Boobook
Ecological Consulting

Well Lease Area / Infrastructure Zone Ecological Assessment Report: Fairview Zone FV530-531-532

Compiled by Boobook for Santos

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Revision	Date	Description	Author	Verifier	Approved
A	24/12/2013	Draft report issued to client for review	C. Eddie, O. Warner, A. Bendall	M. Eddie	C. Eddie
B	29/1/2014	Draft report incorporating client comment issued for further review	R. Johnson, C. Eddie	M. Eddie	C. Eddie
0	17/2/2014	Final report issued to client	C. Eddie	M. Eddie	C. Eddie

1. Abbreviations

Table 1: Abbreviations

Abbreviation	Description
cm	centimeter (s)
DBH	Diameter at breast height
DEHP	Department of Environment and Heritage Protection
DOE	Department of the Environment
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
EVNT	Endangered, Vulnerable or Near Threatened
GLNG	Gladstone Liquefied Natural Gas
ha	hectare (s)
km	kilometer (s)
m	metre (s)
NC Act	*Nature Conservation Act 1992*
QWP	Queensland Wetlands Program
RE	Regional Ecosystem (s)
SEVT	Semi-evergreen vine thicket
TAR plant	Type A restricted Plant
TEC	Threatened Ecological Community(ies)
VM Act	*Vegetation Management Act 1999*
WoNS	Weeds of National Significance

2. Introduction

2.1 Purpose & Scope

Boobook was commissioned by Santos to undertake ecological assessments on the proposed FV530-531-532 well lease and associated infrastructure zone located on Fairview Holding, approximately 53km east-northeast of Injune, in the Fairview gas field, south central Queensland. The property is described as Lot 1 on Plan CP908635 and lies within Province 24 (Carnarvon Ranges) of the Brigalow Belt South bioregion (Young et. al. 1999).

The areas to be assessed were defined as follows. A Construction Disturbance Zone (hereafter the 'Zone') was defined around the lease (non-linear). Buffers of different dimensions (100m, 200m) were established around the Zone. Boobook was requested to undertake the following assessments:

Within the Construction Disturbance Zone:

- Perform a quaternary vegetation assessment for each regional ecosystem (RE) and non-remnant vegetation community present;
- Estimate stem density and percentage foliage cover of the dominant species in each woody stratum present in the remnant/non-remnant communities present;
- Provide comment on the ecosystem function of vegetation present;
- Provide location and description of any plants of conservation concern listed in the *Nature Conservation Act 1992* (NC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) present;
- Provide comment on the presence and abundance of Least Concern (NC Act) plants and weeds;
- Provide location and characteristics of any Type A restricted plants (TAR plants) in the Zone;
- Provide location and description of any fauna of conservation concern listed in the *Nature Conservation Act 1992* (NC Act) or *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) present;
- Provide location and characteristics of potential fauna habitat features, including summary data on the abundance of hollow-bearing trees, hollow logs, coarse woody debris and organic litter;
- Assess the presence/absence of general fauna habitat for EPBC Act and NCA Act listed EVNT fauna and flora;
- Assess the presence of Koala Habitat;
- Record any incidental records of non-EVNT fauna;
- Record any observed animal breeding places;
- Comment on the nature and location of watercourses and drainage features, wetlands, lakes and springs;
- Assess the presence or absence of any listed Threatened Ecological Communities (TEC) (EPBC Act).

Outside the Zone but within the 100m Buffer:

- Comment on the nature and location of watercourses and drainage features, as defined by the *Water Act 2000*.

Outside the Zone but within the 200m Buffer:

- Perform a quaternary vegetation assessment for each RE present;
- Provide location and characteristics of any unmapped/incorrectly mapped TEC and other matters under the EPBC Act; and
- Report on the presence of any lakes or springs present.

2.2 Survey Team

The project supervisor (Craig Eddie) was approved by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) in writing on the 28th of January 2011 for the purpose of undertaking ecological assessment works for the Gladstone Liquefied Natural Gas (GLNG) project.

