometres

Sheet 10 of 17

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

env Australia

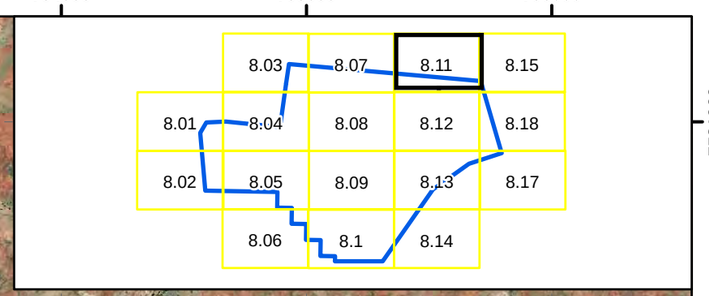
Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.10**

787000 788000 789000 790000 791000 792000 793000 794000 795000 796000

7531000 7530000 7529000 7528000 7527000 7526000



N

0 1

Kilometres

Sheet 11 of 17

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

17 2 1 Burnt

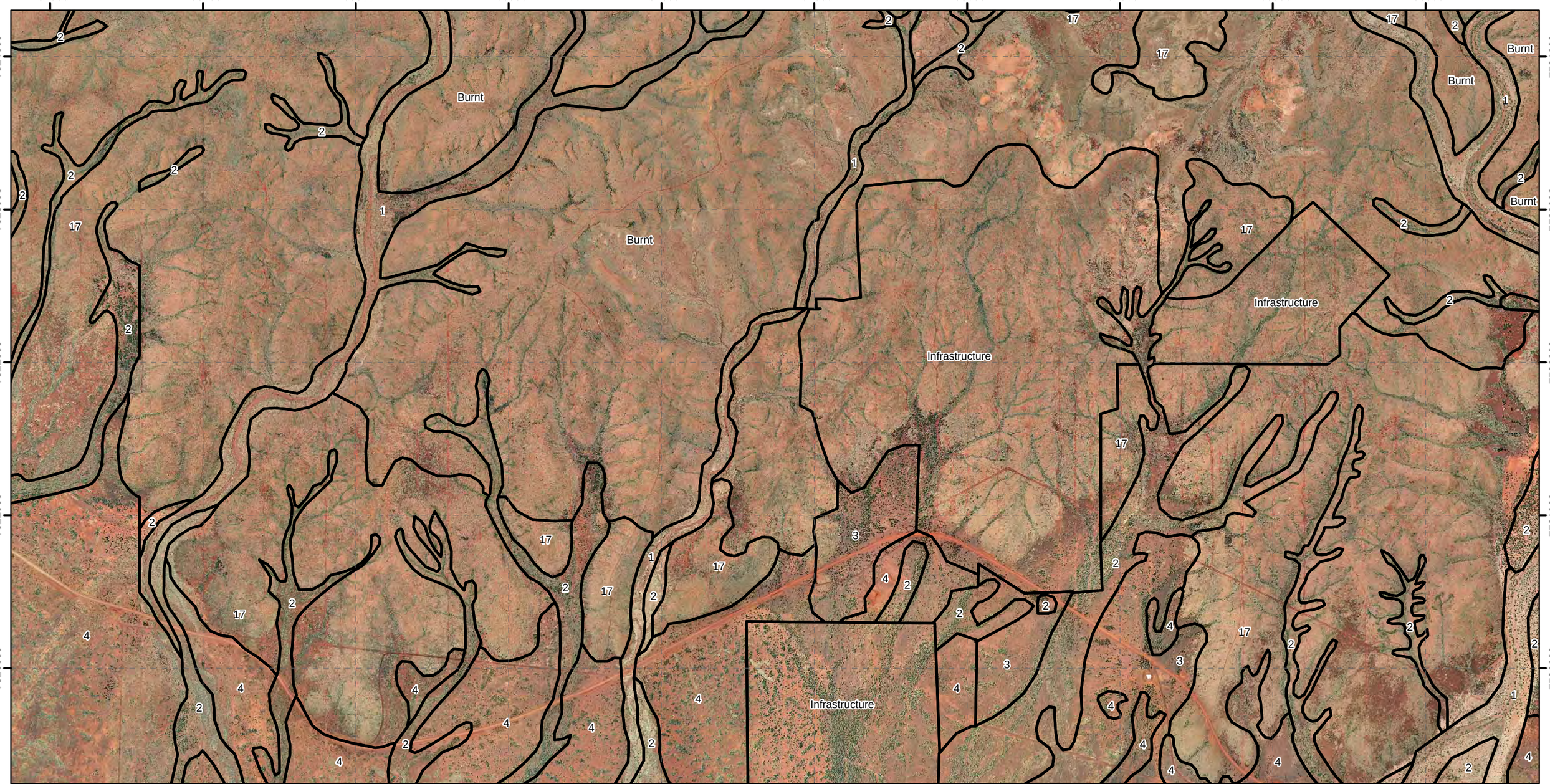
CLIENT			
Fortescue Metals Group Limited			
AUTHOR:	DRAWN	JOB NO.	
L. Trotter	S. Rho	10.112	
SCALE	PROJECTION	DATE	
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010	

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.11**



N

0 1

Kilometres

Sheet 12 of 17

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE 9.12

787000 788000 789000 790000 791000 792000 793000 794000 795000 796000

7518000 7517000 7516000 7515000 7514000 7513000

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

0 1

Kilometres

Sheet 13 of 17

env Australia

CLIENT		
Fortescue Metals Group Limited		
AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	PROJECTION	DATE
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.13**

787000 788000 789000 790000 791000 792000 793000 794000 795000 796000

7510000 7509000 7508000 7507000 7506000 7505000

13 2 13 2 3 13 10 10 4 2 26 13 26 10 22 26

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

0 1

Kilometres

Sheet 14 of 17

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

787000 788000 789000 790000 791000 792000 793000 794000 795000 796000

CONSULTANT

Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

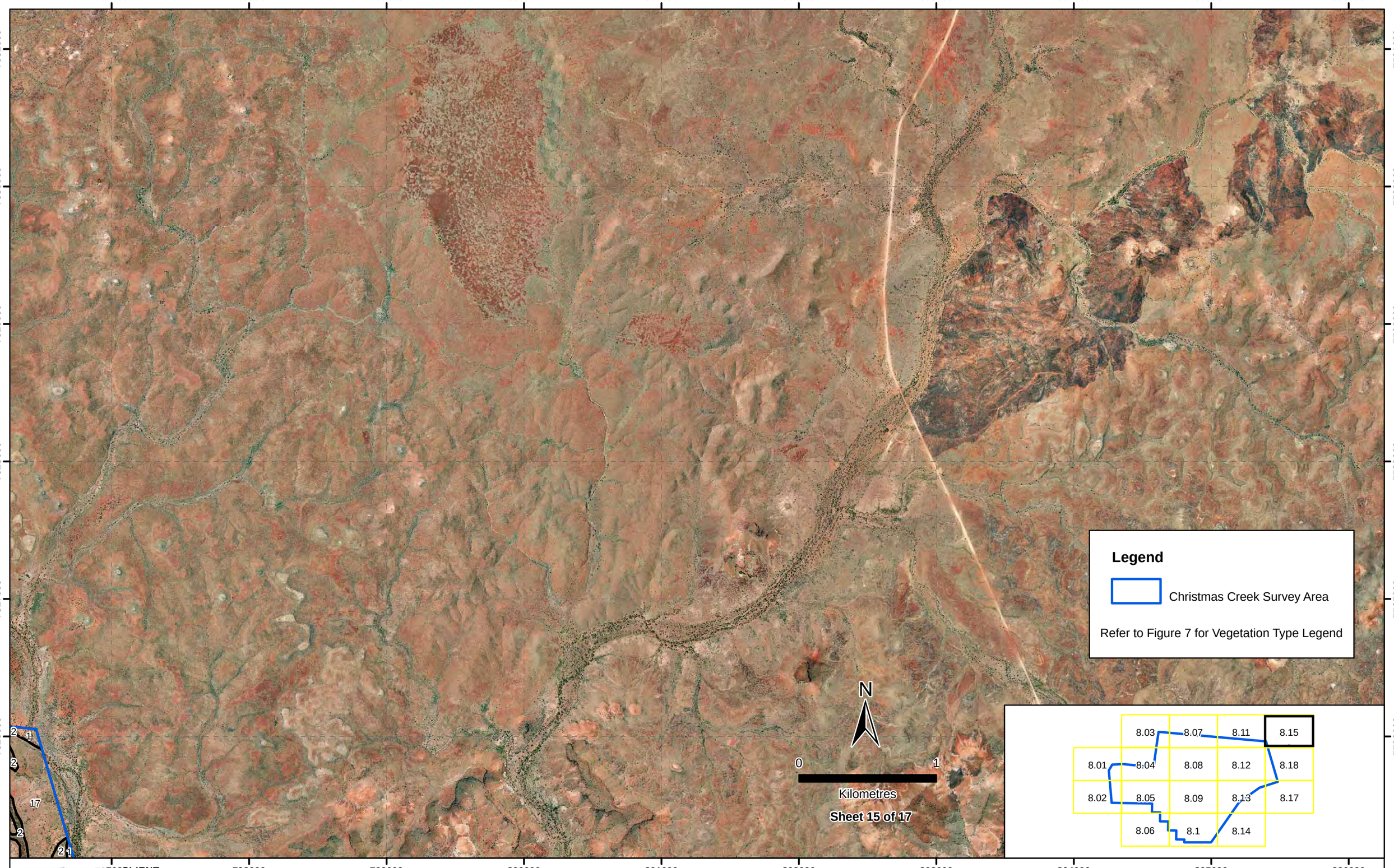
Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.14**

797000 798000 799000 800000 801000 802000 803000 804000 805000 806000

7531000
7530000
7529000
7528000
7527000
7526000



CLIENT
Fortescue Metals Group Limited

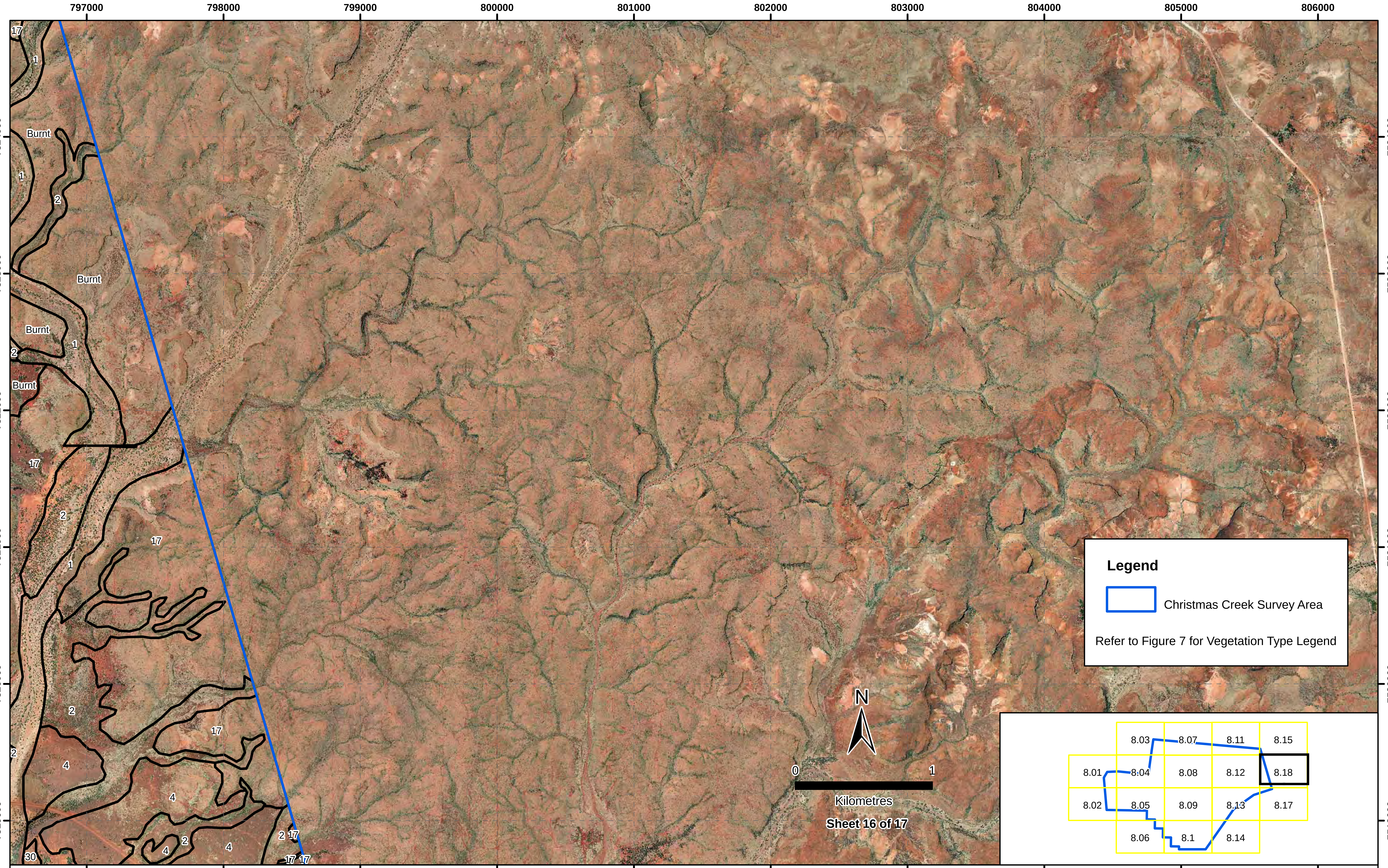
AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	PROJECTION	DATE
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.15**



CLIENT
Fortescue Metals Group Limited

AUTHOR: L. Trotter
DRAWN: S. Rho
JOB NO. 10.112
SCALE: 1:25,000 @ A3
PROJECTION: GDA 94 MGA 50
DATE: 14-10-2010

env Australia

Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.16**

797000 798000 799000 800000 801000 802000 803000 804000 805000 806000

7517000 7516000 7515000 7514000 7513000 7512000

2 2 4 4 2 4 2 30

Legend

Christmas Creek Survey Area

Refer to Figure 7 for Vegetation Type Legend

N

0 1

Kilometres

Sheet 17 of 17

8.03 8.07 8.11 8.15
8.01 8.04 8.08 8.12 8.18
8.02 8.05 8.09 8.13 8.17
8.06 8.1 8.14

CLIENT
Fortescue Metals Group Limited

AUTHOR:	DRAWN	JOB NO.
L. Trotter	S. Rho	10.112
SCALE	**PROJECTION**	**DATE**
1:25,000 @ A3	GDA 94 MGA 50	14-10-2010

env Australia

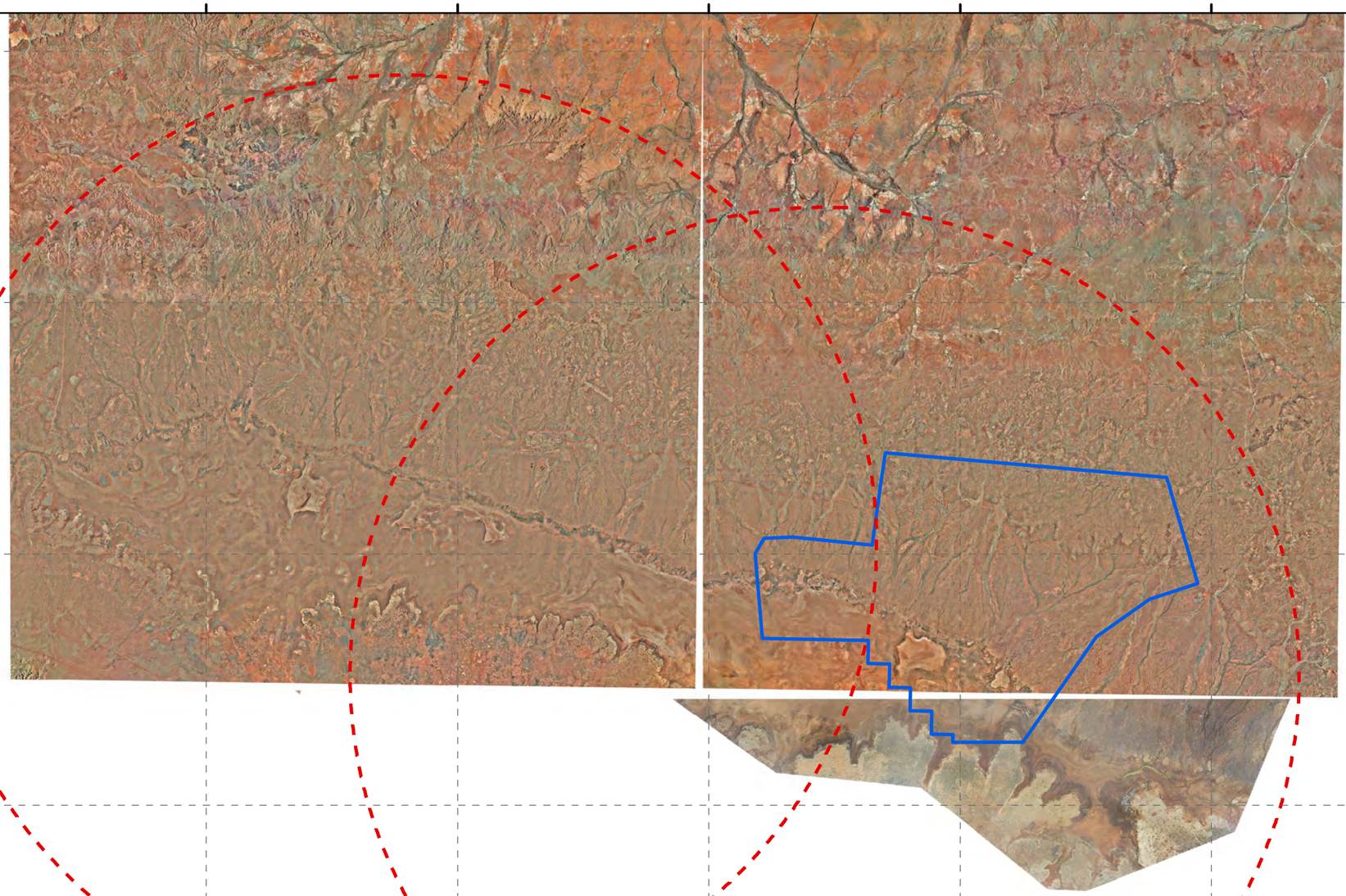
Vegetation Types

Christmas Creek Flora and Vegetation Assessment

FIGURE **9.17**

680000 700000 720000 740000 760000 780000 800000 820000

7560000 7540000 7520000 7500000 7480000



Legend

- Christmas Creek Survey Area
- Fortescue Marsh Priority Ecological Community (Priority 1) Buffer Zone

N

0 5 10 15

Kilometres

CLIENT		JOB NO.	
Fortescue Metals Group Limited		10.112	
AUTHOR:	DRAWN	DATE	
L. Trotter	S. Rho	30-09-2010	
SCALE		PROJECTION	
1:400,000 @ A3		GDA 94 MGA 50	

env Australia

Location of Priority Ecological Communities

Christmas Creek Flora and Vegetation Assessment

FIGURE 10

APPENDIX A

DEFINITION OF DECLARED RARE / PRIORITY / THREATENET FLORA AND SIGNIFICANT FLORA POTENTIALLY OCCURRING IN THE SURVEY AREA

APPENDIX A

DEFINITIONS OF DECLARED RARE / PRIORITY / THREATENED FLORA AND SIGNIFICANT SPECIES POTENTIALLY OCCURRING IN THE PROJECT AREA

A1: Categories of Declared Rare and Priority Flora

Conservation Code	Category
X	**Declared Rare Flora - Presumed Extinct Taxa** Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
R	**Declared Rare Flora - Extant Taxa** "Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such"
P1	**Priority One - Poorly Known Taxa** "Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but urgently need further survey."
P2	**Priority Two - Poorly Known Taxa** "Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but urgently need further survey."
P3	**Priority Three - Poorly Known Taxa** "Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but need further survey."
P4	**Priority Four - Rare Taxa** "Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years."