The field survey described by this report was undertaken by Boobook on 18 December 2013 and was conducted by Craig Eddie (Principal Ecologist) and Angela Bendall (Field Assistant). All aspects of the project including field survey and reporting were conducted under the supervision of Craig Eddie (Principal Ecologist and Project Supervisor).

Any collections of endangered, vulnerable, near threatened (EVNT) and least concern flora protected under the NC Act were conducted in accordance with Scientific Purposes Permit WISP11669312 issued to Craig Eddie as the representative for Boobook Enterprises Pty. Ltd. This permit is valid from 13 August 2012 to 12 August 2017.

3. Methodology

3.1 Desktop & Literature Review

A desktop search was undertaken by interrogating the following datasets:

- RE and remnant vegetation at the property scale using mapping version 6.1 (DEHP 2013a);
- Essential Habitat mapping (DEHP 2013b);
- Regrowth Vegetation mapping (DEHP2013c);
- Referable Wetlands mapping (DEHP 2013d);
- Wildnet fauna and flora records (DEHP 2013e);
- ESA mapping (DEHP 2013f);
- HERBRECS Queensland Herbarium flora specimen database (DEHP 2013g);
- Queensland Wetlands Program (QWP) 1: 100 000 wetlands mapping (DEHP 2013h); and
- EPBC Protected Matters summary (DOE 2013).

These datasets provided a baseline for subsequent field assessment.

The searches were conducted using the lot/plan details or the coordinates -25.66435°S, 149.0407°E (datum GDA94), which corresponds to the approximate centre point of the well lease, with a 10km buffer.

3.2 Field Survey

Vegetation structure and species composition was assessed during a walking traverse of the Zone. Detailed descriptions of vegetation were compiled at representative assessment locations within the mapped Zone. A representative site was selected for each RE present.

Locations of each survey site are shown in Figure 1. All of these assessments were consistent with the quaternary level of detail as per Neldner *et al.* (2012).

Quaternary assessments are those sites where all location, environmental (landform, substrate) and overall vegetation structure and species composition was recorded. Abundance of all dominant species in each layer was recorded. A list of additional species present at each site was also obtained (i.e. species that were not dominant were also recorded as being present but their abundance was not rated). Species names for flora follow Bostock and Holland (2010). The location of each survey site was determined using a handheld GPS unit (Garmin GPSmap 78S). The datum for all GPS co-ordinates quoted within this report is GDA94. When referred to within this report the sites are identified alphanumerically using a prefix Q, e.g. Q1. At each quaternary site the following was recorded:

1. height (median and maximum/minimum) of each stratum of vegetation (i.e. ground, shrub, tree and emergent layers);
2. dominant flora in each stratum of vegetation;
3. structural formation type codes (Neldner *et al.* 2012: Table 29);
4. RE type mapped;
5. RE type observed;
6. broad geology type;
7. landform type;
8. broad soil type;
9. connectivity/patch characteristics (i.e. whether the isolated or degree of connectivity to surrounding vegetation);
10. presence and abundance of weeds (declared and non-declared species) as well as estimated % coverage of the site;
11. presence of endangered, vulnerable or near threatened flora;
12. a list of all other flora encountered at the Site; and
13. disturbance types (e.g. clearing, grazing, fire history, pest animal diggings): categories as per Neldner *et al.* (2012) with some minor modification to suit local variables.

Quaternary assessment report sheets are presented in Appendix A. The assessment descriptions provide a snapshot of the species present during the inspection, but do not represent a complete inventory of the native flora and weeds present at the location. Subsequent visits would be necessary over a range of seasons to compile a more detailed inventory of species present. Despite these limitations, sufficient information was collected to assess the status, condition and composition of vegetation communities within the study area.

Additionally, for the dominant species in each woody stratum (trees, shrubs) present at the survey site an estimate was made of stem density and mean diameter at breast height (DBH). Stem density is expressed as the number of stems per hectare and is derived by extrapolation of counts from one or more 20m x 50m or 25m x 25m quadrats within the site. DBH was measured or estimated and is

given as a median value except in the case where the dominant plants formed a low shrub stratum in which some stems in the stratum failed to reach breast height. In this case a minimum-maximum range with a zero minimum value is used.

At each survey site, summary data was collected for potential fauna habitat features. This included:

- organic litter cover (%) including woody debris <10cm diameter;
- hollow-bearing trees (count, number/ha);
- hollow-bearing logs (count, number/ha); and
- fallen woody material (logs and other woody debris =/>10cm diameter)(count/ha and total length/ha).

Data was derived from 50m x 50m quaternary plot or multiple smaller quadrats within the plot and extrapolated to derive values/ha.

A search was made for TAR plants within the Zone. If found the location was established with a Toughbook and/or hand-held GPS unit and the species, height, DBH and possible management options were recorded. The presence of any watercourses within 100m and wetlands within 200m of the Zone was recorded.

Prior to field assessment, a desk-top examination of satellite imagery was used to identify sites of potential interest within the Buffer. These sites were then inspected in the field. Where the inspection confirmed the presence of potential environmental values (e.g. Of Concern or Endangered RE, high-value regrowth, wetlands, TEC) the values were documented as above.

Representative photographs were taken at each quaternary survey site in the Zone and/or Buffer, as well as at any wetlands or watercourses, habitat features or TAR plants.

4. Results & Discussion

4.1 Vegetation Assessment

4.1.1 DEHP Regional Ecosystem Mapping

Two remnant RE polygons are mapped within the Zone and Buffer. The description and status of these RE polygons is shown in Table 2.

Table 2: Remnant RE mapped in Zone and Buffer FV530-531-532.

RE Code	VM Act Class	Biodiversity Status	Short Description*
11.10.1	Least Concern	No Concern At Present	*Corymbia citriodora* open forest on coarse-grained sedimentary rocks
11.3.2 / 11.3.25	Of Concern / Least Concern	Of Concern / Of Concern	*Eucalyptus populnea* woodland on alluvial plains / *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines

* Short description as per Regional Ecosystem Description Database (REDD), Department of Environment and Heritage Protection, Queensland Government (DEHP 2013i).

4.1.2 Regional Ecosystems Observed

One RE was observed in the Zone and Buffer, this being RE 11.10.1. This RE was sampled at survey sites Q1-, Q2- and Q3-FV530 (Figure 1). This RE is scheduled as Least Concern under the *Vegetation Management Act 1999* (VM Act) and has a DEHP biodiversity status of No Concern At Present. Quaternary survey site data are provided in Appendix A and summarised in Table 3. Representative images of survey sites are shown in Figures 2a-f.

Table 3: Floristics and Structure of remnant vegetation at survey sites in Zone and Buffer FV530-531-532.

Site	**Location**	**Vegetation Description**		
Q1-FV530	55J 704834E 7159909N	*Eucalyptus crebra, Callitris glaucophylla* woodland; midlayer dominated by *Petalostigma pubescens;* shrub layer dominated by *Grewia latifolia* and regenerating *Acacia* spp.; ground layer dominated by native perennial grasses and forbs (RE 11.10.1)		
Stratum	Median height (m)	% foliage cover	Stems/ha	DBH (cm)
T1	14.0	5	120	30
T2	4.0	1	20	15
S1	0.6	10	200	2
G	0.3	50	1600	1
Site	**Location**	**Vegetation Description**		
Q2-FV530	55J 704897E 7160092N	*Eucalyptus crebra, Callitris glaucophylla* open woodland; grassy ground layer dominated by native perennial spp. (RE 11.10.1)		
Stratum	Median height (m)	% foliage cover	Stems/ha	DBH (cm)
T1	16.0	5	80	40
T1	8.0	1	20	10
G	1.0	50	n/a	n/a
Site	**Location**	**Vegetation Description**		
Q3-FV530	55J 704822E 7160197N	*Corymbia citriodora, Eucalyptus crebra, Angophora leiocarpa* woodland; low tree layer dominated by *Petalostigma pubescens;* ground layer dominated by *Cleistochloa subjuncea* and forbs (RE 11.10.1)		
Stratum	Median height (m)	% foliage cover	Stems/ha	DBH (cm)
T1	18.0	25	180	30
T1	4.0	1	20	10
G	0.5	45	n/a	n/a