Source: Department of Environment and Conservation (2010). *Western Australian Flora Conservation Codes*. Department of Environment and Conservation, Perth, Western Australia. Online: http://florabase.calm.wa.gov.au.

A2: Categories of Threatened Flora Species

Category Code	Category
Ex	**Extinct** Taxa which at a particular time if, at the time, there is no reasonable doubt that the last member of the species has died**.**
ExW	**Extinct in the Wild** Taxa which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	**Critically Endangered** Taxa which at a particular time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	**Endangered** Taxa which is not critically endangered and it is facing a very high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
V	**Vulnerable** Taxa which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Source: *Environment Protection and Biodiversity Conservation Act* 1999

A3: Significant Flora Species Potentially Occurring in the Project Area

Species	Code	Description
Lepidium catapycnon	DRF	Woody perennial herb or shrub to 0.3 m high. Found on skeletal soils on hillsides.
Eremophila pilosa	P1	Shrub to 0.8 m high with purple flowers.
Eremophila spongiocarpa	P1	Compact, succulent-leaved shrub, to 1 m high with white flowers. Found on weakly saline alluvial plain on margins of marsh.
Helichrysum oligochaetum	P1	Erect annual, herb to 0.25 m high with yellow flowers. Found on red clay on alluvial plains.
Myriocephalus scalpellus	P1	Semi-erect herb to 0.08 m high. Found in depression on clay flood plains.
Nicotiana heterantha	P1	Decumbent, short-lived annual or perennial herb to 0.5 m high. Forms low spreading colonies with white / cream flowers on seasonally wet black clay flats.
Peplidium sp. Fortescue Marsh (S. van Leeuwen 4865)	P1	Description unavailable.
Tecticornia sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063)	P1	An erect, spreading shrub to 0.6 m with red to green foliage. It is known to occur on samphire flats in association with salt lakes.
Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055)	P1	Low shrub up to 1.5 m. Its fleshy leaves are almost circular in appearance and about 1-2mm in diameter. During drier periods, only the upper two leaves remain on the small branchlets give the appearance of two red balls cupped on the branchlet tips. The flowers are much reduced and not easily observed, but are green to green-yellow. This species favours heavy clays on the margins of salt lakes and salt marshes
Stylidium weeliwolli	P2	Annual herb to 0.25 m high with 4 rod-shaped throat appendages. Flowers are pink and red. Known to occur on edge of watercourses on gritty sandy soil or clay.
Phyllanthus aridus	P3	Erect, much branched shrub to .25 m with cream to green flowers.
Rostellularia adscendens var. latifolia	P3	Herb or shrub to 0.3 m high with blue, purple and violet flowers. Known to occur near creeks and rocky hills with stone soils.
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3	Perennial erect shrub to 1.4 m height with red, pink flowers.
Tecticornia sp. Roy Hill (H. Pringle 62)	P3	Erect, yellow-green shrub, 0.4–1.2 m high. Red clayey sand. Flat floodways, lake beds, saline alluvial plains, drainage sumps.

Species	Code	Description
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	P3	Tussocky perennial, grass-like or herb, 0.9–1.8 m high. Found on red clay on clay pans and grass plains.
Eremophila youngii subsp. *lepidota*	P4	Dense, spreading shrub, (0.2–)1–3 m high. Fl. purple, red, pink, Jan–Mar/Jun–Sep. Stony red sandy loam. Flats plains, floodplains, sometimes semi-saline, clay flats.
Goodenia nuda	P4	Erect to ascending herb 0.5 m high with yellow flowers.

Source: Department of Environment and Conservation Database Search (August 2010)

APPENDIX B

DEFINITION OF THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

APPENDIX B

DEFINITIONS OF THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

B1: Definitions of Threatened Ecological Communities

Presumed Totally Destroyed (PD)

An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant **and either** of the following applies (A or B);

A) Records within the last 50 years have not been confirmed despite thorough searches or known or likely habitats **or**

B) All occurrences recorded within the last 50 years have since been destroyed.

Critically Endangered (CR)

An ecological community will be listed as **Critically Endangered** when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting **any one or more** of the following criteria (A, B or C):

A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and **either or both** of the following apply (i or ii)

   i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 5 years)

   ii) modification throughout its range is continuing such that in the immediate future (within approximately 5 years) the community is unlikely to be capable of being substantially rehabilitated.

B) Current distribution is limited, and **one or more** of the following apply (i, ii or iii):

   i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 5 years)

   ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes

   iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes

C) The ecological community exists only as highly modified occurrences which may be capable of being rehabilitated if such work begins in the immediate future (within approximately 5 years)

Endangered (EN)

An ecological community will be listed as **Endangered** when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information, by it meeting **any one or more** of the following criteria (A, B or C):

A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 70% and **either or both** of the following apply (i or ii)

   i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term (within approximately 10 years)
   ii) modification throughout its range is continuing such that in the short term future (within approximately 10 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

B) Current distribution is limited, and **one or more** of the following apply (i, ii or iii):

   i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 10 years)
   ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes
   iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes

C) The ecological community exists only as highly modified occurrences which may be capable of being rehabilitated if such work begins in the short term future (within approximately 10 years).

Vulnerable (VU)

An ecological community will be listed as **Vulnerable** when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction in the medium to long term future. This will be determined on the basis of the best available information, by it meeting **any one or more** of the following criteria (A, B or C):

A) The ecological community exists largely as modified occurrences which are likely to be capable of being substantially restored or rehabilitated.
B) The ecological community can be modified or destroyed and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.
C) The ecological community may still be widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Source: Department of Environment and Conservation (2010). *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*. Department of Environment and Conservation, Perth, Western Australia. Online: www.naturebase.net/

B2: Definitions of Priority Ecological Communities

Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly known ecological communities Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly known ecological communities. Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.

Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:

(ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;

(iii) Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

(a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered

not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

(b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.

(c) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities. Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Source: Department of Environment and Conservation (2010). *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*. Department of Environment and Conservation, Perth, Western Australia. Online: www.naturebase.net/

APPENDIX C

FLORA SURVEY QUADRAT & RELEVÉ LOCATIONS

Christmas Creek Project Area

Site Number	Site Type	# Easting	# Northing
CDR024	Relevé	775513	7526302
CDR025	Relevé	775922	7524950
CDR026	Relevé	777743	7526907
CDR027	Relevé	782856	7525131
CDR029	Relevé	785515	7523748
CDR030	Relevé	787733	7522528
CDR031	Relevé	786996	7522500
CDR032	Relevé	787845	7518750
CDR033	Relevé	788984	7518718
CDR034	Relevé	790864	7518007
CDR035	Relevé	791235	7517489
CDR036	Relevé	795900	7519299
CDR037	Relevé	797720	7517622
CDR038	Relevé	795627	7522820
CDR039	Relevé	792237	7521045
CDR040	Relevé	795747	7525523
CD01	Quadrat	772553	7514997
CD02	Quadrat	783340	7506482
CD03	Quadrat	783575	7509249
CD04	Quadrat	770610	7515986
CD05	Quadrat	768382	7514714
CD06	Quadrat	774558	7516178
CD07	Quadrat	775211	7514563
CD08	Quadrat	769826	7515577
CD09	Quadrat	765058	7515603
CD10	Quadrat	765214	7515576
CD11	Quadrat	784242	7526540
CD12	Quadrat	787985	7525554
CD13	Quadrat	778716	7508563
CD14	Quadrat	780505	7507012
CD15	Quadrat	780733	7509499
CD16	Quadrat	781967	7508263
CD17	Quadrat	774209	7512603
CD18	Quadrat	775206	7510512
CD19	Quadrat	790902	7523107

Site Number	Site Type	# Easting	# Northing
CD20	Quadrat	792389	7525690
CD21	Quadrat	774856	7527812

World Geodetic System 1984 (WGS84), Zone 50K

APPENDIX D

FLORA SURVEY QUADRAT DATA SHEETS

Christmas Creek **Site** CD01

Described by **Date** 2/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 772554 **mE** 7514997 **mN**

Habitat Flat / Dry Marsh.

Soil Soft Red-brown Clay with slight Cracking.

Rock Type N/A.

Vegetation Low Open Heath of *Tecticornia indica* subsp*. bidens, Tecticornia indica* subsp*. leiostachya, Tecticornia auriculata* and *Tecticornia* sp. Christmas Creek (K. A. Shepherd et. al. KS 1063) and *Tecticornia* sp. Dennys Crossing (K.A. Shepherd & J. English KS 552).

Veg Condition Excellent.

Fire Age Very old.

Notes Aspect: N/A.
Bare ground: 25%.
Litter cover: +% Logs; +% Twigs; +% Lvs.
Disturbance type: N/A.
Notes: Bare ground just South of quadrat.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Tecticornia auriculata	1%	<0.2m	CD01.03	
	Tecticornia indica subsp*. bidens*	60%	<0.2m	CD01.04	
	Tecticornia indica subsp*. leiostachya*	2%	<0.2m	CD01.07	
	Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)	1%	<0.2m	CD01.01	
	Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	<1%	<0.2m	CD01.02	
	Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055)	+	<0.3m	CD01.05	

Christmas Creek **Site** CD02

Described by ML **Date** 2/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 783341 **mE** 7506483 **mN**

Habitat Flat / Broad plain.

Soil Red-brown Clay, cracking.

Rock Type N/A.

Vegetation Low Open Heath of *Tecticornia auriculata* and *Tecticornia* sp. Christmas Creek (K. A. Shepherd et. al. KS 1063).

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 50%.
Litter cover: 0% Logs; +% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes: In the middle of Marsh.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Tecticornia auriculata	40%	<0.7m	CD02.01	Dominant.
	Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)	4%	<0.3m	CD02.02	
	Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	+	<0.3m	CD02.03	
	Tecticornia sp. Roy Hill (H. Pringle 62)	+	0.5m	CD02.04	

Christmas Creek **Site** CD03

Described by **Date** 2/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 783577 **mE** 7509250 **mN**

Habitat Flat / Broad plain.

Soil Red-brown Clay.

Rock Type N/A.

Vegetation Low Open Shrubland of *Tecticornia* sp. Christmas Creek (K. A. Shepherd et. al. KS 1063) and *Samolus repens* var. *floribundus* with *Muellerolimon salicorniaceum*.

Veg Condition Very Good.

Fire Age Very old.

Notes Aspect: N/A.
Bare ground: 50%.
Litter cover: 0% Logs; +% Twigs; +% Lvs.
Disturbance type: N/A.
Notes: In the middle of Marsh.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Muellerolimon salicorniaceum	6%	1m	CD03.01	
	Samolus repens var. *floribundus*	(1%)	0.6m	CD03.05	Dead.
	Tecticornia indica subsp. *leiostachya*	<1%	0.4m	CD03.03	
	Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)	14%	<0.5m	CD03.02	

Christmas Creek **Site** CD04

Described by **Date** 3/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 770611 **mE** 7515987 **mN**

Habitat Flat / Broad plain.

Soil Red-brown Cracking Clay.

Rock Type N/A.

Vegetation Low Open Heath of *Tecticornia indica* subsp*. bidens, Tecticornia auriculata* and *Tecticornia* sp. Dennys Crossing (K.A. Shepherd & J. English KS 552).

Veg Condition Excellent.

Fire Age Very old.

Notes Aspect: N/A.
Bare ground: 30%.
Litter cover: 0% Logs; +% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes: Fringe of actual Marsh clearing.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Tecticornia auriculata	4%	0.5m	CD04.01	
	Tecticornia indica subsp*. bidens*	61%	0.3m	CD04.02	
	Tecticornia indica subsp*. leiostachya*	+	0.3m	CD04.08	
	Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)	+	0.4m	CD04.05	
	Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	1%	0.3m	CD04.04	
	Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055)	+	0.3m	CD04.07	

Christmas Creek **Site** CD05

Described by **Date** 3/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 768382 **mE** 7514715 **mN**

Habitat Flat / Broad plain.

Soil Red-brown soft Clay cracking.

Rock Type N/A.

Vegetation Low Open Heath of *Tecticornia* sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) and *Tecticornia auriculata*.

Veg Condition Excellent.

Fire Age Very old.

Notes Aspect: N/A.
Bare ground: 35%.
Litter cover: 0% Logs; +% Twigs; 0% Lvs.
Disturbance type: Water stress.
Notes: Drainage line nearby, community carries on south for approximately 1-2km.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Tecticornia auriculata	<1%	0.6m	CD05.02	
	Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055)	60%	0.2-0.8m	CD05.01	

Christmas Creek **Site** CD06

Described by ML **Date** 3/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 77455 **mE** 7516179 **mN**

Habitat Flat / Broad plain.

Soil Red-brown Clay.

Rock Type N/A.

Vegetation Low Shrubland of *Tecticornia indica* subsp*. bidens* and *Scaevola spinescens* with *Acacia synchronicia*.

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 65%.
Litter cover: 0% Logs; +% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes: No grasses or ground cover.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia synchronicia	2%	1-2m	CD06.03	
	Amphipogon sericeus	+	<0.2m	CD06.05	Newman form
	Eremophila spongiocarpa	+	0.6m	CD06.04	P1 Flowering (White flower)
	Scaevola spinescens	15%	<0.5m	CD06.01	
	Tecticornia indica subsp*. bidens*	20%	<0.4m	CD06.02	

Christmas Creek **Site** CD07

Described by ML **Date** 3/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 775212 **mE** 7514564 **mN**

Habitat Flat / Broad plain.

Soil Red-brown Sandy loam with clay.

Rock Type Quartz, Ironstone, BIF.

Vegetation Low Open Heath of *Tecticornia indica* subsp*. bidens, Tecticornia* sp. Dennys Crossing (K.A. Shepherd & J. English KS 552) and *Muellerolimon salicorniaceum.*

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 35%.
Litter cover: 0% Logs; +% Twigs; 0% Lvs.
Disturbance type: Cattle.
Notes:Lots of pebbles ons ubstrate.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Muellerolimon salicorniaceum	1%	0.5-1m	CD07.03	
	Tecticornia indica subsp*. bidens*	55%	<0.4m	CD07.01	
	Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	10%	<0.3m	CD07.02	

Christmas Creek **Site** CD08

Described by **Date** 3/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 769826 **mE** 7515577 **mN**

Habitat Flat / Broad plain.

Soil Red-brown soft Clay, cracking.

Rock Type N/A.

Vegetation Scattered Low Shrubs of *Tecticornia* sp. Christmas Creek (K. A. Shepherd et. al. KS 1063).

Veg Condition Completely Degraded.

Fire Age Very old.

Notes Aspect: N/A.
Bare ground: 100%.
Litter cover: 0% Logs; 0% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes: Dry Marsh.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)	+	0.2m	CD08.01	

Christmas Creek **Site** CD09

Described by ML **Date** 3/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 765059 **mE** 7515603 **mN**

Habitat Flat / Broad plain.

Soil Red-brown loamy clay.

Rock Type N/A.

Vegetation Low Open Heath of *Tecticornia indica* subsp*. bidens, Muellerolimon salicorniaceum* and *Euphorbia* sp.

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 20%.
Litter cover: 0% Logs; 1% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes: Dead grasses and ground cover, nothing collectable.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Euphorbia sp.	2-3%	<0.1m	CD10.01	
	Maireana luehmannii	+	0.2m	CD09.04	
	Muellerolimon salicorniaceum	3%	<0.6m	CD09.02	
	Tecticornia auriculata	+	<0.3m	CD09.03	
	Tecticornia indica subsp*. bidens*	60%	<0.3m	CD09.01	

Christmas Creek **Site** CD10

Described by **Date** 3/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 765215 **mE** 7515576 **mN**

Habitat Flat / Broad plain.

Soil Red-brown soft Clay, cracking.

Rock Type N/A.

Vegetation Low Open Heath of *Euphorbia* sp. and *Muellerolimon salicorniaceum*.

Veg Condition Very Poor.

Fire Age Very Old.

Notes Aspect: N/A.
Bare ground: 60%.
Litter cover: 0% Logs; +% Twigs; 0% Lvs.
Disturbance type: Water-starved, Cattle.
Notes: Surrounded by community seen in CD09.

SPECIES LIST:

Quad	Name	Cover	C Class	Height	Specimen	Notes
	Euphorbia sp.	(40%)		<0.1m	CD10.01	
	Muellerolimon salicorniaceum	<1%		0.2-0.8m	CD10.03	
	Tecticornia indica subsp. *bidens*	+		0.3m	CD10.02	

Christmas Creek **Site** CD11

Described by **Date** 3/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 784243 **mE** 7526540 **mN**

Habitat Hilltop.

Soil Red-brown loam with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Hummock Grassland of *Triodia* sp. and *Triodia* aff. *basedowii* with emergent patches of *Eucalyptus leucophloia, Grevillea wickhamii* subsp*. aprica* and *Hakea chordophylla* over *Acacia inaequilatera* and *Acacia maitlandii.*

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: South,
Bare ground: 30%.
Litter cover: 0% Logs; 1-2% Twigs; 2% Lvs.
Disturbance type: N/A.
Notes: Gullies either side of hillslope.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia aneura var*. microcarpa*	+	0.4m	CD11.05	
	Acacia inaequilatera	1%	1.5m	CD11.04	
	Acacia maitlandii	1%	1m	CD11.03	
	Acacia marramamba	+	1.5m	CDR013.01	
	Acacia pruinocarpa	+	1.5m	CDR002.04	
	Corymbia ferriticola	+	1m	CD11.07	
	Eucalyptus leucophloia	3%	3-4m	NC	
	Grevillea pyramidalis subsp*. leucadendron*	+	<0.5m	CD11.08	
	Grevillea wickhamii subsp*. aprica*	4%	1-3m	CD20.03	
	Hakea chordophylla	1%	1-3m	CD11.02	
	Triodia aff*. basedowii*	5%	<0.4m	CD11.06	Triodia sp. 1
	Triodia sp*.*	45%	<0.5m	CD11.01	T. epactia/pungens

Christmas Creek **Site** CD12

Described by **Date** 3/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 787985 **mE** 7525555 **mN**

Habitat Hill top / Upper slope.

Soil Red-brown loam with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Open Hummock Grassland of *Triodia* aff. *basedowii* and *Triodia* sp. with emergent patches of *Eucalyptus leucophloia* subsp. *leucophloia, Grevillea wickhamii* subsp. *aprica, Hakea chordophylla* over *Acacia inaequilatera.*

Veg Condition Excellent.

Fire Age Very old.

Notes Aspect: N/A.
Bare ground: 15%.
Litter cover: 1% Logs; +% Twigs; +% Lvs.
Disturbance type: N/A.
Notes: Surrounded by undulating hills.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia acradenia	+	0.8m	CD12.12	
	Acacia inaequilatera	1%	1m	CD12.09	
	Acacia pruinocarpa	+	1m	CD12.03	
	Calytrix carinata	+	0.5m	CD12.04	
	Eucalyptus leucophloia subsp. *leucophloia*	1%	3-4m	CD12.01	
	Grevillea wickhamii subsp. *aprica*	2%	2m	CD12.10	
	Hakea chordophylla	1%	3-4m	CD12.02	
	Ptilotus calostachyus	(+)	1m	CD12.05	
	Senna glutinosa subsp. *luerssenii*	+	1m	CD12.11	
	Triodia aff. *basedowii*	20%	0.5m	CD12.06	Triodia sp. 1
	Triodia sp.	5%	0.5m	CD12.08	T. epactia/pungens

Christmas Creek **Site** CD13

Described by ML **Date** 4/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 778717 **mE** 7508563 **mN**

Habitat Flat / Broad plain.

Soil Red-brown Clay.

Rock Type N/A.

Vegetation Low Shrubland of *Tecticornia indica* subsp*. bidens, Tecticornia auriculata, Muellerolimon salicorniaceum, Heliotropium curassavicum* and *Atriplex flabelliformis*.

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 80%
Litter cover: 0% Logs; +% Twigs; +% Lvs.
Disturbance type: Cattle.
Notes:

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Atriplex flabelliformis	1%	<0.3m	CD13.01	
	Cressa australis	+	0.1m	CD13.10	Flowering (White flower)
	Frankenia ambita	+	0.1m	CD13.11	Flowering.
	Heliotropium curassavicum	3%	<0.1m	CD13.02	
	Muellerolimon salicorniaceum	5%	0.6m	CD13.05	Flowering (white flowers)
	Nicotiana occidentalis subsp*. obliqua*	+	<0.2m	CD13.09	Flowering (Long tube flower)
	Tecticornia auriculata	3%	0.3-0.5m	CD13.06	
	Tecticornia indica subsp*. bidens*	7%	<0.75m	CD13.12	
	Tecticornia sp. Roy Hill (H. Pringle 62)	+	0.4m	CD14.04	

Christmas Creek **Site** CD14

Described by ML **Date** 4/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 780506 **mE** 7507012 **mN**

Habitat Flat / Broad plain.

Soil Red-brown cracking Clay.

Rock Type N/A.

Vegetation Low Open Heath of *Tecticornia* sp. Christmas Creek (K. A. Shepherd et. al. KS 1063), *Muellerolimon salicorniaceum*, *Tecticornia auriculata* and *Euphorbia* sp.

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 50%.
Litter cover: 0% Logs; +% Twigs; 0% Lvs.
Disturbance type: Minor cattle disturbance.
Notes: Dead grasses: nothing collectable.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Euphorbia sp.	1%	<0.1m	CD10.01	
	Muellerolimon salicorniaceum	8%	1m	CD14.03	
	Tecticornia auriculata	2%	<0.75m	CD14.02	
	Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)	38%	<0.5m	CD14.01	
	Tecticornia sp. Roy Hill (H. Pringle 62)	+	0.2m	CD14.04	

Christmas Creek **Site** CD15

Described by **Date** 4/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 780734 **mE** 7509500 **mN**

Habitat Flat / Broad plain.

Soil Red-brown soft Clay.

Rock Type N/A.

Vegetation Low Shrubland of *Tecticornia* sp. Christmas Creek (K. A. Shepherd et. al. KS 1063), *Tecticornia auriculata* and *Tecticornia indica* subsp. *bidens.*

Veg Condition Excellent.

Fire Age Very old.

Notes Aspect: N/A.
Bare ground: 65%.
Litter cover: 0% Logs; +% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes: Community continues for kilometers in radius of quadrat, with only variation on density of *Muellerolimon salicorniaceum*.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Muellerolimon salicorniaceum	+	<0.8m	CD15.04	
	Tecticornia auriculata	9%	0.4-0.8m	CD15.03	
	Tecticornia indica subsp. *bidens*	6%	0.2-0.5m	CD15.02	
	Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)	13%	0.2-0.5m	CD15.06	
	Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	+	0.1m	CD15.01	

Christmas Creek **Site** CD16

Described by **Date** 4/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 781968 **mE** 7508263 **mN**

Habitat Flat / Broad plain.

Soil Red-brown soft Clay with cracking.

Rock Type N/A.

Vegetation Low Shrubland of *Muellerolimon salicorniaceum, Tecticornia auriculata, Tecticornia* sp. Dennys Crossing (K.A. Shepherd & J. English KS 552) and *Tecticornia* sp. Christmas Creek (K. A. Shepherd et. al. KS 1063).

Veg Condition Excellent.

Fire Age Very old.

Notes Aspect: N/A.
Bare ground: 65%.
Litter cover: 0% Logs; +% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes: Surrounding vegetation consistent to the south, runs for kilometers.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Muellerolimon salicorniaceum	25%	0.5-1m	CD16.07	
	Tecticornia auriculata	2%	0.3-1m	CD16.02	
	Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)	1%	0.4m	CD16.06	
	Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	2%	0.4m	CD16.04	
	Tecticornia sp. Roy Hill (*H. P*ringle 62)	+	0.3m	CD16.01	

Christmas Creek **Site** CD17

Described by **Date** 4/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 774210 **mE** 7512603 **mN**

Habitat Flat / Broad plain.

Soil Red-brown Clay.

Rock Type N/A.

Vegetation Low Open Heath of *Tecticornia indica* subsp*. bidens, Tecticornia indica* subsp*. leiostachya* and *Muellerolimon salicorniaceum.*

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 55%.
Litter cover: 0% Logs; 1% Twigs; +% Lvs.
Disturbance type: Grazing.
Notes:

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Cressa australis	+	<0.1m	CD17.03	
	Muellerolimon salicorniaceum	2%	0.5-1m	CD13.05	
	Tecticornia indica subsp*. bidens*	30%	<0.5m	CD17.02	
	Tecticornia indica subsp*. leiostachya*	10%	<0.3m	CD17.01	

Christmas Creek **Site** CD18

Described by **Date** 4/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 775206 **mE** 7510512 **mN**

Habitat Flat / Broad plain.

Soil Red-brown soft Clay with cracking.

Rock Type N/A.

Vegetation Low Open Shrubland of *Tecticornia indica* subsp*. bidens, Tecticornia auriculata* and *Tecticornia* sp. Roy Hill (H. Pringle 62).

Veg Condition Excellent.

Fire Age Very old.

Notes Aspect: N/A.
Bare ground: 75%.
Litter cover: 0% Logs; +% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes: Community continues on over 1 km radius.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Tecticornia auriculata	2%	0.1m	CD18.03	
	Tecticornia indica subsp*. bidens*	4%	0.3m	CD18.02	
	Tecticornia indica subsp*. leiostachya*	+	0.3m	CD18.01	
	Tecticornia sp. Roy Hill (H. Pringle 62)	2%	0.8m	CD18.05	

Christmas Creek **Site** CD19

Described by **Date** 4/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 790902 **mE** 7523107 **mN**

Habitat Upper slope with undulating hills.

Soil Red-brown loam with surface later of rocks, cobbles and pebbles.

Rock Type Ironstone.

Vegetation

Veg Condition Completely Degraded.

Fire Age Recent.

Notes Aspect: N/A.
Bare ground: 100%
Litter cover: 0% Logs; 0% Twigs; 0% Lvs.
Disturbance type: Fire.
Notes: Recent fire has cleared huge area of undulating hills. Quadrat placed in surviving vegetation nearby which suggests vegetation was *Triodia* hummock grassland with *Hakea lorea* subsp. *lorea* and *Grevillea wickhamii*.

SPECIES LIST:

Quad	Name	Cover	C Class	Height	Specimen	Notes

Christmas Creek **Site** CD20

Described by **Date** 4/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 792390 **mE** 7525690 **mN**

Habitat Hill top / Upper Hill slope surrounded by undulating hills.

Soil Red-brown loam with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Hummock Grassland of *Triodia basedowii* with *Grevillea wickhamii* subsp. *aprica*.

Veg Condition Excellent.

Fire Age Very old.

Notes Aspect: N/A.
Bare ground: 50%.
Litter cover: +% Logs; 0% Twigs; +% Lvs.
Disturbance type: Surrounded by recent nearby fire.
Notes:

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia acradenia	+	1.5m	CD20.08	
	Corymbia candida subsp. *dipsodes*	+	0.7m	CD20.05	Juvenile, smooth bark.
	Grevillea pyramidalis subsp. *leucadendron*	+	2m	CD20.02	
	Grevillea wickhamii subsp. *aprica*	1%	1-3m	CD20.03	
	Keraudrenia nephrosperma	+	0.8m	CD20.09	
	Senna glaucifolia	+	1m	CD20.07	
	Senna glutinosa subsp. *luerssenii*	+	1m	CD20.06	
	Tribulus suberosus	+	0.5m	CD20.04	
	Triodia basedowii	50%	0.5m	CD20.01	Triodia sp. 2

Christmas Creek **Site** CD21

Described by **Date** 5/08/2010 **Type** Q

Location Christmas Creek.

MGA Zone 50 774857 **mE** 7527813 **mN**

Habitat Flat / Broad plain.

Soil Red-brown loam with surface

Rock Type Ironstone.

Vegetation Hummock Grassland of *Triodia longiceps* and *Triodia basedowii* with *Eucalyptus leucophloia* subsp*. leucophloia.*

Veg Condition Excellent.

Fire Age Young.

Notes Aspect: North.
Bare ground: 65%.
Litter cover: 0% Logs; +% Twigs; +% Lvs.
Disturbance type: Nearby drainage line.
Notes:

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia acradenia	+	1.5m	CD20.08	
	Acacia bivenosa		2m	CD21.06	
	Cymbopogon ambiguus	+	0.4m	CD21.07	
	Eucalyptus leucophloia subsp*. leucophloia*	1%	4-5m	CD21.01	
	Hakea lorea subsp*. lorea*	+	1-2m	CD21.02	
	Sclerolaena densiflora	+	0.1m	CD21.03	
	Senna glutinosa subsp*. luerssenii*	+	0.8m	CD20.06	
	Tribulus suberosus	+	0.3m	CD20.04	
	Triodia basedowii	10%	0.4m	CD21.05	Triodia sp. 2
	Triodia longiceps	15%	0.6m	CD21.04	

Christmas Creek **Site** CDR024

Described by **Date** 17/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 775514 **mE** 7526302 **mN**

Habitat Lower Hill slope with surrounding undulating hills.

Soil Red-brown loam with surface cover of pebbles and cobbles.

Rock Type Ironstone.

Vegetation Scattered *Eucalyptus leucophloia* over *Acacia pruinocarpa, Acacia Acacia* aff. *aneura* (narrow fine veined; site 1259), *Acacia acradenia* and *Grevillea wickhamii* over *Triodia basedowii.*

Veg Condition Excellent.

Fire Age Very Old.

Notes Aspect: South.
Bare ground: 50%.
Litter cover: +% Logs; +% Twigs; 0% Lvs.
Disturbance type:
Notes:

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia acradenia	1%	2m	CDR019.02	
	Acacia aff. *aneura* (narrow fine veined; site 1259)	2%	1m	CDR015.03	
	Acacia pruinocarpa	1%	2m	CDR002.04	
	Eucalyptus leucophloia	+	4m	CDR003.03	
	Grevillea wickhamii	+	1m	CDR004.04	
	Triodia basedowii	30%	0.5m	CDR006.02	

Christmas Creek **Site** CDR025

Described by **Date** 17/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 775922 **mE** 7524951 **mN**

Habitat Flat / Broad plain.

Soil Red-brown loam with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Low Open Woodland of *Acacia* aff. *aneura* (narrow fine veined; site 1259), *Acacia pruinocarpa, Acacia tetragonophylla, Acacia ayersiana* over *Dodonaea petiolaris, Psydrax latifolia* over *Aristida contorta* and *Sclerolaena* sp.

Veg Condition Poor.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 60%.
Litter cover: 1% Logs; +% Twigs; +% Lvs.
Disturbance type: Drill line clearing nearby, Grazing.
Notes: Sclerolaena sp. 1% Cover Dead.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia aff. *aneura* (narrow fine veined; site 1259)	8%	1-4m	CDR016.01	
	Acacia ayersiana	1%	1m	CDR025.01	
	Acacia pruinocarpa	4%	1-4m	CDR002.04	
	Acacia tetragonophylla	1%	2m	CDR015.04	
	Aristida contorta	(2%)	0.6m	NC	Dead.
	Dodonaea petiolaris	2%	1m	CDR017.04	
	Psydrax latifolia	+	0.8m	NC	
	Sclerolaena sp.	(1%)	0.5m	NC	Dead.

Christmas Creek **Site** CDR026

Described by **Date** 17/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 777744 **mE** 7526907 **mN**

Habitat Creekline.

Soil Soft Brown Sand with surface layer of pebbles.

Rock Type Ironstone.

Vegetation Low Open Woodland of *Eucalyptus victrix* over *Acacia pyrifolia, Acacia tetanophylla, Acacia pruinocarpa, Grevillea wickhamii* over *Triodia longiceps*.

Veg Condition Excellent.

Fire Age Very Old.

Notes Aspect: N/A.
Bare ground: 70%.
Litter cover: 2% Logs; 1% Twigs; 1% Lvs.
Disturbance type: N/A.
Notes:

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia pruinocarpa	2%	2m	CDR002.04	
	Acacia pyrifolia	1%	3m	CDR005.03	
	Acacia tenuissima	+	1m	CDR001.02	
	Acacia tetragonophylla	1%	1.5m	CDR015.04	
	Aristida sp.	1%		NC	Dead
	Eucalyptus victrix	8%	4-5m	CDR004.02	
	Grevillea wickhamii	+	2m	CDR004.04	
	Petalostylis labicheoides	1%	1m	NC	
	Tephrosia rosea var. *glabrior*	+	0.5m	CDR026.02	
	Triodia longiceps	2%	0.5m	CDR026.01	

Christmas Creek **Site** CDR027

Described by **Date** 17/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 782856 **mE** 7525132 **mN**

Habitat Upper Hill Slope with surrounding undulating hills.

Soil Red-brown sand with significant pebble and cobble surface layer.

Rock Type Ironstone.

Vegetation Scattered *Eucalyptus leucophloia* subsp*. leucophloia* over *Acacia maitlandii, Grevillea wickhamii, Acacia pruinocarpa* over *Triodia basedowii* and *Triodia epactia*.

Veg Condition Excellent.

Fire Age Very Old.

Notes Aspect: South.
Bare ground: 60%.
Litter cover: +% Logs; +% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes:

SPECIES LIST:

Quad	Name	Cover	C Class	Height	Specimen	Notes
	Acacia maitlandii	1%		1.5m	CDR002.03	
	Acacia pruinocarpa	1%		2m	CDR002.04	
	Acacia pyrifolia	+		1m	CDR005.03	
	Eucalyptus leucophloia	1%		3m	CDR003.03	
	Grevillea wickhamii	1%		1m	CDR004.04	
	Hakea lorea subsp*. lorea*	+		1m	CDR027.01	
	Triodia basedowii	30%		0.5m	CDR006.02	
	Triodia epactia	15%		0.6m	CDR008.03	Patches

Christmas Creek **Site** CDR029

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 785515 **mE** 7523749 **mN**

Habitat Lower Hill slope with surrounding undulating plains.

Soil Red-brown with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Scattered Trees of *Eucalyptus leucophloia* subsp*. leucophloia* over *Acacia ancistrocarpa* and *Acacia acradenia* over *Senna glutinosa* subsp*. glutinosa* and *Acacia pyrifolia* over *Triodia basedowii* and *Triodia epactia.*

Veg Condition Very Poor.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 45%.
Litter cover: 0% Logs; 0% Twigs; 0% Lvs.
Disturbance type: Heavily disturbed by drill lines.
Notes:

SPECIES LIST:

Quad	Name	Cover	C Class	Height	Specimen	Notes
	Acacia acradenia	3%		2m	CDR029.02	
	Acacia ancistrocarpa	3%		2m	CDR029.01	
	Acacia marramamba	+		3m	CDR013.01	
	Acacia pyrifolia	1%		1m	CDR005.03	
	Eucalyptus leucophloia	1%		1-5m	CDR003.03	
	Grevillea wickhamii	+		1m	CDR004.04	
	Senna glutinosa subsp*. glutinosa*	1%		1m	CDR015.01	
	Triodia basedowii	20%		0.5m	CDR006.02	
	Triodia epactia	5%		0.6m	CDR017.02	

Christmas Creek **Site** CDR030

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 787733 **mE** 7522528 **mN**

Habitat Lower Hill Slope with surrounding undulating Hills.

Soil Red-brown loam with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Hummock Grassland of *Triodia basedowii* and *Triodia epactia* with emergent patches of *Eucalyptus leucophloia* subsp. *leucophloia* over *Acacia ancistrocarpa, Acacia marramamba* over *Ptilotus obovatus* var. *obovatus.*

Veg Condition Excellent.

Fire Age Very Old.

Notes Aspect: South.
Bare ground: 30%.
Litter cover: 0% Logs; 0% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes:

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia acradenia	+	1m	CDR029.02	
	Acacia ancistrocarpa	3%	3m	CDR029.01	
	Acacia marramamba	1%	2m	CDR013.01	
	Eucalyptus leucophloia	1%	1-4m	CDR003.03	
	Grevillea wickhamii	+	1m	CDR004.04	
	Hakea lorea subsp. *lorea*	+	1m	CDR023.01	
	Ptilotus obovatus var. *obovatus*	+	0.8m	NC	
	Triodia basedowii	25%	0.5m	CDR006.02	
	Triodia epactia	5%	0.6m	CDR006.01	

Christmas Creek **Site** CDR031

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 786997 **mE** 7522501 **mN**

Habitat Drainage Line

Soil Brown Sand with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Scattered *Eucalyptus victrix* over *Acacia pruinocarpa, Acacia tumida* with *Acacia pyrifolia* over *Triodia epactia.*

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: East.
Bare ground: 70%
Litter cover: 2% Logs; 2% Twigs; 1% Lvs.
Disturbance type: N/A.
Notes: *Aristida* sp. Dead present.

SPECIES LIST:

Quad	Name	Cover	C Class	Height	Specimen	Notes
	Acacia aff. *aneura* (narrow fine veined; site 1259)	1%		1-3m	CDR031.02	
	Acacia bivenosa	+		1m	CDR001.03	
	Acacia pruinocarpa	2%		3m	CDR002.04	
	Acacia pyrifolia	1%		2m	CDR005.03	
	Acacia tumida var. *pilbarensis*	7%		2m	CDR005.02	
	Aristida sp.	(+)		0.5m	NC	Dead
	Eucalyptus victrix	+		3m	CDR004.02	
	Grevillea wickhamii	1%		1m	CDR004.04	
	Themeda triandra	+		0.5m	NC	
	Triodia epactia	6%		0.6m	CDR031.01	

Christmas Creek **Site** CDR032

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 787846 **mE** 7518750 **mN**

Habitat Flat / Broad plain.