Some variation in the composition and dominance of canopy species was observed within the Zone and Buffer. For example, Spotted Gum (*Corymbia citriodora* subsp*. variegata*) was prevalent at survey site Q3-FV530 but was absent from Q1-FV530 where ironbarks were dominant. Despite this variation, vegetation within the Zone and Buffer is considered to be all RE 11.10.1.

The northeastern portion of the Zone is mapped as a mixed polygon of RE 11.3.2/11.3.25, however, no examples of RE 11.3.2 or 11.3.25 were observed within any part of the Zone or Buffer. The quaternary assessments (Appendix A) do not support the presence of these RE.

4.1.3 Threatened Ecological Communities Observed

No Threatened Ecological Communities (TEC) were observed in the Zone or Buffer.

4.1.4 Non-remnant Vegetation Observed

No non-remnant vegetation occurs in the Zone or Buffer.

4.1.5 Ecological Function of Vegetation

As discussed at section 4.1.4 the entire Zone is remnant vegetation supporting dry sclerophyll woodland dominated by eucalypts. Beyond the Zone, the entire Buffer is similarly vegetated by eucalypt woodland and open forest. Woodland ecological function within the Zone, including potential habitat values for woodland-dependent fauna and flora, has been temporarily reduced by severe fire effects. Despite the lack of some microhabitat features, the structural and floristic features of the woodland are either present or regenerating (e.g. shrub layer). Woodland within the Zone still provides habitat value for woodland-dependent fauna, this being evidenced by the return post-fire of Buff-rumped Thornbills which have nested at the proposed lease site. Fauna habitat values are likely to increase over time and the Zone is important for the maintenance of connectivity with surrounding woodland.

Figure 3 shows that within a 5km radius of the Zone vegetation is almost entirely remnant and consists primarily of eucalypt woodland and open forest on sandstone uplands, with smaller occurrences of alluvial woodland associated with watercourses and patches of semi-evergreen vine thicket (SEVT) on steep scarps. Remnant vegetation within the Zone and Buffer provides connectivity in all directions between these tracts of remnant vegetation. Although the proposed removal of vegetation within the Zone is unlikely to significantly impact on ecosystem functioning and connectivity at the landscape level, disturbance to vegetation in this area is likely to have some negative impacts. These may include an increase in the abundance and species richness of weeds within the Zone, potential runoff of sediments from bare ground into adjoining water features and potential increase of disturbed habitat likely to be occupied by pest fauna.

4.2 Additional Observations

4.2.1 Additional Flora Species

Approximately 74 species of native flora were detected within the Zone and Buffer (Appendix B). In addition, nine non-native species were recorded within the Zone. One of these, Velvety Tree Pear (*Opuntia tomentosa*), is a declared Class 2 weed scheduled under the *Land Protection (Pest and Stock Route Management) Act 2002* (DAFF 2013) and is also a Weed of National Significance (WoNS). This species occurs in low densities throughout the Zone and Buffer.

4.2.2 Type A Restricted Plants

One species of TAR plant was recorded within the Zone this being Kurrajong (*Brachychiton populneus*). Location and details of TAR plants have been provided within the Flora layer within Santos GIS.

4.2.3 Fauna Habitat Features

Fauna habitat features identified within the Zone included occasional small logs (none hollow-bearing), dead trees with loose bark and hollow-bearing trees. Although remnant, many fauna habitat features have been removed from the Site due to severe fire (Figure 4a), especially from the northeastern half of the Zone. The location and details of fauna habitat features are provided in the relevant Santos Toughbook data files.