Soil Red-brown loam with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Low Open Woodland of *Acacia* aff. *aneura* (narrow fine veined; site 1259), *Acacia tetragonophylla* and *Acacia pruinocarpa* over *Psydrax latifolia, Eremophila forrestii* over *Sclerolaena* sp.

Veg Condition Good.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 80%.
Litter cover: 1% Logs; 1% Twigs; 1% Lvs.
Disturbance type: Grazing.
Notes: *Sclerolaena* sp. Dead present.

SPECIES LIST:

Quad	Name	Cover	C Class	Height	Specimen	Notes
	Acacia aff. *aneura* (narrow fine veined; site 1259)	10%		1-6m	CDR032.01	
	Acacia pruinocarpa	1%		5m	CDR002.04	
	Acacia tetragonophylla	+		1m	CDR015.04	
	Dodonaea petiolaris	4%		1m	CDR017.04	
	Eremophila forrestii	+		0.6m	CDR015.05	
	Psydrax latifolia	+		1m	NC	
	Ptilotus obovatus var. *obovatus*	(1%)		0.5m	NC	
	Sclerolaena sp.	(+)		0.5m	NC	Dead

Christmas Creek **Site** CDR033

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 788984 **mE** 7518718 **mN**

Habitat Flat / Broad plain.

Soil Red-brown sand with surface layer of rock, cobbles and pebbles.

Rock Type Ironstone, quartz.

Vegetation Low Open Woodland of *Acacia* aff. *aneura* (long, flat, recurved; FMR 35.3) and *Acacia* aff. *aneura* (narrow fine veined; site 1259) over *Acacia pruinocarpa* and *Psydrax latifolia* over *Sclerolaena* sp.

Veg Condition Very Good.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 75%.
Litter cover: 1% Logs; +% Twigs; +% Lvs.
Disturbance type: Grazing.
Notes: *Sclerolaena* sp. Dead present.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia aff. *aneura* (long, flat, recurved; FMR 35.3)	8%	1-4m	CDR033.02	
	Acacia aff. *aneura* (narrow fine veined; site 1259)	3%	1-4m	CDR033.01	
	Acacia pruinocarpa	1%	1-2m	CDR002.04	
	Dodonaea petiolaris	1%	1.2m	CDR017.04	
	Psydrax latifolia	+	1m	NC	
	Ptilotus obovatus var. *obovatus*	(1%)	0.5m	NC	Grazed
	Sclerolaena sp.	(1%)	0.6m	NC	Dead

Christmas Creek **Site** CDR034

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 790864 **mE** 7518008 **mN**

Habitat Flat / Broad plain.

Soil Red-brown loam with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Low Open Woodland of *Acacia* aff. *aneura* (narrow fine veined; site 1259), *Acacia pruinocarpa* and *Acacia tetragonophylla* over *Psydrax latifolia* and *Ptilotus obovatus* var. *obovatus* over *Sclerolaena* sp. and *Maireana* sp.

Veg Condition Very Good.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 75%.
Litter cover: 1% Logs; 1% Twigs; 0% Lvs.
Disturbance type: Grazing.
Notes: *Sclerolaena* and *Maireana* sp. Dead present.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia aff. *aneura* (narrow fine veined; site 1259)	7%	1-5m	CDR033.01	
	Acacia pruinocarpa	2%	1-5m	CDR002.04	
	Acacia synchronicia	+	0.5m	CDR003.02	
	Acacia tetragonophylla	1%	2m	CDR015.04	
	Maireana sp.	(+)	0.2m	NC	Dead
	Psydrax latifolia	+	1m	NC	
	Ptilotus obovatus var. *obovatus*	+	0.5m	NC	
	Rhagodia sp. Hamersley (M. Trudgen 17794)	+	1m	CDR034.01	
	Sclerolaena sp.	(+)	0.5 m	NC	Dead

Christmas Creek **Site** CDR035

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 791236 **mE** 7517490 **mN**

Habitat Cracking Clay Flat.

Soil N/A

Rock Type

Vegetation Tall Open Shrubland of *Acacia synchronicia* over *Senna glaucifolia* over *Aristida* sp.

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 90%.
Litter cover: 1% Logs; +% Twigs; +% Lvs.
Disturbance type: N/A.
Notes:

SPECIES LIST:

Quad	Name	Cover	C Class	Height	Specimen	Notes
	Acacia synchronicia	5%		1-3m	CDR003.02	
	Aristida sp.	(1%)		0.4m	NC	Dead
	Senna glaucifolia	+		0.9m	CDR035.01	

Christmas Creek **Site** CDR036

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 795901 **mE** 7519300 **mN**

Habitat Creekline (Major)

Soil Soft Brown Sand with surface layer of scattered cobbles and pebbles.

Rock Type Ironstone.

Vegetation Low Open Woodland of *Eucalyptus victrix, Eucalyptus camaldulensis* over *Grevillea wickhamii, Petalostylis labicheoides, Acacia tumida, Melaleuca argentea, Acacia pyrifolia* over *Triodia longiceps*.

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: North.
Bare ground: 80%.
Litter cover: 1% Logs; +% Twigs; +% Lvs.
Disturbance type: N/A.
Notes: Dead *Aristida* sp.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia aff. *aneura* (long, flat, recurved; FMR 35.3)	1%	5m	CDR036.03	
	Acacia coriacea subsp. *pendens*	3%	5m	CDR036.02	
	Acacia pyrifolia	1%	2m	CDR005.03	
	Acacia tumida var. *pilbarensis*	+	2m	CDR005.02	
	Aristida sp.	(+)	0.5m	NC	Dead
	Corymbia hamersleyana	+	3m	CDR036.04	
	Eucalyptus victrix	4%	1-6m	CDR004.02	
	Grevillea wickhamii	+	2m	CDR004.04	
	Melaleuca glomerata	1%	1m	CDR036.01	
	Petalostylis labicheoides	+	1m	NC	
	Triodia longiceps	+	0.4m	CDR004.03	

Christmas Creek **Site** CDR037

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 797720 **mE** 7517622 **mN**

Habitat Flat / Broad plain.

Soil Red-Brown loam with surface layer of pebbles and cobbles.

Rock Type Ironstone.

Vegetation Low Open Woodland of *Acacia* aff. *aneura* (narrow fine veined; site 1259), *Acacia rhodophloia, Acacia tetragonophylla* over *Psydrax latifolia, Dodonaea petiolaris, Ptilotus obovatus* var. *obovatus* over *Sclerolaena* sp.

Veg Condition Good.

Fire Age Old.

Notes Aspect: N/A.
Bare ground: 70%.
Litter cover: 1% Logs; +% Twigs; +% Lvs.
Disturbance type: Grazing.
Notes: *Sclerolaena* sp. Dead present.

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia aff. *aneura* (narrow fine veined; site 1259)	3%	1-5m	CDR032.01	
	Acacia rhodophloia	1%	1-4m	CDR037.01	
	Acacia tetragonophylla	+	1.5m	CDR015.04	
	Dodonaea petiolaris	1%	1m	CDR017.04	
	Psydrax latifolia	1%	1-3m	NC	
	Ptilotus obovatus var. *obovatus*	+	0.9m	NC	
	Sclerolaena sp.	(+)	0.5m	NC	Dead

Christmas Creek **Site** CDR038

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 795606 **mE** 7523313 **mN**

Habitat Lower Hill slope.

Soil Red-brown loam with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Scattered Low Trees of *Eucalyptus leucophloia* subsp*. leucophloia* over *Acacia ancistrocarpa* and *Acacia pyrifolia* over *Triodia basedowii* and *Triodia epactia*.

Veg Condition Excellent.

Fire Age Old.

Notes Aspect: South.
Bare ground: 55%.
Litter cover: 0% Logs; 0% Twigs; 0% Lvs.
Disturbance type: N/A.
Notes:

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia ancistrocarpa	2%	2m	CDR029.01	
	Acacia pyrifolia	1%	1m	CDR005.03	
	Eucalyptus leucophloia	1%	3m	CDR003.03	
	Hakea lorea subsp*. lorea*	+	3m	CDR023.01	
	Triodia basedowii	35%	0.5m	CDR006.02	
	Triodia epactia	5%	0.5m	CDR008.03	

Christmas Creek **Site** CDR039

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 792238 **mE** 7521045 **mN**

Habitat Flat / Broad plain.

Soil Red-brown loam with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Low Open Woodland of *Acacia* aff. *aneura* (narrow fine veined; site 1259) over *Acacia pruinocarpa* and *Ptilotus obovatus* var. *obovatus* over *Triodia epactia.*

Veg Condition Good.

Fire Age Old.

Notes

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia aff. *aneura* (narrow fine veined; site 1259)	5%	1-5m	CDR032.01	
	Acacia pruinocarpa	2%	2m	CDR002.04	
	Acacia tetragonophylla	+	2m	CDR015.04	
	Dodonaea petiolaris	+	1m	CDR017.04	
	Psydrax latifolia	+	1m	NC	
	Ptilotus obovatus var. *obovatus*	+	0.8m	NC	
	Triodia epactia	1%	0.5m	CDR008.03	

Christmas Creek **Site** CDR040

Described by **Date** 18/07/2010 **Type** R

Location Christmas Creek.

MGA Zone 50 795748 **mE** 7525523 **mN**

Habitat Hill Slope.

Soil Red-brown loam with surface layer of cobbles and pebbles.

Rock Type Ironstone.

Vegetation Scattered Low Trees of *Eucalyptus leucophloia* over *Acacia ancistrocarpa* over *Triodia basedowii* and *Triodia epactia.*

Veg Condition Good.

Fire Age Moderate.

Notes Aspect: South.
Bare ground: 40%
Litter cover: 0% Logs; +% Twigs; +% Lvs.
Disturbance type: Nearby Fire.
Notes:

SPECIES LIST:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia ancistrocarpa	1%	2m	CDR002.01	
	Acacia pyrifolia	+	2m	CDR005.03	
	Eucalyptus leucophloia	1%	4m	CDR003.03	
	Hakea lorea subsp. *lorea*	+	1m	CDR023.01	
	Senna glutinosa subsp. *glutinosa*	+	1m	CDR015.01	
	Triodia basedowii	40%	0.5m	CDR019.03	
	Triodia epactia	5%	0.5m	CDR008.03	

APPENDIX C
FLORA SURVEY QUADRAT AND RELEVE LOCATIONS

APPENDIX E

VEGETATION CONDITION SCALES

Definition of Condition Scales (Trudgen 1991)

Condition Code	Definition
E	**Excellent** Pristine or nearly so, no obvious signs of damage caused by the activities of European man.
VG	**Very Good** Some relatively slight signs of damage caused by the activities of European man, e.g. some signs of damage to tree trunks caused by repeated fire and the presence of some relatively non-aggressive weeds such as *Ursinia anthemoides* or *Briza* species, or occasional vehicle tracks.
G	**Good** More obvious signs of damage caused by the activities of European man, including some obvious impact on the vegetation structure such as caused by low levels of grazing or by selective logging. Weeds as above, possibly plus some more aggressive ones.
P	**Poor** Still retains basic vegetation structure or ability to regenerate to it after very obvious impacts of activities of European man such as grazing or partial clearing (chaining) or very frequent fires. Weeds as above, probably plus some more aggressive ones such as *Ehrharta* species.
VP	**Very Poor** Severely impacted by grazing, fire, clearing or a combination of these activities. Scope for some regeneration but, not to a state approaching good condition without intensive management. Usually with a number of weed species including aggressive species.
D	**Completely Degraded** Areas that are completely or almost completely without native species in the structure of their vegetation, e.g. areas that are cleared or "parkland cleared" with their flora comprising weed or crop species with isolated native trees or shrubs.

Source: Trudgen, ME (1991). *Vegetation Condition Scale*. In: *National Trust (WA) 1993 Urban Bushland Policy*. National trust of Australia (WA), Wildflower Society of Western Australia Inc. & the Tree Society Inc. Perth, Western Australia.