Summary data for woody potential fauna habitat features present at the Zone are shown in Table 4.

Table 4: Baseline data for potential fauna habitat features within Zone FV530-531-532.

Habitat Feature	Count/ha	Length/ha (m)	Cover (%)
Q1-FV530			
Hollow-bearing trees	8	n/a	-
Hollow-bearing logs	nil	n/a	-
Woody material =/>10cm diam.	20	136	-
Organic litter <10cm diam.	-	-	10

One active breeding place was recorded within the Zone, this being the nest of a Buff-rumped Thornbill (*Acanthiza reguloides*) (Figure 4b). At least three recently hatched nestlings were in the nest at the time of the inspection. According to Higgins and Peter (2002) this species fledges to independence in 15-19 days and re-use of nests to produce a second clutch has been recorded. Summary details for the nest site are provided in Table 5 below.

Table 5: Details of active breeding places in Zone FV530-531-532.

Waypoint	Location	Species	Comments
Nest1-FV530	55J 704869E 7159892N	Buff-rumped Thornbill *(Acanthiza reguloides)*	Active nest c. 2m off ground in dead Red Ash (*Alphitonia excelsa*); contained at least three unfledged chicks

4.2.4 Wetlands and Watercourses

No watercourses as defined by the *Water Act 2000* (DNRM 2013) were detected in or within 100m of the Zone. No High Ecological Significance wetlands as shown on a Map of Referable Wetlands (DEHP 2013d) were detected within the Zone. No springs or lakes occur within the Zone or Buffer.

Queensland Wetlands Program mapping (DEHP 2013h) shows the presence of Wetlands of General Ecological Significance which correspond with the mapped boundaries of two RE which frequently contain wetland features, these being RE 11.3.2 and 11.3.25. No evidence of the presence of wetlands (or these RE) was obtained within the mapped wetland area in the Zone or Buffer (Appendix E). Refer to quaternary site data for further detail from survey sites Q2-FV530 and Q3-FV530 which are located within the mapped wetland polygon.

Three drainage features were recorded within the 100m linear infrastructure Buffer. The locations of these features are shown in Figure 1 and descriptions are provided in Table 6. The lack of riparian vegetation and defined bed and banks indicates that these are drainage features and not watercourses (*Water Act 2000*). Additionally, these meet the definition of a drainage feature according to the Act because they are likely to be only capable of flowing during and immediately after rainfall, for a short period and they do not have sufficient continual flow to maintain a riparian ecosystem. Representative images are shown at Figures 4c-i.

Table 6: Drainage features detected within Zone and Buffer FV530-531-532.

Waypoint Code	Location	Description
W1-FV530	55J 704736E 7159963N	Drainage feature with scoured channel to c. 1m depth; nil water; nil riparian vegetation; nil hydrophytes; surrounded by *Eucalyptus crebra, Callitris glaucophylla* woodland.
W2-FV530	55J 704882E 7159778N	Drainage feature: nil water; nil hydrophytes; nil riparian vegetation; scoured channel present; surrounded by *Eucalyptus crebra, E. melanophloia* and *Callitris glaucophylla* woodland
Q2-FV530	55J 704897E 7160092N	Drainage feature (mapped second order stream): surrounded by *Eucalyptus crebra, Callitris glaucophylla* open woodland; grassy ground layer dominated by native perennial spp. (RE 11.10.1). Shallow scoured channel with low banks at survey site, rocky and with some small temporary puddles further upstream; nil riparian vegetation; hydrophytes are scarce and include *Lophostemon suaveolens* and *Cynodon dactylon*.

4.2.5 EVNT Fauna and Flora, Koala and General Habitat

No EVNT fauna or flora was detected within the Zone or the Buffer. EVNT fauna recorded within 10km of the Zone includes Glossy Black-cockatoo (*Calyptorhynchus lathami*) (DEHP 2013e). Although vegetation at the Site is remnant, recent disturbance by fire within the Zone and Buffer has depleted many potential fauna habitat features (see Table 4). Despite this disturbance it is considered that over time fauna habitat features will increase and the Site will offer further potential shelter and foraging opportunities for a range of EVNT fauna.

These results are preliminary only: further targeted surveys at appropriate times of the year would be required to better define the occurrence of EVNT fauna within the study area. The potential for EVNT fauna to be present in the Zone and Buffer, based on the presence or absence of general fauna habitat factors, is discussed in Appendix C.

Five species of EVNT flora are recorded within 10km of the Zone (DEHP 2013e), these being Large-flowered Beard Heath (*Leucopogon grandiflorus*), Cracow Wattle (*Acacia calantha*), Isla Gorge Wattle (*A. islana*), Swamp Paperbark (*Melaleuca irbyana)* and *Sannantha brachypoda*. EVNT flora potentially present within the Zone and Buffer is discussed in Appendix D.

The entire Zone and Buffer is mapped as Essential Habitat for Cracow Wattle (*A. calantha*). Although habitat within the Zone and Buffer is potentially suitable for this species in a general sense, no evidence of the presence of this species within the Zone or Buffer could be found during the field survey. The Zone is approximately 430m northwest of the collection site for this species (DEHP 2013g).

No evidence of the presence of Koala was detected during the field survey. Potential food trees are present within the Zone, primarily Narrow-leaved Ironbark (*Eucalyptus crebra*). Additional

food trees are present within the Buffer, especially Spotted Gum (*Corymbia citriodora* subsp. *variegata*). Many of the canopy trees within the Zone appear to have been killed by fire and therefore offer only general foraging habitat opportunities. It is considered that higher quality Koala Habitat is present within the Buffer than that occurring within the Zone.

5. References

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Figure 1: **Map of Zone and Buffer FV530-531-532 showing survey sites and other points of interest.**