APPENDIX D
DATA SHEETS

APPENDIX F

FLORA INVENTORY

CHRISTMAS CREEK PROJECT AREA

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
ACANTHACEAE	*Dicladanthera forrestii*	√	√	
	Dipteracanthus australasicus	√		
	Dipteracanthus australasicus subsp. *australasicus*		√	
	Rostellularia adscendens var. *clementii*		√	
	Rostellularia adscendens var. *latifolia* (P3)	√		
ADIANTACEAE	*Cheilanthes brownii*		√	
	Cheilanthes sieberi subsp. sieberi	√	√	
AIZOACEAE	*Trianthema glossostigma*		√	
	Trianthema pilosa		√	
	Trianthema triquetra		√	
	Trianthema turgidifolia	√		
	Zaleya galericulata		√	
AMARANTHACEAE	*Achyranthes aspera*		√	
	** Aerva javanica*	√	√	
	Alternanthera nana		√	
	Alternanthera nodiflora	√	√	
	Amaranthus aff. *interruptus* (MET 16,114)		√	
	Amaranthus interruptus		√	
	Amaranthus pallidiflorus		√	
	Gomphrena affinis subsp. *pilbarensis*		√	
	Gomphrena canescens subsp. *canescens*	√		
	Gomphrena cunninghamii	√	√	
	Gomphrena kanisii		√	
	Gomphrena karijini			
	Gomphrena lanata		√	
	Ptilotus aervoides		√	
	Ptilotus aphyllus		√	
	Ptilotus appendiculatus var. *appendiculatus*		√	
	Ptilotus astrolasius var. *astrolasius*	√	√	
	Ptilotus auriculifolius		√	
	Ptilotus axillaris		√	
	Ptilotus calostachyus	√		√
	Ptilotus calostachyus var. *calostachyus*		√	
	Ptilotus carinatus		√	
	Ptilotus clementii		√	
	Ptilotus exaltatus	√		
	Ptilotus exaltatus var. *exaltatus*	√	√	
	Ptilotus fusiformis var. *fusiformis*	√	√	
	Ptilotus gaudichaudii	√		
	Ptilotus gaudichaudii var. *gaudichaudii*		√	
	Ptilotus gomphrenoides var. *gomphrenoides*		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Ptilotus helipteroides var. *helipteroides*		√	
	Ptilotus macrocephalus		√	
	Ptilotus obovatus var. *obovatus*	√	√	√
	Ptilotus polystachyus var. *polystachyus*	√	√	
	Ptilotus roei		√	
	Ptilotus rotundifolius		√	
	Ptilotus schwartzii var. *schwartzii*		√	
	Ptilotus sp. *LM100*	√		
APIACEAE	*Trachymene oleracea* subsp. *oleracea*		√	
APOCYNACEAE	*Carissa lanceolata*	√		
ASCLEPIADACEAE	*Marsdenia australis*		√	
	Rhyncharrhena linearis		√	
	Sarcostemma viminale subsp. *australe*	√	√	
ASTERACEAE	*Angianthus tomentosus*	√		
	** Bidens bipinnata*		√	
	** Bidens pilosa*	√		
	Blumea tenella	√	√	
	Brachyscome ciliocarpa		√	
	Calocephalus sp. Pilbara-Desert (M.E. Trugden 11454)		√	
	Calotis hispidula		√	
	Calotis plumulifera		√	
	Calotis porphyroglossa	√		
	Centipeda minima		√	
	Centipeda minima subsp. *macrocephala*	√		
	Centipeda thespidioides		√	
	Chrysocephalum aff. *apiculatum*		√	
	Flaveria australasica	√	√	
	Gnephosis arachnoidea		√	
	Helichrysum gilesii		√	
	Helichrysum luteoalbum	√		
	Minuria integerrima		√	
	Pluchea dentex	√	√	
	Pluchea dunlopii	√	√	
	Pluchea ferdinandi-muelleri		√	
	Pluchea rubelliflora	√	√	
	Pluchea tetranthera		√	
	Pterocaulon serrulatum		√	
	Pterocaulon sphacelatum	√		
	Pterocaulon sphaeranthoides		√	
	Pterocaulon sphaeranthoides x *sphacelatum*		√	
	Rhodanthe charsleyae		√	
	Rhodanthe floribunda		√	
	Rhodanthe margarethae		√	
	Rutidosis helichrysoides		√	
	Rutidosis helichrysoides subsp. *helichrysoides*		√	
	** Sigesbeckia orientalis*	√	√	
	** Sonchus oleraceus*		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Streptoglossa bubakii		√	
	Streptoglossa cylindriceps	√	√	
	Streptoglossa decurrens	√	√	
	Streptoglossa liatroides		√	
	Streptoglossa macrocephala		√	
	Streptoglossa sp.	√		
	Vittadinia arida	√	√	
	Vittadinia virgata		√	
BORAGINACEAE	*Ehretia saligna* var. *saligna*		√	
	Heliotropium chrysocarpum		√	
	Heliotropium crispatum		√	
	Heliotropium cunninghamii		√	
	**Heliotropium curassavicum*	√		√
	Heliotropium heteranthum		√	
	Heliotropium pachyphyllum		√	
	Heliotropium sp. *LM168*	√		
	Trichodesma zeylanicum	√		
	Trichodesma zeylanicum var. *zeylanicum*		√	
BRASSICACEAE	*Lepidium echinatum*		√	
	Lepidium muelleri-ferdinandii		√	
	Lepidium oxytrichum		√	
	Lepidium pedicellosum		√	
	Lepidium phlebopetalum		√	
	Lepidium pholidogynum		√	
	Stenopetalum anfractum		√	
	Stenopetalum decipiens		√	
	Stenopetalum nutans		√	
BYBLIDACEAE	*Byblis filifolia*		√	
CAESALPINIACEAE	*Petalostylis cassioides*		√	
	Petalostylis labicheoides	√		√
	Senna ?glaucifolia x aff. *oligophylla* (thinly sericeous) (FMR29-11)		√	
	Senna artemisioides subsp. aff. *oligophylla* (thinly sericeous)		√	
	Senna artemisioides subsp. aff. *oligophylla* (thinly sericeous)x *helmsii*		√	
	Senna artemisioides subsp. *helmsii*	√	√	
	Senna artemisioides subsp. *oligophylla*	√	√	
	Senna artemisioides subsp. *oligophylla* (thinly sericeous MET 15,035)		√	
	Senna artemisioides subsp. oligophylla x glaucifolia (HD13-14)		√	
	Senna artemisioides subsp. *oligophylla x glutinosa* (FMG116-02)		√	
	Senna artemisioides subsp. *oligophylla x helmsii*		√	
	Senna artemisioides subsp. *oligophylla x helmsii* (FMR75-01)		√	
	Senna artemisioides subsp. *x sturtii*		√	
	Senna curvistyla		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Senna glaucifolia	√	√	√
	Senna glaucifolia x ? (site 626)		√	
	Senna glutinosa subsp. *glutinosa*	√	√	√
	Senna glutinosa subsp. *pruinosa*	√	√	
	Senna glutinosa subsp. *x luerssenii*	√	√	√
	Senna glutinosa x luerssenii		√	
	Senna glutinosa x stricta		√	
	Senna hamersleyensis		√	
	Senna luerssenii x stricta		√	
	Senna notabilis	√	√	
	Senna sericea	√	√	
	Senna sp. Karijini (MET 10,392)		√	
	Senna sp. Meekatharra (E. Bailey 1-26)		√	
	Senna sp. West Angelas (MET 16,115)		√	
	Senna stricta		√	
	Senna symonii		√	
	Wahlenbergia tumidifructa		√	
CAPPARACEAE	*Capparis lasiantha*		√	
	Capparis umbonata		√	
	Cleome oxalidea		√	
	Cleome viscosa	√	√	
CARYOPHYLLACEAE	*Polycarpaea corymbosa* var. *corymbosa*	√	√	
	Polycarpaea holtzei	√	√	
	Polycarpaea involucrata		√	
	Polycarpaea longiflora	√	√	
CELASTRACEAE	*Maytenus* sp. Mt Windell (S. van Leeuwen 846)		√	
CHENOPODIACEAE	*Atriplex bunburyana*	√		
	Atriplex codonocarpa	√	√	
	Atriplex flabelliformis	√		√
	Atriplex lindleyi	√		
	Atriplex semilunaris	√		
	Chenopodium melanocarpum		√	
	Dissocarpus paradoxus	√		
	Dysphania glomulifera subsp. *eremaea*		√	
	Dysphania kalpari		√	
	Dysphania rhadinostachya	√		
	Dysphania rhadinostachya subsp. *rhadinostachya*		√	
	Enchylaena tomentosa	√		
	Enchylaena tomentosa var. *tomentosa*	√	√	
	Halosarcia auriculata	√		
	Halosarcia halocnemoides subsp. *halocnemoides*	√		
	Halosarcia halocnemoides subsp. *tenuis*	√		
	Halosarcia indica subsp. *bidens*	√		
	Halosarcia indica subsp. *leiostachya*	√		
	Maireana amoena	√		
	Maireana carnosa	√	√	
	Maireana georgei	√	√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Maireana luehmannii	√		√
	Maireana melanocoma		√	
	Maireana planifolia	√	√	
	Maireana planifolia x villosa		√	
	Maireana pyramidata	√	√	
	Maireana sp.			√
	Maireana thesioides		√	
	Maireana tomentosa		√	
	Maireana triptera	√		
	Maireana villosa		√	
	Rhagodia eremaea	√	√	
	Rhagodia sp. Hamersley (M. Trudgen 17794)		√	√
	Salsola tragus	√	√	
	Salsola tragus subsp. *tragus*	√		
	Sclerolaena alata	√		
	Sclerolaena bicornis var. *bicornis*		√	
	Sclerolaena cornishiana	√	√	
	Sclerolaena costata		√	
	Sclerolaena cuneata	√	√	
	Sclerolaena densiflora	√		√
	Sclerolaena eriacantha		√	
	Sclerolaena lanicuspis	√	√	
	Sclerolaena sp.			√
	Sclerolaena sp. nov. aff. *densiflora*		√	
	Tecticornia indica subsp. *bidens*			√
	Tecticornia indica subsp. *leiostachya*			√
	Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)			√
	Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)			√
	Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055)			√
	Tecticornia sp. Roy Hill (H. Pringle 62)			√
CONVOLVULACEAE	*Bonamia media* var. *villosa*		√	
	Bonamia rosea	√	√	
	Convolvulus angustissimus subsp. *angustissimus*		√	
	Cressa australis	√		√
	Evolvulus alsinoides	√		
	Evolvulus alsinoides var. *decumbens*	√	√	
	Evolvulus alsinoides var. *villosicalyx*		√	
	Ipomoea calobra		√	
	Ipomoea muelleri	√	√	
	Ipomoea polymorpha		√	
	Operculina aequisepala		√	
	Polymeria aff. *ambigua* (PAN 26B-20)		√	
	Polymeria aff. *calycina*		√	
	Porana commixta	√	√	
CUCURBITACEAE	** Citrullus colocynthis*		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Cucumis melo subsp. *agrestis*		√	
	Mukia maderaspatana	√	√	
CYPERACEAE	*?Eleocharis geniculata*	√		
	Bulbostylis barbata		√	
	Bulbostylis turbinata		√	
	Cyperus conicus		√	
	Cyperus hesperius	√		
	Cyperus iria		√	
	Cyperus vaginatus		√	
	Fimbristylis dichotoma		√	
	Fimbristylis leucocolea	√		
	Fimbristylis microcarya		√	
	Fimbristylis simulans		√	
	Schoenoplectus laevis		√	
ELATINACEAE	*Bergia pedicellaris*		√	
EUPHORBIACEAE	*Euphorbia australis* (mid-green form)		√	
	Euphorbia biconvexa		√	
	Euphorbia coghlanii	√	√	
	Euphorbia sp.			√
	Euphorbia sp. (BPBS10-50)			
	Euphorbia sp. (FML49-02)		√	
	Euphorbia sp. (FMLMC-10)		√	
	Euphorbia sp. (FMR15-29)		√	
	Euphorbia sp. (FMR46-21)		√	
	Euphorbia sp. (FMR70-12)		√	
	Euphorbia sp. (PAN5-15)		√	
	Euphorbia sp. (site 1089)		√	
	Euphorbia tannensis subsp. *eremophila* (Hamersley form)		√	
	Flueggea virosa subsp. *melanthesoides*	√	√	
	Leptopus decaisnei var. *decaisnei*		√	
	Phyllanthus erwinii		√	
	Phyllanthus maderaspatensis	√	√	
	Sauropus sp. Central Ranges (D .J. Edinger et. al. 2420)		√	
FRANKENIACEAE	*Frankenia ambita*	√		√
	Frankenia irregularis	√		
GENTIANACEAE	*Centaurium clementii*	√		
GOODENIACEAE	*Brunonia australis*		√	
	Dampiera candicans	√	√	
	Dampiera cinerea		√	
	Goodenia armitiana		√	
	Goodenia cusackiana	√	√	
	Goodenia lamprosperma		√	
	Goodenia microptera		√	
	Goodenia muelleriana		√	
	Goodenia nuda		√	
	Goodenia prostrata		√	
	Goodenia sp.		√	
	Goodenia stobbsiana	√	√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Goodenia tenuiloba	√		
	Goodenia triodiophila	√	√	
	Goodenia vilmoriniae		√	
	Scaevola amblyanthera var. *centralis*		√	
	Scaevola parvifolia subsp. *pilbarae*		√	
	Scaevola spinescens	√		√
	Scaevola spinescens (broad form)		√	
	Scaevola spinescens (narrow form)		√	
GYROSTEMONACEAE	*Codonocarpus cotinifolius*	√	√	
	Gyrostemon tepperi		√	
HALORAGACEAE	*Haloragis gossei*		√	
JUNCAGINACEAE	*Triglochin hexagona*	√		
LAMIACEAE	*Basilicum polystachyon*		√	
	Clerodendrum floribundum var. *angustifolium*		√	
	Dicrastylis georgei		√	
	Dicrastylis sp.		√	
	Newcastelia hexarrhena		√	
	Newcastelia sp. Hamersley Range (S. van Leeuwen 4264)		√	
LAURACEAE	*Cassytha capillaris*		√	
	Cassytha filiformis		√	
LORANTHACEAE	*Amyema fitzgeraldii*	√	√	
LYTHRACEAE	*Ammannia multiflora*		√	
MALVACEAE	*Abutilon* aff. *lepidum* (1) (MET 15 352)		√	
	Abutilon aff. *lepidum* (2) (MET 15 970)		√	
	Abutilon aff. *lepidum* (4)		√	
	Abutilon amplum		√	
	Abutilon cryptopetalum		√	
	Abutilon cunninghamii		√	
	Abutilon dioicum			
	Abutilon fraseri		√	
	Abutilon lepidum	√	√	
	Abutilon leucopetalum		√	
	Abutilon macrum		√	
	Abutilon otocarpum	√		
	Abutilon otocarpum (acute leaf form)	√	√	
	Abutilon oxycarpum subsp. *prostratum*		√	
	Abutilon sp.	√		
	Abutilon trudgenii		√	
	Gossypium australe	√		
	Gossypium australe (Burrup Peninsula form)	√	√	
	Gossypium robinsonii		√	
	Hibiscus aff. *coatesii*		√	
	Hibiscus aff. *coatesii* (site 664)		√	
	Hibiscus aff. *goldsworthii* (site 1260)		√	
	Hibiscus aff. *platychlamys* (FMG88-08)		√	
	Hibiscus aff. *platychlamys* (site 1139)		√	
	Hibiscus aff. *sturtii* (site 1209)		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Hibiscus aff. *sturtii* (site 903)		√	
	Hibiscus brachychlaenus		√	
	Hibiscus brachysiphonius (P3)		√	
	Hibiscus burtonii	√	√	
	Hibiscus coatesii	√	√	
	Hibiscus gardneri (ms)		√	
	Hibiscus leptocladus		√	
	Hibiscus panduriformis	√		
	Hibiscus platychlamys		√	
	Hibiscus sp. (site 316)		√	
	Hibiscus sturtii var. *?platychlamys*	√		
	Hibiscus sturtii var. aff. *campylochlamys* (MET 15,957)		√	
	Hibiscus sturtii var. aff. *campylochlamys* (site 1398)		√	
	Hibiscus sturtii var. aff. *grandiflorus*		√	
	Hibiscus sturtii var. *campylochlamys*	√	√	
	Hibiscus sturtii var. *platychlamys*	√	√	
	Hibiscus sturtii var. *truncatus*		√	
	Hibiscus trionum var. *vesicarius*		√	
	Lawrencia ?densiflora	√		
	** Malvastrum americanum*	√	√	
	Sida aff. *cardiophylla*		√	
	Sida aff. *cardiophylla* (site 1086)		√	
	Sida aff. *cardiophylla* (site 1215)		√	
	Sida aff. *clementii* (FML22-46)		√	
	Sida aff. *echinocarpa* (MET 15,350)		√	
	Sida aff. *excedentifolia* (FML58-14A) (ms)	√	√	
	Sida aff. *fibulifera* (FMG125-20)		√	
	Sida aff. *fibulifera* (HD186.1)		√	
	Sida aff. *fibulifera* (HD200-6)		√	
	Sida aff. *fibulifera* (MET 16,494)		√	
	Sida aff. *fibulifera* (site 1394)		√	
	Sida aff. *fibulifera* (site 1506)		√	
	Sida aff. *fibulifera* 'var. L'		√	
	Sida arenicola		√	
	Sida atrovirens (ms)	√	√	
	Sida brownii		√	
	Sida cardiophylla	√	√	
	Sida clementii		√	
	Sida echinocarpa		√	
	Sida excedentifolia (ms)	√	√	
	Sida fibulifera			
	Sida platycalyx		√	
	Sida sp. (MET 16,086)		√	
	Sida sp. ?Shovelanna Hill (S. van Leeuwen 3842)	√		
	Sida sp. aff. spiciform panicles (FML46-13)		√	
	Sida sp. Roy Hill Station (M.Maier 17/3704)		√	
	Sida sp. rugose (ms)		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Sida sp. spiciform panicles (E.Leyland s.n. 14/8/90)		√	
	Sida sp. unisexual (N.H. Speck 574)		√	
	Sida sp. Wittenoom (W.R. Barker 1962)		√	
	Sida spinosa	√	√	
MIMOSACEAE	*Acacia ?stenophylla*	√		
	Acacia acradenia	√	√	√
	Acacia adoxa var. *adoxa*	√	√	
	Acacia adsurgens	√	√	
	Acacia aff. *aneura* (grey flat, recurved tips; MET 15828)		√	
	Acacia aff. *aneura* (long, flat, recurved; FMR 35.3)		√	√
	Acacia aff. *aneura* (narrow fine veined; site 1259)		√	√
	Acacia aff. *stowardii* (linear form)		√	
	Acacia ampliceps	√		
	Acacia ancistrocarpa	√	√	√
	Acacia aneura (flat curved; MET 15548)		√	
	Acacia aneura (grey bushy form; MET 15732)		√	
	Acacia aneura (grey flat recurved tips; MET 15828)		√	
	Acacia aneura var. *?aneura/intermedia*	√	√	
	Acacia aneura var. *aneura*	√		
	Acacia aneura var. *conifera*	√	√	
	Acacia aneura var. *intermedia*	√		
	Acacia aneura var. *longicarpa*		√	
	Acacia aneura var. *microcarpa*			√
	Acacia arida	√	√	
	Acacia atkinsiana		√	
	Acacia ayersiana	√	√	√
	Acacia bivenosa		√	√
	Acacia bivenosa (wispy/weeping form)		√	
	Acacia bivenosa x ampliceps		√	
	Acacia catenulata		√	
	Acacia citrinoviridis		√	
	Acacia citrinoviridis x (FMN09-02)		√	
	Acacia coriacea subsp. *pendens*	√	√	√
	Acacia coriacea subsp. *sericophylla*	√	√	
	Acacia cowleana		√	
	Acacia dictyophleba		√	
	Acacia distans	√		
	Acacia elachantha		√	
	Acacia elachantha (golden hairy variant)		√	
	Acacia elachantha (silvery hairy variant)		√	
	Acacia eriopoda	√	√	
	Acacia farnesiana		√	
	Acacia hilliana	√	√	
	Acacia inaequilatera	√	√	√

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Acacia kempeana	√		
	Acacia maitlandii	√	√	√
	Acacia marramamba	√	√	√
	Acacia melleodora		√	
	Acacia monticola	√	√	
	Acacia monticola x tumida x pilbarensis		√	
	Acacia pachyacra		√	
	Acacia paraneura		√	
	Acacia pruinocarpa	√	√	√
	Acacia pyrifolia	√	√	√
	Acacia rhodophloia	√	√	√
	Acacia sclerosperma subsp. *sclerosperma*	√	√	
	Acacia sericophylla	√		
	Acacia sibirica			
	Acacia spondylophylla	√	√	
	Acacia stowardii (crowded smaller phyllodes)		√	
	Acacia synchronicia	√	√	√
	Acacia synchronicia (narrow phyllode form)		√	
	Acacia tenuissima	√	√	
	Acacia tetragonophylla	√	√	√
	Acacia trachycarpa		√	
	Acacia tumida	√		
	Acacia tumida var. *pilbarensis*		√	√
	Acacia tumida var. *tumida*	√		
	Acacia validinervia		√	
	Acacia victoriae	√	√	
	Acacia wanyu		√	
	Acacia xiphophylla	√	√	
	Neptunia dimorphantha		√	
MOLLUGINACEAE	*Mollugo molluginis*		√	
MORACEAE	*Ficus brachypoda*		√	
MYOPORACEAE	*Eremophila cuneifolia*	√	√	
	Eremophila exilifolia		√	
	Eremophila forrestii	√		√
	Eremophila forrestii subsp. *forrestii* (ms)	√	√	
	Eremophila forrestii x latrobei		√	
	Eremophila lanceolata (ms)	√	√	
	Eremophila latrobei subsp. aff. *filiformis* (ms)		√	
	Eremophila latrobei subsp. *filiformis* (ms)	√	√	
	Eremophila latrobei subsp. *glabra*		√	
	Eremophila longifolia	√	√	
	Eremophila maculata	√		
	Eremophila pachomai (ms)		√	
	Eremophila pilosa (ms) (P1)		√	
	Eremophila platycalyx subsp. platycalyx (ms)	√		
	Eremophila spongiocarpa (ms) (P1)	√		√
	Eremophila youngii subsp. lepidota (ms)	√		