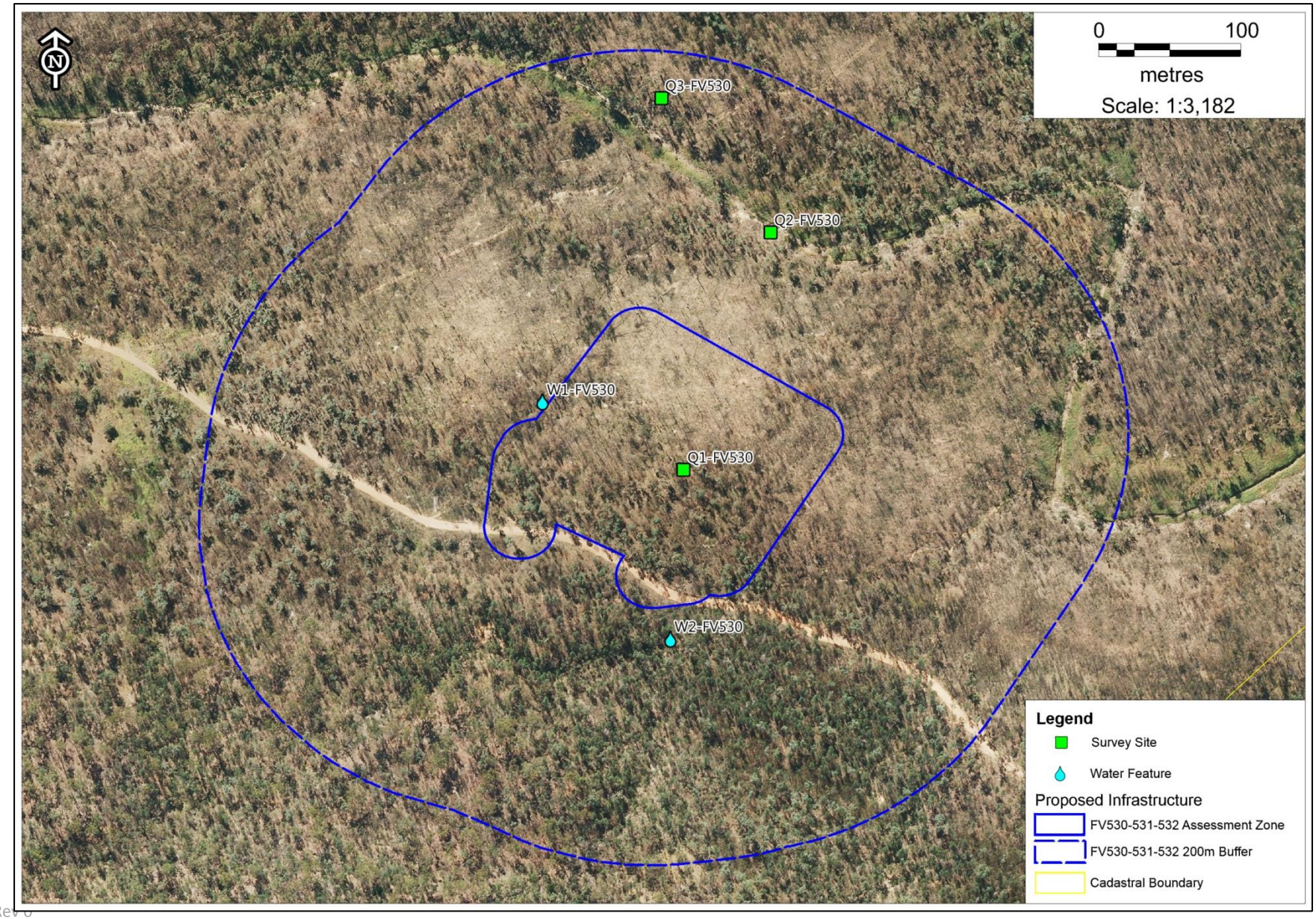

Figure 2a,b: Two views of RE 11.10.1 within the Zone at the proposed FV530-531-532 well site sampled at survey site Q1-FV530 looking north (left) and west (right).

Figure 2c,d: Two views of RE 11.10.1 within the 100m Buffer at survey site Q2-FV530 looking west (left) and south (right). This area is mapped incorrectly as RE 11.3.2/11.3.25.

Figure 2e,f: Two views of RE 11.10.1 within the 200m Buffer at survey site Q3-FV530 looking east (left) and west (right). This area is mapped incorrectly as RE 11.3.2/11.3.25.