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	(P4)			
MYRTACEAE	*Calytrix carinata*	√	√	√
	Corymbia candida subsp. *candida*	√	√	
	Corymbia candida subsp. *dipsodes*		√	√
	Corymbia deserticola	√		
	Corymbia deserticola subsp. *deserticola*	√	√	
	Corymbia ferriticola			√
	Corymbia ferriticola subsp. *ferriticola*		√	
	Corymbia hamersleyana		√	√
	Corymbia opaca	√		
	Eucalyptus camaldulensis		√	
	Eucalyptus camaldulensis var. *obtusa*	√		
	Eucalyptus gamophylla	√	√	
	Eucalyptus leucophloia	√		
	Eucalyptus leucophloia subsp. *leucophloia*	√	√	√
	Eucalyptus trivalvis		√	
	Eucalyptus victrix	√	√	√
	Eucalyptus xerothermica		√	
	Melaleuca glomerata	√	√	√
	Melaleuca lasiandra	√		
	Melaleuca leiocarpa	√		
NYCTAGINACEAE	*Boerhavia burbidgeana*		√	
	Boerhavia coccinea		√	
	Boerhavia repleta		√	
	Boerhavia schomburgkiana	√		
OLEACEAE	*Jasminum didymum* subsp. *lineare*		√	
PAPAVERACEAE	* *Argemone ochroleuca* subsp. *ochroleuca*		√	
PAPILIONACEAE	*Aeschynomene indica*		√	
	Alysicarpus muelleri		√	
	Crotalaria dissitiflora subsp. *benthamiana*		√	
	Crotalaria medicaginea		√	
	Cullen cinereum	√	√	
	Cullen graveolens		√	
	Cullen leucanthum		√	
	Cullen leucochaites		√	
	Cullen martinii	√	√	
	Cullen pogonocarpum		√	
	Gastrolobium grandiflorum	√		
	Glycine canescens		√	
	Gompholobium polyzygum	√		
	Indigofera brevidens	√		
	Indigofera colutea		√	
	Indigofera georgei		√	
	Indigofera linifolia		√	
	Indigofera linnaei		√	
	Indigofera monophylla	√		
	Indigofera monophylla (brown calyx form)		√	
	Indigofera monophylla (FMR35-01)		√	
	Indigofera monophylla (form not recorded)		√	
	Indigofera monophylla (grey leaflet form)		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Indigofera monophylla (grey/green leaflet form)		√	
	Indigofera monophylla (PAN57-9)		√	
	Indigofera monophylla (small leaflet form)		√	
	Indigofera trita		√	
	Isopogon atropurpurea		√	
	Isopogon forrestii		√	
	Kennedia prorepens		√	
	Leptosema chambersii		√	
	Lotus cruentus		√	
	Rhynchosia minima	√		
	Rhynchosia minima var. *australis*		√	
	Rhynchosia sp. Chichester (MET 15,225)		√	
	Sesbania cannabina	√	√	
	Swainsona ?laciniata	√		
	Swainsona decurrens		√	
	Swainsona formosa		√	
	Swainsona kingii	√	√	
	Swainsona leeana		√	
	Swainsona sp.		√	
	Swainsona stenodonta		√	
	Tephrosia aff. *clementii* (10) (HD88-3)		√	
	Tephrosia aff. *clementii* (12) (HD1-32)		√	
	Tephrosia aff. *clementii* (2)		√	
	Tephrosia aff. *clementii* (9) (HD284-6)		√	
	Tephrosia aff. *rosea* (HD292-37)		√	
	Tephrosia densa (ms)		√	
	Tephrosia rosea var. *glabrior* (ms)	√	√	
	Tephrosia sp.	√		
	Tephrosia sp. (seedling: may be one of spp. above)		√	
	Tephrosia sp. Bungaroo Creek (M.E.Trudgen 11601) (PN)		√	
	Tephrosia supina		√	
PITTOSPORACEAE	*Pittosporum angustifolium*	√		
PLUMBAGINACEAE	*Muellerolimon salicorniaceum*	√		√
POACEAE	*?Aristida* sp.	√		
	Aristida sp.			√
	Amphipogon sericeus		√	√
	Aristida anthoxanthoides		√	
	Aristida contorta	√	√	√
	Aristida holathera var. *holathera*	√	√	
	Aristida inaequiglumis		√	
	Aristida latifolia	√	√	
	Aristida obscura		√	
	Aristida sp. (?aff. nitidula)		√	
	Bothriochloa ewartiana		√	
	Brachyachne convergens	√	√	
	Brachyachne prostrata		√	
	**Cenchrus ciliaris*	√	√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	**Cenchrus setigerus*	√	√	
	**Chloris barbata*	√		
	Chloris pectinata	√	√	
	**Chloris virgata*		√	
	Chrysopogon fallax	√	√	
	Cymbopogon ambiguus	√	√	√
	Cymbopogon bombycinus		√	
	Cymbopogon dependens		√	
	Cymbopogon obtectus		√	
	Cymbopogon procerus		√	
	Dactyloctenium radulans	√	√	
	Dichanthium sericeum	√		
	Dichanthium sericeum subsp. *humilius*		√	
	Digitaria brownii		√	
	Digitaria ctenantha		√	
	**Echinochloa colona*		√	
	Elytrophorus spicatus		√	
	Enneapogon caerulescens	√		
	Enneapogon caerulescens var. *caerulescens*	√	√	
	Enneapogon lindleyanus		√	
	Enneapogon polyphyllus	√	√	
	Enneapogon robustissimus		√	
	Enteropogon acicularis		√	
	Enteropogon ramosus	√		
	Eragrostis aff. *eriopoda* (FMN18-73)		√	
	Eragrostis aff. eriopoda (was site 963)		√	
	Eragrostis cumingii	√	√	
	Eragrostis dielsii	√		
	Eragrostis eriopoda		√	
	Eragrostis exigua		√	
	Eragrostis leptocarpa	√	√	
	Eragrostis pergracilis	√	√	
	Eragrostis setifolia		√	
	Eragrostis tenellula	√	√	
	Eragrostis xerophila		√	
	Eriachne aff. mucronata (fine species MET 12,737)		√	
	Eriachne aff. *tenuiculmis*	√		
	Eriachne aristidea		√	
	Eriachne benthamii		√	
	Eriachne ciliata	√		
	Eriachne flaccida		√	
	Eriachne helmsii		√	
	Eriachne lanata	√	√	
	Eriachne mucronata	√		
	Eriachne mucronata (arid form) (MET 12 736)		√	
	Eriachne mucronata (typical form)		√	
	Eriachne obtusa	√	√	
	Eriachne pulchella subsp. *dominii*		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Eriachne sp.	√	√	
	Eriachne tenuiculmis	√	√	
	Eulalia aurea		√	
	Heteropogon contortus		√	
	Iseilema dolichotrichum		√	
	Iseilema eremaeum		√	
	Iseilema macratherum		√	
	Iseilema membranaceum	√	√	
	Iseilema vaginiflorum		√	
	Panicum decompositum		√	
	Panicum effusum	√		
	Panicum effusum var. *effusum*		√	
	Panicum laevinode		√	
	Panicum sp.	√		
	Paraneurachne muelleri	√	√	
	Paspalidium basicladum		√	
	Paspalidium clementii		√	
	Paspalidium rarum		√	
	Paspalidium sp.		√	
	Perotis rara		√	
	Poaceae sp.	√		
	Schizachyrium fragile		√	
	Setaria dielsii		√	
	Setaria surgens		√	
	** Setaria verticillata*		√	
	Sporobolus australasicus	√	√	
	Themeda sp. Hamersley Station (M.E.Trudgen 11431) (PN) (P3)	√	√	
	Themeda triandra	√	√	√
	Tragus australianus		√	
	Triodia aff. *basedowii*		√	
	Triodia aff. *basedowii*			√
	Triodia angusta	√		
	Triodia basedowii	√		√
	Triodia brizoides	√	√	
	Triodia epactia	√	√	√
	Triodia lanigera	√	√	
	Triodia longiceps	√	√	√
	Triodia melvillei		√	
	Triodia pungens	√	√	
	Triodia schinzii		√	
	Triodia sp.			√
	Triodia wiseana		√	
	Tripogon loliiformis		√	
	Triraphis mollis		√	
	Urochloa gilesii subsp. *gilesii* (glabrous florets)		√	
	Urochloa gilesii subsp. *occidentalis*		√	
	Urochloa holosericea subsp. *velutina*		√	
	Xerochloa laniflora	√		

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Yakirra australiensis	√		
	Yakirra australiensis var. *australiensis*		√	
	Euphorbia aff. *australis* var. 1 (MET 12 337)		√	
POLYGALACEAE	** Acetosa vesicaria*		√	
	Euphorbia aff. *boophthona* (large seed form)		√	
	Euphorbia aff. *coghlanii* (HD186-18)		√	
	Polygala aff. *isingii*		√	
POLYGONACEAE	*Muehlenbeckia florulenta*	√		
	Calandrinia ptychosperma		√	
PORTULACACEAE	*Calandrinia pumila*		√	
	Calandrinia schistorhiza		√	
	Calandrinia stagnensis		√	
	Portulaca cyclophylla	√		
	Portulaca oleracea		√	
	Portulaca pilosa		√	
PRIMULACEAE	*Samolus* ?sp. Millstream (M.I.H. Brooker 2076)	√		
	Samolus repens var. *floribundus*			√
PROTEACEAE	*Grevillea berryana*	√	√	
	Grevillea juncifolia		√	
	Grevillea pyramidalis		√	
	Grevillea pyramidalis subsp. *leucadendron*			√
	Grevillea sp.		√	
	Grevillea striata		√	
	Grevillea wickhamii			√
	Grevillea wickhamii subsp. *aprica*	√	√	√
	Grevillea wickhamii subsp. *hispidula*	√	√	
	Hakea chordophylla	√	√	√
	Hakea lorea subsp. *lorea*	√	√	√
	Oldenlandia crouchiana		√	
RUBIACEAE	*Psydrax latifolia*	√	√	√
	Psydrax rigidula	√		
	Psydrax suaveolens	√	√	
	Spermacoce auriculata	√		
	Spermacoce brachystema		√	
	Synaptantha tillaeacea var. *tillaeacea*		√	
	Anthobolus leptomerioides	√	√	
SANTALACEAE	*Santalum lanceolatum*		√	
	Atalaya hemiglauca	√	√	
	Corchorus aff. *sidoides* (HD179-5)		√	
	Diplopeltis stuartii var. *stuartii*		√	
	Dodonaea coriacea		√	
	Dodonaea lanceolata var. *lanceolata*		√	
	Dodonaea petiolaris	√	√	√
	Dodonaea viscosa subsp. *?spatulata*	√		
	Mimulus gracilis	√	√	
SCROPHULARIACEAE	*Peplidium aithocheilum*	√		
	Peplidium sp. C. Evol. Fl. Fauna Arid Aust. (N. T. Burbidge & A. Kanis 8158)		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Peplidium sp. Munjina (A. A. Mitchell PRP 595)		√	
	Stemodia grossa	√	√	
	Stemodia linophylla		√	
	Stemodia viscosa	√	√	
	Striga curviflora		√	
	Nicotiana benthamiana		√	
SOLANACEAE	*Nicotiana heterantha* (P1)	√		
	Nicotiana occidentalis	√		
	Nicotiana occidentalis subsp. *obliqua*		√	√
	Nicotiana occidentalis subsp. *occidentalis*	√	√	
	Nicotiana simulans		√	
	Solanum centrale		√	
	Solanum cleistogamum	√		
	Solanum diversiflorum		√	
	Solanum esuriale	√		
	Solanum horridum		√	
	Solanum lasiophyllum	√	√	
	Solanum phlomoides		√	
	Solanum sturtianum	√	√	
	Macgregoria racemigera		√	
STACKHOUSIACEAE	*Stackhousia intermedia*		√	
	Keraudrenia ?velutina subsp. *elliptica* (ms)	√		
STERCULIACEAE	*Keraudrenia nephrosperma*	√	√	√
	Keraudrenia velutina subsp. *elliptica* (ms)	√	√	
	Melhania oblongifolia		√	
	Melhania sp. (CH15-39)		√	
	Melhania sp. Turee Creek (MJ1-35)		√	
	Rulingia loxophylla	√	√	
	Rulingia luteiflora	√	√	
	Waltheria indica		√	
	Stylidium desertorum		√	
STYLIDIACEAE	*Stylobasium spathulatum*	√		
SURIANACEAE	*Pimelea ammocharis*		√	
THYMELEACEAE	*Corchorus crozophorifolius*		√	
TILIACEAE	*Corchorus lasiocarpus* subsp. aff. *lasiocarpus* (YEX24-11) (ms)		√	
	Corchorus lasiocarpus subsp. *lasiocarpus* (ms)		√	
	Corchorus lasiocarpus subsp. *parvus* (ms)	√	√	
	Corchorus parviflorus		√	
	Corchorus sidoides subsp. *sidoides*	√		
	Corchorus tectus (ms)		√	
	Corchorus tridens		√	
	Corchorus walcottii	√		
	Triumfetta chaetocarpa		√	
	Triumfetta maconochieana		√	
	?Typha domingensis	√	√	
TYPHACEAE	*Hybanthus aurantiacus*	√	√	
VIOLACEAE	*Tribulus astrocarpus*		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
ZYGOPHYLLACEAE	*Tribulus hirsutus*		√	
	Tribulus macrocarpus		√	
	Tribulus suberosus	√	√	√
	Tribulus terrestris		√	
	Zygophyllum iodocarpum		√	

APPENDIX E
VEGETATION CONDITION SCALE TRUDGEN (1991)

APPENDIX E

VEGETATION CONDITION SCALES

Definition of Condition Scales (Trudgen 1991)

Condition Code	Definition
E	**Excellent** Pristine or nearly so, no obvious signs of damage caused by the activities of European man.
VG	**Very Good** Some relatively slight signs of damage caused by the activities of European man, e.g. some signs of damage to tree trunks caused by repeated fire and the presence of some relatively non-aggressive weeds such as *Ursinia anthemoides* or *Briza* species, or occasional vehicle tracks.
G	**Good** More obvious signs of damage caused by the activities of European man, including some obvious impact on the vegetation structure such as caused by low levels of grazing or by selective logging. Weeds as above, possibly plus some more aggressive ones.
P	**Poor** Still retains basic vegetation structure or ability to regenerate to it after very obvious impacts of activities of European man such as grazing or partial clearing (chaining) or very frequent fires. Weeds as above, probably plus some more aggressive ones such as *Ehrharta* species.
VP	**Very Poor** Severely impacted by grazing, fire, clearing or a combination of these activities. Scope for some regeneration but, not to a state approaching good condition without intensive management. Usually with a number of weed species including aggressive species.
D	**Completely Degraded** Areas that are completely or almost completely without native species in the structure of their vegetation, e.g. areas that are cleared or "parkland cleared" with their flora comprising weed or crop species with isolated native trees or shrubs.

Source: Trudgen, ME (1991). *Vegetation Condition Scale*. In: *National Trust (WA) 1993 Urban Bushland Policy*. National trust of Australia (WA), Wildflower Society of Western Australia Inc. & the Tree Society Inc. Perth, Western Australia.

APPENDIX F
FLORA INVENTORY

APPENDIX F

FLORA INVENTORY

CHRISTMAS CREEK PROJECT AREA

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
ACANTHACEAE	*Dicladanthera forrestii*	√	√	
	Dipteracanthus australasicus	√		
	Dipteracanthus australasicus subsp. *australasicus*		√	
	Rostellularia adscendens var. *clementii*		√	
	Rostellularia adscendens var. *latifolia* (P3)	√		
ADIANTACEAE	*Cheilanthes brownii*		√	
	Cheilanthes sieberi subsp. sieberi	√	√	
AIZOACEAE	*Trianthema glossostigma*		√	
	Trianthema pilosa		√	
	Trianthema triquetra		√	
	Trianthema turgidifolia	√		
	Zaleya galericulata		√	
AMARANTHACEAE	*Achyranthes aspera*		√	
	** Aerva javanica*	√	√	
	Alternanthera nana		√	
	Alternanthera nodiflora	√	√	
	Amaranthus aff. *interruptus* (MET 16,114)		√	
	Amaranthus interruptus		√	
	Amaranthus pallidiflorus		√	
	Gomphrena affinis subsp. *pilbarensis*		√	
	Gomphrena canescens subsp. *canescens*	√		
	Gomphrena cunninghamii	√	√	
	Gomphrena kanisii		√	
	Gomphrena karijini			
	Gomphrena lanata		√	
	Ptilotus aervoides		√	
	Ptilotus aphyllus		√	
	Ptilotus appendiculatus var. *appendiculatus*		√	
	Ptilotus astrolasius var. *astrolasius*	√	√	
	Ptilotus auriculifolius		√	
	Ptilotus axillaris		√	
	Ptilotus calostachyus	√		√
	Ptilotus calostachyus var. *calostachyus*		√	
	Ptilotus carinatus		√	
	Ptilotus clementii		√	
	Ptilotus exaltatus	√		
	Ptilotus exaltatus var. *exaltatus*	√	√	
	Ptilotus fusiformis var. *fusiformis*	√	√	
	Ptilotus gaudichaudii	√		
	Ptilotus gaudichaudii var. *gaudichaudii*		√	
	Ptilotus gomphrenoides var. *gomphrenoides*		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Ptilotus helipteroides var. *helipteroides*		√	
	Ptilotus macrocephalus		√	
	Ptilotus obovatus var. *obovatus*	√	√	√
	Ptilotus polystachyus var. *polystachyus*	√	√	
	Ptilotus roei		√	
	Ptilotus rotundifolius		√	
	Ptilotus schwartzii var. *schwartzii*		√	
	Ptilotus sp. *LM100*	√		
APIACEAE	*Trachymene oleracea* subsp. *oleracea*		√	
APOCYNACEAE	*Carissa lanceolata*	√		
ASCLEPIADACEAE	*Marsdenia australis*		√	
	Rhyncharrhena linearis		√	
	Sarcostemma viminale subsp. *australe*	√	√	
ASTERACEAE	*Angianthus tomentosus*	√		
	** Bidens bipinnata*		√	
	** Bidens pilosa*	√		
	Blumea tenella	√	√	
	Brachyscome ciliocarpa		√	
	Calocephalus sp. Pilbara-Desert (M.E. Trugden 11454)		√	
	Calotis hispidula		√	
	Calotis plumulifera		√	
	Calotis porphyroglossa	√		
	Centipeda minima		√	
	Centipeda minima subsp. *macrocephala*	√		
	Centipeda thespidioides		√	
	Chrysocephalum aff. *apiculatum*		√	
	Flaveria australasica	√	√	
	Gnephosis arachnoidea		√	
	Helichrysum gilesii		√	
	Helichrysum luteoalbum	√		
	Minuria integerrima		√	
	Pluchea dentex	√	√	
	Pluchea dunlopii	√	√	
	Pluchea ferdinandi-muelleri		√	
	Pluchea rubelliflora	√	√	
	Pluchea tetranthera		√	
	Pterocaulon serrulatum		√	
	Pterocaulon sphacelatum	√		
	Pterocaulon sphaeranthoides		√	
	Pterocaulon sphaeranthoides x *sphacelatum*		√	
	Rhodanthe charsleyae		√	
	Rhodanthe floribunda		√	
	Rhodanthe margarethae		√	
	Rutidosis helichrysoides		√	
	Rutidosis helichrysoides subsp. *helichrysoides*		√	
	** Sigesbeckia orientalis*	√	√	
	** Sonchus oleraceus*		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Streptoglossa bubakii		√	
	Streptoglossa cylindriceps	√	√	
	Streptoglossa decurrens	√	√	
	Streptoglossa liatroides		√	
	Streptoglossa macrocephala		√	
	Streptoglossa sp.	√		
	Vittadinia arida	√	√	
	Vittadinia virgata		√	
BORAGINACEAE	*Ehretia saligna* var. *saligna*		√	
	Heliotropium chrysocarpum		√	
	Heliotropium crispatum		√	
	Heliotropium cunninghamii		√	
	**Heliotropium curassavicum*	√		√
	Heliotropium heteranthum		√	
	Heliotropium pachyphyllum		√	
	Heliotropium sp. *LM168*	√		
	Trichodesma zeylanicum	√		
	Trichodesma zeylanicum var. *zeylanicum*		√	
BRASSICACEAE	*Lepidium echinatum*		√	
	Lepidium muelleri-ferdinandii		√	
	Lepidium oxytrichum		√	
	Lepidium pedicellosum		√	
	Lepidium phlebopetalum		√	
	Lepidium pholidogynum		√	
	Stenopetalum anfractum		√	
	Stenopetalum decipiens		√	
	Stenopetalum nutans		√	
BYBLIDACEAE	*Byblis filifolia*		√	
CAESALPINIACEAE	*Petalostylis cassioides*		√	
	Petalostylis labicheoides	√		√
	Senna ?glaucifolia x aff. *oligophylla* (thinly sericeous) (FMR29-11)		√	
	Senna artemisioides subsp. aff. *oligophylla* (thinly sericeous)		√	
	Senna artemisioides subsp. aff. *oligophylla* (thinly sericeous)x *helmsii*		√	
	Senna artemisioides subsp. *helmsii*	√	√	
	Senna artemisioides subsp. *oligophylla*	√	√	
	Senna artemisioides subsp. *oligophylla* (thinly sericeous MET 15,035)		√	
	Senna artemisioides subsp. oligophylla x glaucifolia (HD13-14)		√	
	Senna artemisioides subsp. *oligophylla x glutinosa* (FMG116-02)		√	
	Senna artemisioides subsp. *oligophylla x helmsii*		√	
	Senna artemisioides subsp. *oligophylla x helmsii* (FMR75-01)		√	
	Senna artemisioides subsp. *x sturtii*		√	
	Senna curvistyla		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Senna glaucifolia	√	√	√
	Senna glaucifolia x ? (site 626)		√	
	Senna glutinosa subsp. *glutinosa*	√	√	√
	Senna glutinosa subsp. *pruinosa*	√	√	
	Senna glutinosa subsp. *x luerssenii*	√	√	√
	Senna glutinosa x luerssenii		√	
	Senna glutinosa x stricta		√	
	Senna hamersleyensis		√	
	Senna luerssenii x stricta		√	
	Senna notabilis	√	√	
	Senna sericea	√	√	
	Senna sp. Karijini (MET 10,392)		√	
	Senna sp. Meekatharra (E. Bailey 1-26)		√	
	Senna sp. West Angelas (MET 16,115)		√	
	Senna stricta		√	
	Senna symonii		√	
	Wahlenbergia tumidifructa		√	
CAPPARACEAE	*Capparis lasiantha*		√	
	Capparis umbonata		√	
	Cleome oxalidea		√	
	Cleome viscosa	√	√	
CARYOPHYLLACEAE	*Polycarpaea corymbosa* var. *corymbosa*	√	√	
	Polycarpaea holtzei	√	√	
	Polycarpaea involucrata		√	
	Polycarpaea longiflora	√	√	
CELASTRACEAE	*Maytenus* sp. Mt Windell (S. van Leeuwen 846)		√	
CHENOPODIACEAE	*Atriplex bunburyana*	√		
	Atriplex codonocarpa	√	√	
	Atriplex flabelliformis	√		√
	Atriplex lindleyi	√		
	Atriplex semilunaris	√		
	Chenopodium melanocarpum		√	
	Dissocarpus paradoxus	√		
	Dysphania glomulifera subsp. *eremaea*		√	
	Dysphania kalpari		√	
	Dysphania rhadinostachya	√		
	Dysphania rhadinostachya subsp. *rhadinostachya*		√	
	Enchylaena tomentosa	√		
	Enchylaena tomentosa var. *tomentosa*	√	√	
	Halosarcia auriculata	√		
	Halosarcia halocnemoides subsp. *halocnemoides*	√		
	Halosarcia halocnemoides subsp. *tenuis*	√		
	Halosarcia indica subsp. *bidens*	√		
	Halosarcia indica subsp. *leiostachya*	√		
	Maireana amoena	√		
	Maireana carnosa	√	√	
	Maireana georgei	√	√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Maireana luehmannii	√		√
	Maireana melanocoma		√	
	Maireana planifolia	√	√	
	Maireana planifolia x villosa		√	
	Maireana pyramidata	√	√	
	Maireana sp.			√
	Maireana thesioides		√	
	Maireana tomentosa		√	
	Maireana triptera	√		
	Maireana villosa		√	
	Rhagodia eremaea	√	√	
	Rhagodia sp. Hamersley (M. Trudgen 17794)		√	√
	Salsola tragus	√	√	
	Salsola tragus subsp. *tragus*	√		
	Sclerolaena alata	√		
	Sclerolaena bicornis var. *bicornis*		√	
	Sclerolaena cornishiana	√	√	
	Sclerolaena costata		√	
	Sclerolaena cuneata	√	√	
	Sclerolaena densiflora	√		√
	Sclerolaena eriacantha		√	
	Sclerolaena lanicuspis	√	√	
	Sclerolaena sp.			√
	Sclerolaena sp. nov. aff. *densiflora*		√	
	Tecticornia indica subsp. *bidens*			√
	Tecticornia indica subsp. *leiostachya*			√
	Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)			√
	Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)			√
	Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055)			√
	Tecticornia sp. Roy Hill (H. Pringle 62)			√
CONVOLVULACEAE	*Bonamia media* var. *villosa*		√	
	Bonamia rosea	√	√	
	Convolvulus angustissimus subsp. *angustissimus*		√	
	Cressa australis	√		√
	Evolvulus alsinoides	√		
	Evolvulus alsinoides var. *decumbens*	√	√	
	Evolvulus alsinoides var. *villosicalyx*		√	
	Ipomoea calobra		√	
	Ipomoea muelleri	√	√	
	Ipomoea polymorpha		√	
	Operculina aequisepala		√	
	Polymeria aff. *ambigua* (PAN 26B-20)		√	
	Polymeria aff. *calycina*		√	
	Porana commixta	√	√	
CUCURBITACEAE	** Citrullus colocynthis*		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Cucumis melo subsp. *agrestis*		√	
	Mukia maderaspatana	√	√	
CYPERACEAE	*?Eleocharis geniculata*	√		
	Bulbostylis barbata		√	
	Bulbostylis turbinata		√	
	Cyperus conicus		√	
	Cyperus hesperius	√		
	Cyperus iria		√	
	Cyperus vaginatus		√	
	Fimbristylis dichotoma		√	
	Fimbristylis leucocolea	√		
	Fimbristylis microcarya		√	
	Fimbristylis simulans		√	
	Schoenoplectus laevis		√	
ELATINACEAE	*Bergia pedicellaris*		√	
EUPHORBIACEAE	*Euphorbia australis* (mid-green form)		√	
	Euphorbia biconvexa		√	
	Euphorbia coghlanii	√	√	
	Euphorbia sp.			√
	Euphorbia sp. (BPBS10-50)			
	Euphorbia sp. (FML49-02)		√	
	Euphorbia sp. (FMLMC-10)		√	
	Euphorbia sp. (FMR15-29)		√	
	Euphorbia sp. (FMR46-21)		√	
	Euphorbia sp. (FMR70-12)		√	
	Euphorbia sp. (PAN5-15)		√	
	Euphorbia sp. (site 1089)		√	
	Euphorbia tannensis subsp. *eremophila* (Hamersley form)		√	
	Flueggea virosa subsp. *melanthesoides*	√	√	
	Leptopus decaisnei var. *decaisnei*		√	
	Phyllanthus erwinii		√	
	Phyllanthus maderaspatensis	√	√	
	Sauropus sp. Central Ranges (D .J. Edinger et. al. 2420)		√	
FRANKENIACEAE	*Frankenia ambita*	√		√
	Frankenia irregularis	√		
GENTIANACEAE	*Centaurium clementii*	√		
GOODENIACEAE	*Brunonia australis*		√	
	Dampiera candicans	√	√	
	Dampiera cinerea		√	
	Goodenia armitiana		√	
	Goodenia cusackiana	√	√	
	Goodenia lamprosperma		√	
	Goodenia microptera		√	
	Goodenia muelleriana		√	
	Goodenia nuda		√	
	Goodenia prostrata		√	
	Goodenia sp.		√	
	Goodenia stobbsiana	√	√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Goodenia tenuiloba	√		
	Goodenia triodiophila	√	√	
	Goodenia vilmoriniae		√	
	Scaevola amblyanthera var. *centralis*		√	
	Scaevola parvifolia subsp. *pilbarae*		√	
	Scaevola spinescens	√		√
	Scaevola spinescens (broad form)		√	
	Scaevola spinescens (narrow form)		√	
GYROSTEMONACEAE	*Codonocarpus cotinifolius*	√	√	
	Gyrostemon tepperi		√	
HALORAGACEAE	*Haloragis gossei*		√	
JUNCAGINACEAE	*Triglochin hexagona*	√		
LAMIACEAE	*Basilicum polystachyon*		√	
	Clerodendrum floribundum var. *angustifolium*		√	
	Dicrastylis georgei		√	
	Dicrastylis sp.		√	
	Newcastelia hexarrhena		√	
	Newcastelia sp. Hamersley Range (S. van Leeuwen 4264)		√	
LAURACEAE	*Cassytha capillaris*		√	
	Cassytha filiformis		√	
LORANTHACEAE	*Amyema fitzgeraldii*	√	√	
LYTHRACEAE	*Ammannia multiflora*		√	
MALVACEAE	*Abutilon* aff. *lepidum* (1) (MET 15 352)		√	
	Abutilon aff. *lepidum* (2) (MET 15 970)		√	
	Abutilon aff. *lepidum* (4)		√	
	Abutilon amplum		√	
	Abutilon cryptopetalum		√	
	Abutilon cunninghamii		√	
	Abutilon dioicum			
	Abutilon fraseri		√	
	Abutilon lepidum	√	√	
	Abutilon leucopetalum		√	
	Abutilon macrum		√	
	Abutilon otocarpum	√		
	Abutilon otocarpum (acute leaf form)	√	√	
	Abutilon oxycarpum subsp. *prostratum*		√	
	Abutilon sp.	√		
	Abutilon trudgenii		√	
	Gossypium australe	√		
	Gossypium australe (Burrup Peninsula form)	√	√	
	Gossypium robinsonii		√	
	Hibiscus aff. *coatesii*		√	
	Hibiscus aff. *coatesii* (site 664)		√	
	Hibiscus aff. *goldsworthii* (site 1260)		√	
	Hibiscus aff. *platychlamys* (FMG88-08)		√	
	Hibiscus aff. *platychlamys* (site 1139)		√	
	Hibiscus aff. *sturtii* (site 1209)		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Hibiscus aff. *sturtii* (site 903)		√	
	Hibiscus brachychlaenus		√	
	Hibiscus brachysiphonius (P3)		√	
	Hibiscus burtonii	√	√	
	Hibiscus coatesii	√	√	
	Hibiscus gardneri (ms)		√	
	Hibiscus leptocladus		√	
	Hibiscus panduriformis	√		
	Hibiscus platychlamys		√	
	Hibiscus sp. (site 316)		√	
	Hibiscus sturtii var. *?platychlamys*	√		
	Hibiscus sturtii var. aff. *campylochlamys* (MET 15,957)		√	
	Hibiscus sturtii var. aff. *campylochlamys* (site 1398)		√	
	Hibiscus sturtii var. aff. *grandiflorus*		√	
	Hibiscus sturtii var. *campylochlamys*	√	√	
	Hibiscus sturtii var. *platychlamys*	√	√	
	Hibiscus sturtii var. *truncatus*		√	
	Hibiscus trionum var. *vesicarius*		√	
	Lawrencia ?densiflora	√		
	** Malvastrum americanum*	√	√	
	Sida aff. *cardiophylla*		√	
	Sida aff. *cardiophylla* (site 1086)		√	
	Sida aff. *cardiophylla* (site 1215)		√	
	Sida aff. *clementii* (FML22-46)		√	
	Sida aff. *echinocarpa* (MET 15,350)		√	
	Sida aff. *excedentifolia* (FML58-14A) (ms)	√	√	
	Sida aff. *fibulifera* (FMG125-20)		√	
	Sida aff. *fibulifera* (HD186.1)		√	
	Sida aff. *fibulifera* (HD200-6)		√	
	Sida aff. *fibulifera* (MET 16,494)		√	
	Sida aff. *fibulifera* (site 1394)		√	
	Sida aff. *fibulifera* (site 1506)		√	
	Sida aff. *fibulifera* 'var. L'		√	
	Sida arenicola		√	
	Sida atrovirens (ms)	√	√	
	Sida brownii		√	
	Sida cardiophylla	√	√	
	Sida clementii		√	
	Sida echinocarpa		√	
	Sida excedentifolia (ms)	√	√	
	Sida fibulifera			
	Sida platycalyx		√	
	Sida sp. (MET 16,086)		√	
	Sida sp. ?Shovelanna Hill (S. van Leeuwen 3842)	√		
	Sida sp. aff. spiciform panicles (FML46-13)		√	
	Sida sp. Roy Hill Station (M.Maier 17/3704)		√	
	Sida sp. rugose (ms)		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Sida sp. spiciform panicles (E.Leyland s.n. 14/8/90)		√	
	Sida sp. unisexual (N.H. Speck 574)		√	
	Sida sp. Wittenoom (W.R. Barker 1962)		√	
	Sida spinosa	√	√	
MIMOSACEAE	*Acacia ?stenophylla*	√		
	Acacia acradenia	√	√	√
	Acacia adoxa var. *adoxa*	√	√	
	Acacia adsurgens	√	√	
	Acacia aff. *aneura* (grey flat, recurved tips; MET 15828)		√	
	Acacia aff. *aneura* (long, flat, recurved; FMR 35.3)		√	√
	Acacia aff. *aneura* (narrow fine veined; site 1259)		√	√
	Acacia aff. *stowardii* (linear form)		√	
	Acacia ampliceps	√		
	Acacia ancistrocarpa	√	√	√
	Acacia aneura (flat curved; MET 15548)		√	
	Acacia aneura (grey bushy form; MET 15732)		√	
	Acacia aneura (grey flat recurved tips; MET 15828)		√	
	Acacia aneura var. *?aneura/intermedia*	√	√	
	Acacia aneura var. *aneura*	√		
	Acacia aneura var. *conifera*	√	√	
	Acacia aneura var. *intermedia*	√		
	Acacia aneura var. *longicarpa*		√	
	Acacia aneura var. *microcarpa*			√
	Acacia arida	√	√	
	Acacia atkinsiana		√	
	Acacia ayersiana	√	√	√
	Acacia bivenosa		√	√
	Acacia bivenosa (wispy/weeping form)		√	
	Acacia bivenosa x ampliceps		√	
	Acacia catenulata		√	
	Acacia citrinoviridis		√	
	Acacia citrinoviridis x (FMN09-02)		√	
	Acacia coriacea subsp. *pendens*	√	√	√
	Acacia coriacea subsp. *sericophylla*	√	√	
	Acacia cowleana		√	
	Acacia dictyophleba		√	
	Acacia distans	√		
	Acacia elachantha		√	
	Acacia elachantha (golden hairy variant)		√	
	Acacia elachantha (silvery hairy variant)		√	
	Acacia eriopoda	√	√	
	Acacia farnesiana		√	
	Acacia hilliana	√	√	
	Acacia inaequilatera	√	√	√

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Acacia kempeana	√		
	Acacia maitlandii	√	√	√
	Acacia marramamba	√	√	√
	Acacia melleodora		√	
	Acacia monticola	√	√	
	Acacia monticola x tumida x pilbarensis		√	
	Acacia pachyacra		√	
	Acacia paraneura		√	
	Acacia pruinocarpa	√	√	√
	Acacia pyrifolia	√	√	√
	Acacia rhodophloia	√	√	√
	Acacia sclerosperma subsp. *sclerosperma*	√	√	
	Acacia sericophylla	√		
	Acacia sibirica			
	Acacia spondylophylla	√	√	
	Acacia stowardii (crowded smaller phyllodes)		√	
	Acacia synchronicia	√	√	√
	Acacia synchronicia (narrow phyllode form)		√	
	Acacia tenuissima	√	√	
	Acacia tetragonophylla	√	√	√
	Acacia trachycarpa		√	
	Acacia tumida	√		
	Acacia tumida var. *pilbarensis*		√	√
	Acacia tumida var. *tumida*	√		
	Acacia validinervia		√	
	Acacia victoriae	√	√	
	Acacia wanyu		√	
	Acacia xiphophylla	√	√	
	Neptunia dimorphantha		√	
MOLLUGINACEAE	*Mollugo molluginis*		√	
MORACEAE	*Ficus brachypoda*		√	
MYOPORACEAE	*Eremophila cuneifolia*	√	√	
	Eremophila exilifolia		√	
	Eremophila forrestii	√		√
	Eremophila forrestii subsp. *forrestii* (ms)	√	√	
	Eremophila forrestii x latrobei		√	
	Eremophila lanceolata (ms)	√	√	
	Eremophila latrobei subsp. aff. *filiformis* (ms)		√	
	Eremophila latrobei subsp. *filiformis* (ms)	√	√	
	Eremophila latrobei subsp. *glabra*		√	
	Eremophila longifolia	√	√	
	Eremophila maculata	√		
	Eremophila pachomai (ms)		√	
	Eremophila pilosa (ms) (P1)		√	
	Eremophila platycalyx subsp. platycalyx (ms)	√		
	Eremophila spongiocarpa (ms) (P1)	√		√
	Eremophila youngii subsp. lepidota (ms)	√		

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	(P4)			
MYRTACEAE	*Calytrix carinata*	√	√	√
	Corymbia candida subsp. *candida*	√	√	
	Corymbia candida subsp. *dipsodes*		√	√
	Corymbia deserticola	√		
	Corymbia deserticola subsp. *deserticola*	√	√	
	Corymbia ferriticola			√
	Corymbia ferriticola subsp. *ferriticola*		√	
	Corymbia hamersleyana		√	√
	Corymbia opaca	√		
	Eucalyptus camaldulensis		√	
	Eucalyptus camaldulensis var. *obtusa*	√		
	Eucalyptus gamophylla	√	√	
	Eucalyptus leucophloia	√		
	Eucalyptus leucophloia subsp. *leucophloia*	√	√	√
	Eucalyptus trivalvis		√	
	Eucalyptus victrix	√	√	√
	Eucalyptus xerothermica		√	
	Melaleuca glomerata	√	√	√
	Melaleuca lasiandra	√		
	Melaleuca leiocarpa	√		
NYCTAGINACEAE	*Boerhavia burbidgeana*		√	
	Boerhavia coccinea		√	
	Boerhavia repleta		√	
	Boerhavia schomburgkiana	√		
OLEACEAE	*Jasminum didymum* subsp. *lineare*		√	
PAPAVERACEAE	* *Argemone ochroleuca* subsp. *ochroleuca*		√	
PAPILIONACEAE	*Aeschynomene indica*		√	
	Alysicarpus muelleri		√	
	Crotalaria dissitiflora subsp. *benthamiana*		√	
	Crotalaria medicaginea		√	
	Cullen cinereum	√	√	
	Cullen graveolens		√	
	Cullen leucanthum		√	
	Cullen leucochaites		√	
	Cullen martinii	√	√	
	Cullen pogonocarpum		√	
	Gastrolobium grandiflorum	√		
	Glycine canescens		√	
	Gompholobium polyzygum	√		
	Indigofera brevidens	√		
	Indigofera colutea		√	
	Indigofera georgei		√	
	Indigofera linifolia		√	
	Indigofera linnaei		√	
	Indigofera monophylla	√		
	Indigofera monophylla (brown calyx form)		√	
	Indigofera monophylla (FMR35-01)		√	
	Indigofera monophylla (form not recorded)		√	
	Indigofera monophylla (grey leaflet form)		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Indigofera monophylla (grey/green leaflet form)		√	
	Indigofera monophylla (PAN57-9)		√	
	Indigofera monophylla (small leaflet form)		√	
	Indigofera trita		√	
	Isopogon atropurpurea		√	
	Isopogon forrestii		√	
	Kennedia prorepens		√	
	Leptosema chambersii		√	
	Lotus cruentus		√	
	Rhynchosia minima	√		
	Rhynchosia minima var. *australis*		√	
	Rhynchosia sp. Chichester (MET 15,225)		√	
	Sesbania cannabina	√	√	
	Swainsona ?laciniata	√		
	Swainsona decurrens		√	
	Swainsona formosa		√	
	Swainsona kingii	√	√	
	Swainsona leeana		√	
	Swainsona sp.		√	
	Swainsona stenodonta		√	
	Tephrosia aff. *clementii* (10) (HD88-3)		√	
	Tephrosia aff. *clementii* (12) (HD1-32)		√	
	Tephrosia aff. *clementii* (2)		√	
	Tephrosia aff. *clementii* (9) (HD284-6)		√	
	Tephrosia aff. *rosea* (HD292-37)		√	
	Tephrosia densa (ms)		√	
	Tephrosia rosea var. *glabrior* (ms)	√	√	
	Tephrosia sp.	√		
	Tephrosia sp. (seedling: may be one of spp. above)		√	
	Tephrosia sp. Bungaroo Creek (M.E.Trudgen 11601) (PN)		√	
	Tephrosia supina		√	
PITTOSPORACEAE	*Pittosporum angustifolium*	√		
PLUMBAGINACEAE	*Muellerolimon salicorniaceum*	√		√
POACEAE	*?Aristida* sp.	√		
	Aristida sp.			√
	Amphipogon sericeus		√	√
	Aristida anthoxanthoides		√	
	Aristida contorta	√	√	√
	Aristida holathera var. *holathera*	√	√	
	Aristida inaequiglumis		√	
	Aristida latifolia	√	√	
	Aristida obscura		√	
	Aristida sp. (?aff. nitidula)		√	
	Bothriochloa ewartiana		√	
	Brachyachne convergens	√	√	
	Brachyachne prostrata		√	
	**Cenchrus ciliaris*	√	√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	**Cenchrus setigerus*	√	√	
	**Chloris barbata*	√		
	Chloris pectinata	√	√	
	**Chloris virgata*		√	
	Chrysopogon fallax	√	√	
	Cymbopogon ambiguus	√	√	√
	Cymbopogon bombycinus		√	
	Cymbopogon dependens		√	
	Cymbopogon obtectus		√	
	Cymbopogon procerus		√	
	Dactyloctenium radulans	√	√	
	Dichanthium sericeum	√		
	Dichanthium sericeum subsp. *humilius*		√	
	Digitaria brownii		√	
	Digitaria ctenantha		√	
	**Echinochloa colona*		√	
	Elytrophorus spicatus		√	
	Enneapogon caerulescens	√		
	Enneapogon caerulescens var. *caerulescens*	√	√	
	Enneapogon lindleyanus		√	
	Enneapogon polyphyllus	√	√	
	Enneapogon robustissimus		√	
	Enteropogon acicularis		√	
	Enteropogon ramosus	√		
	Eragrostis aff. *eriopoda* (FMN18-73)		√	
	Eragrostis aff. eriopoda (was site 963)		√	
	Eragrostis cumingii	√	√	
	Eragrostis dielsii	√		
	Eragrostis eriopoda		√	
	Eragrostis exigua		√	
	Eragrostis leptocarpa	√	√	
	Eragrostis pergracilis	√	√	
	Eragrostis setifolia		√	
	Eragrostis tenellula	√	√	
	Eragrostis xerophila		√	
	Eriachne aff. mucronata (fine species MET 12,737)		√	
	Eriachne aff. *tenuiculmis*	√		
	Eriachne aristidea		√	
	Eriachne benthamii		√	
	Eriachne ciliata	√		
	Eriachne flaccida		√	
	Eriachne helmsii		√	
	Eriachne lanata	√	√	
	Eriachne mucronata	√		
	Eriachne mucronata (arid form) (MET 12 736)		√	
	Eriachne mucronata (typical form)		√	
	Eriachne obtusa	√	√	
	Eriachne pulchella subsp. *dominii*		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Eriachne sp.	√	√	
	Eriachne tenuiculmis	√	√	
	Eulalia aurea		√	
	Heteropogon contortus		√	
	Iseilema dolichotrichum		√	
	Iseilema eremaeum		√	
	Iseilema macratherum		√	
	Iseilema membranaceum	√	√	
	Iseilema vaginiflorum		√	
	Panicum decompositum		√	
	Panicum effusum	√		
	Panicum effusum var. *effusum*		√	
	Panicum laevinode		√	
	Panicum sp.	√		
	Paraneurachne muelleri	√	√	
	Paspalidium basicladum		√	
	Paspalidium clementii		√	
	Paspalidium rarum		√	
	Paspalidium sp.		√	
	Perotis rara		√	
	Poaceae sp.	√		
	Schizachyrium fragile		√	
	Setaria dielsii		√	
	Setaria surgens		√	
	** Setaria verticillata*		√	
	Sporobolus australasicus	√	√	
	Themeda sp. Hamersley Station (M.E.Trudgen 11431) (PN) (P3)	√	√	
	Themeda triandra	√	√	√
	Tragus australianus		√	
	Triodia aff. *basedowii*		√	
	Triodia aff. *basedowii*			√
	Triodia angusta	√		
	Triodia basedowii	√		√
	Triodia brizoides	√	√	
	Triodia epactia	√	√	√
	Triodia lanigera	√	√	
	Triodia longiceps	√	√	√
	Triodia melvillei		√	
	Triodia pungens	√	√	
	Triodia schinzii		√	
	Triodia sp.			√
	Triodia wiseana		√	
	Tripogon loliiformis		√	
	Triraphis mollis		√	
	Urochloa gilesii subsp. *gilesii* (glabrous florets)		√	
	Urochloa gilesii subsp. *occidentalis*		√	
	Urochloa holosericea subsp. *velutina*		√	
	Xerochloa laniflora	√		

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Yakirra australiensis	√		
	Yakirra australiensis var. *australiensis*		√	
	Euphorbia aff. *australis* var. 1 (MET 12 337)		√	
POLYGALACEAE	** Acetosa vesicaria*		√	
	Euphorbia aff. *boophthona* (large seed form)		√	
	Euphorbia aff. *coghlanii* (HD186-18)		√	
	Polygala aff. *isingii*		√	
POLYGONACEAE	*Muehlenbeckia florulenta*	√		
	Calandrinia ptychosperma		√	
PORTULACACEAE	*Calandrinia pumila*		√	
	Calandrinia schistorhiza		√	
	Calandrinia stagnensis		√	
	Portulaca cyclophylla	√		
	Portulaca oleracea		√	
	Portulaca pilosa		√	
PRIMULACEAE	*Samolus* ?sp. Millstream (M.I.H. Brooker 2076)	√		
	Samolus repens var. *floribundus*			√
PROTEACEAE	*Grevillea berryana*	√	√	
	Grevillea juncifolia		√	
	Grevillea pyramidalis		√	
	Grevillea pyramidalis subsp. *leucadendron*			√
	Grevillea sp.		√	
	Grevillea striata		√	
	Grevillea wickhamii			√
	Grevillea wickhamii subsp. *aprica*	√	√	√
	Grevillea wickhamii subsp. *hispidula*	√	√	
	Hakea chordophylla	√	√	√
	Hakea lorea subsp. *lorea*	√	√	√
	Oldenlandia crouchiana		√	
RUBIACEAE	*Psydrax latifolia*	√	√	√
	Psydrax rigidula	√		
	Psydrax suaveolens	√	√	
	Spermacoce auriculata	√		
	Spermacoce brachystema		√	
	Synaptantha tillaeacea var. *tillaeacea*		√	
	Anthobolus leptomerioides	√	√	
SANTALACEAE	*Santalum lanceolatum*		√	
	Atalaya hemiglauca	√	√	
	Corchorus aff. *sidoides* (HD179-5)		√	
	Diplopeltis stuartii var. *stuartii*		√	
	Dodonaea coriacea		√	
	Dodonaea lanceolata var. *lanceolata*		√	
	Dodonaea petiolaris	√	√	√
	Dodonaea viscosa subsp. *?spatulata*	√		
	Mimulus gracilis	√	√	
SCROPHULARIACEAE	*Peplidium aithocheilum*	√		
	Peplidium sp. C. Evol. Fl. Fauna Arid Aust. (N. T. Burbidge & A. Kanis 8158)		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
	Peplidium sp. Munjina (A. A. Mitchell PRP 595)		√	
	Stemodia grossa	√	√	
	Stemodia linophylla		√	
	Stemodia viscosa	√	√	
	Striga curviflora		√	
	Nicotiana benthamiana		√	
SOLANACEAE	*Nicotiana heterantha* (P1)	√		
	Nicotiana occidentalis	√		
	Nicotiana occidentalis subsp. *obliqua*		√	√
	Nicotiana occidentalis subsp. *occidentalis*	√	√	
	Nicotiana simulans		√	
	Solanum centrale		√	
	Solanum cleistogamum	√		
	Solanum diversiflorum		√	
	Solanum esuriale	√		
	Solanum horridum		√	
	Solanum lasiophyllum	√	√	
	Solanum phlomoides		√	
	Solanum sturtianum	√	√	
	Macgregoria racemigera		√	
STACKHOUSIACEAE	*Stackhousia intermedia*		√	
	Keraudrenia ?velutina subsp. *elliptica* (ms)	√		
STERCULIACEAE	*Keraudrenia nephrosperma*	√	√	√
	Keraudrenia velutina subsp. *elliptica* (ms)	√	√	
	Melhania oblongifolia		√	
	Melhania sp. (CH15-39)		√	
	Melhania sp. Turee Creek (MJ1-35)		√	
	Rulingia loxophylla	√	√	
	Rulingia luteiflora	√	√	
	Waltheria indica		√	
	Stylidium desertorum		√	
STYLIDIACEAE	*Stylobasium spathulatum*	√		
SURIANACEAE	*Pimelea ammocharis*		√	
THYMELEACEAE	*Corchorus crozophorifolius*		√	
TILIACEAE	*Corchorus lasiocarpus* subsp. aff. *lasiocarpus* (YEX24-11) (ms)		√	
	Corchorus lasiocarpus subsp. *lasiocarpus* (ms)		√	
	Corchorus lasiocarpus subsp. *parvus* (ms)	√	√	
	Corchorus parviflorus		√	
	Corchorus sidoides subsp. *sidoides*	√		
	Corchorus tectus (ms)		√	
	Corchorus tridens		√	
	Corchorus walcottii	√		
	Triumfetta chaetocarpa		√	
	Triumfetta maconochieana		√	
	?Typha domingensis	√	√	
TYPHACEAE	*Hybanthus aurantiacus*	√	√	
VIOLACEAE	*Tribulus astrocarpus*		√	

Family	Species	Mattiske 2004-2006	Biota 2005	Christmas Creek, ENV 2010
ZYGOPHYLLACEAE	*Tribulus hirsutus*		√	
	Tribulus macrocarpus		√	
	Tribulus suberosus	√	√	√
	Tribulus terrestris		√	
	Zygophyllum iodocarpum		√	

APPENDIX G

MATRIX OF SPECIES FOUND WITHIN SURVEY AREA

APPENDIX G
SPECIES MATRIX

Species	CD01	CD02	CD03	CD04	CD05	CD06	CD07	CD08	CD09	CD10	CD11	CD12	CD13	CD14	CD15	CD16	CD17
Acacia acradenia												+					
Acacia aff. *aneura* (long, flat, recurved; FMR 35.3)																	
Acacia aff. *aneura* (narrow fine veined; site 1259)																	
Acacia ancistrocarpa																	
Acacia aneura var. *microcarpa*											+						
Acacia ayersiana																	
Acacia bivenosa																	
Acacia coriacea subsp. *pendens*																	
Acacia inaequilatera											1%	+					
Acacia maitlandii											1%						
Acacia marramamba											+						
Acacia pruinocarpa											+	+					
Acacia pyrifolia																	
Acacia rhodophloia																	
Acacia synchronicia						2%											
Acacia tetragonophylla																	
Acacia tumida var. pilbarensis																	
Amphipogon sericeus						+											
Aristida contorta																	
Aristida sp.																	
Atriplex flabelliformis													1%				
Calytrix carinata												+					
Corymbia candida subsp. *dipsodes*																	
Corymbia ferriticola											+						
Corymbia hamersleyana																	
Cressa australis													+				+
Cymbopogon ambiguus																	
Dodonaea petiolaris																	
Eremophila forrestii																	
Eremophila spongiocarpa						+											
Eucalyptus leucophloia											3%						
Eucalyptus leucophloia subsp. *leucophloia*												1%					
Eucalyptus victrix																	
Euphorbia sp.									2-3%	(40%)				1%			
Frankenia ambita													+				
Grevillea pyramidalis subsp. *leucadendron*											+						
Grevillea wickhamii																	
Grevillea wickhamii subsp. *aprica*											4%	2%					
Hakea chordophylla											1%	1%					

APPENDIX G
SPECIES MATRIX

Species	CD01	CD02	CD03	CD04	CD05	CD06	CD07	CD08	CD09	CD10	CD11	CD12	CD13	CD14	CD15	CD16	CD17
Hakea lorea subsp. *lorea*																	
Heliotropium curassavicum													3%				
Keraudrenia nephrosperma																	
Maireana luehmannii									+								
Maireana sp.																	
Melaleuca glomerata																	
Muellerolimon salicorniaceum			6%				1%		3%	<1%			5%	8%	+	25%	2%
Nicotiana occidentalis subsp. *obliqua*													+				
Petalostylis labicheoides																	
Psydrax latifolia																	
Ptilotus calostachyus												(+)					
Ptilotus obovatus var. *obovatus*																	
Rhagodia sp. Hamersley (M. Trudgen 17794)																	
Samolus repens var. *floribundus*			(1%)														
Scaevola spinescens						15%											
Sclerolaena densiflora																	
Sclerolaena sp.																	
Senna glaucifolia																	
Senna glutinosa subsp. *glutinosa*																	
Senna glutinosa subsp. *luerssenii*												+					
Tecticornia auriculata	1%	40%		1%	<1%				+				2%	2%	8%	2%	
Tecticornia indica subsp. *bidens*	60%			60%		20%	55%		60%	+			1%		6%		30%
Tecticornia indica subsp. *leiostachya*	2%		<1%	+													10%
Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)	1%	4%	10%	+				+						38%	10%	1%	
Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)	<1%	+		1%			10%								+	2%	
Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055)	+			+	60%												
Tecticornia sp. Roy Hill (H. Pringle 62)		+											+	+		+	
Themeda triandra																	
Tribulus suberosus																	
Triodia aff. *basedowii*											5%						
Triodia basedowii												20%					
Triodia epactia																	
Triodia longiceps																	
Triodia sp.											45%	5%					

APPENDIX G
SPECIES MATRIX

Species	CD18	CD20	CD21	CDR024	CDR025	CDR027	CDR029	CDR030	CDR031	CDR032	CDR033	CDR034	CDR035	CDR036	CDR037	CDR038	CDR039	CDR040
Acacia acradenia		+	+	1%			3%	+										
Acacia aff. *aneura* (long, flat, recurved; FMR 35.3)											8%			1%				
Acacia aff. *aneura* (narrow fine veined; site 1259)				2%	8%				1%	10%	2%	7%			3%		5%	
Acacia ancistrocarpa							3%	3%								2%		1%
Acacia aneura var. *microcarpa*																		
Acacia ayersiana					1%													
Acacia bivenosa			nc						+									
Acacia coriacea subsp. *pendens*														3%				
Acacia inaequilatera																		
Acacia maitlandii						1%												
Acacia marramamba							+	1%										
Acacia pruinocarpa				1%	4%	1%			2%	1%	1%	2%					2%	
Acacia pyrifolia						+	1%		1%					1%		1%		+
Acacia rhodophloia															1%			
Acacia synchronicia												+	5%					
Acacia tetragonophylla					1%					+		1%			+		+	
Acacia tumida var. pilbarensis									7%					+				
Amphipogon sericeus																		
Aristida contorta					(2%)													
Aristida sp.									(+)				(1%)	(+)				
Atriplex flabelliformis																		
Calytrix carinata																		
Corymbia candida subsp. *dipsodes*		+																
Corymbia ferriticola																		
Corymbia hamersleyana														+				
Cressa australis																		
Cymbopogon ambiguus			+															
Dodonaea petiolaris					2%					4%	1%				1%		+	
Eremophila forrestii										+								
Eremophila spongiocarpa																		
Eucalyptus leucophloia				+		1%	1%	1%								1%		1%
Eucalyptus leucophloia subsp. *leucophloia*			1%															
Eucalyptus victrix									+					4%				
Euphorbia sp.																		
Frankenia ambita																		
Grevillea pyramidalis subsp. *leucadendron*		+																
Grevillea wickhamii				+		1%	+	+	1%					+				
Grevillea wickhamii subsp. *aprica*		1%																
Hakea chordophylla																		

APPENDIX G
SPECIES MATRIX

Species	CD18	CD20	CD21	CDR024	CDR025	CDR027	CDR029	CDR030	CDR031	CDR032	CDR033	CDR034	CDR035	CDR036	CDR037	CDR038	CDR039	CDR040
Hakea lorea subsp. *lorea*			+			+		+								+		+
Heliotropium curassavicum																		
Keraudrenia nephrosperma		+																
Maireana luehmannii																		
Maireana sp.												(+)						
Melaleuca glomerata														1%				
Muellerolimon salicorniaceum																		
Nicotiana occidentalis subsp. *obliqua*																		
Petalostylis labicheoides														+				
Psydrax latifolia					+					+	+	+			1%		+	
Ptilotus calostachyus																		
Ptilotus obovatus var. *obovatus*								+		(1%)	(1%)	+			+		+	
Rhagodia sp. Hamersley (M. Trudgen 17794)												+						
Samolus repens var. *floribundus*																		
Scaevola spinescens																		
Sclerolaena densiflora			+															
Sclerolaena sp.					(1%)					(+)	(1%)	(+)			(+)			
Senna glaucifolia		+											+					
Senna glutinosa subsp. *glutinosa*							1%											+
Senna glutinosa subsp. *luerssenii*		+	+															
Tecticornia auriculata	2%																	
Tecticornia indica subsp. *bidens*	3%																	
Tecticornia indica subsp. *leiostachya*	+																	
Tecticornia sp. Christmas Creek (K. A. Shepherd et. al. KS 1063)																		
Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)																		
Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055)																		
Tecticornia sp. Roy Hill (H. Pringle 62)	2%																	
Themeda triandra									+									
Tribulus suberosus		+	+															
Triodia aff. *basedowii*																		
Triodia basedowii		50%	10%	30%		30%	20%	25%								35%		40%
Triodia epactia						15%	5%	5%	5%							5%	1%	5%
Triodia longiceps			15%											+				
Triodia sp.																		

APPENDIX H
LOCATION OF PRIORITY FLORA

APPENDIX H

LOCATION OF PRIORITY FLORA

Taxa	Site Number	# Easting	# Northing	% Cover	Project Area
Atriplex flabelliformis (P3)	CD13	778717	7508563	1%	Christmas Creek
Eremophila spongiocarpa (P1)	CD06	774559	7516179	<1%	Christmas Creek
Rhagodia sp. Harsley (M. Trudgen 17794) (P3)	CDR034	790864	7518008	<1%	Christmas Creek
Tecticornia sp. Christmas Creek (K.A. Shepherd & T. Colmer et al. KS 1063) (P1)	CD01	772554	7514997	1%	Christmas Creek
	CD02	783341	7506483	4%	Christmas Creek
	CD03	783577	7509250	14%	Christmas Creek
	CD04	770611	7515987	<1%	Christmas Creek
	CD08	769826	7515577	<1%	Christmas Creek
	CD14	780506	7507012	38%	Christmas Creek
	CD15	780734	7509500	13%	Christmas Creek
	CD16	781968	7508263	1%	Christmas Creek
Tecticornia sp. Fortescue Marsh (K.A. Shepherd et al. KS 1055) (P1)	CD01	772554	7514997	<1%	Christmas Creek
	CD04	770611	7515987	<1%	Christmas Creek
	CD05	768382	7514715	60%	Christmas Creek
Tecticornia sp. Roy Hill (H. Pringle 62) (P3)	CD02	783341	7506483	<1%	Christmas Creek
	CD13	778717	7508563	<1%	Christmas Creek
	CD14	780506	7507012	<1%	Christmas Creek
	CD16	781968	7508263	<1%	Christmas Creek
	CD18	775206	7510512	2%	Christmas Creek

World Geodetic System 1984 (WGS84), Zone 50K