Figure 3: **Landscape context for Zone and Buffer FV530-531-532**

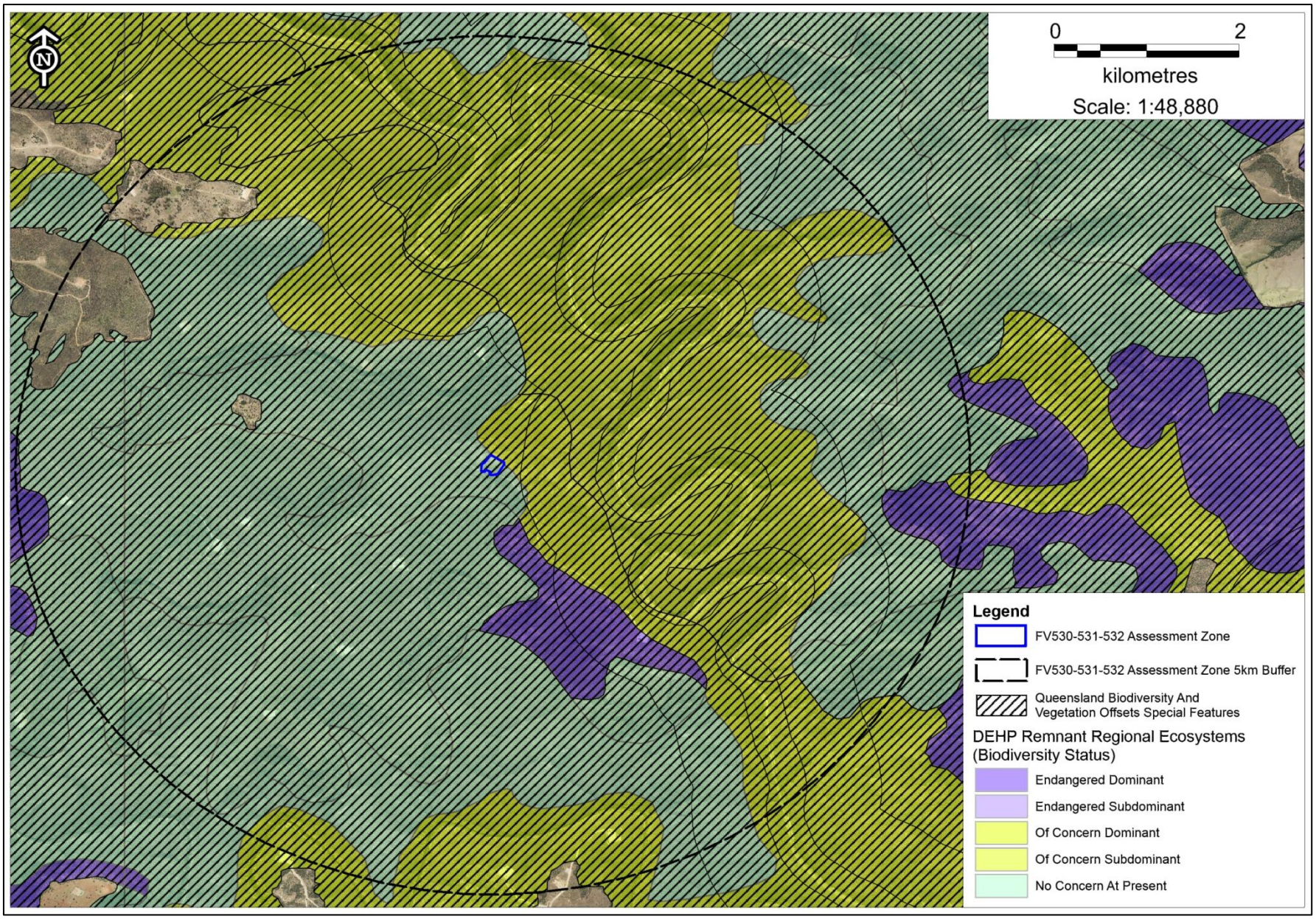

Figure 4a,b: Example of fire scorched vegetation within the Zone at the north eastern end of the proposed FV530-531-532 well lease. Note the lack of terrestrial fauna habitat features such as logs (left). An active Buff-rumped Thornbill nest within the Zone at waypoint Nest1-FV530 (right).

Figure 4c,d: A drainage feature sampled at survey site W1-FV530 looking downstream (left) and upstream (right).

Figure 4e,f: A drainage feature sampled at survey site W2-FV530 looking upstream (left) and downstream (right).

Figure 4g, h: A drainage feature (mapped second order stream) sampled at survey site Q2-FV530 looking downstream (left) and upstream (right).

Figure 4i, j: Another view of the drainage feature (mapped second order stream) sampled at survey site Q2-FV530 looking south from survey site Q3-FV530 (left) and looking downstream along a rocky portion immediately upstream of survey site Q2-FV530. This area contained some small temporary pools within bed rock from recent rain (right).

Appendix A: Quaternary assessment results Zone and Buffer FV530-531-532

Site No.	Q1-FV 530	**Recorder:**	Craig Eddie, Angela Bendall	**Date**	18/12/2013
Purpose	Ecology Assessment, FV530-531-532			**Time**	0835

Locality:
(inc. distance/direction to nearest town) FV530 proposed lease

Zone: 55J 0704834 **E** 7159909 **N** **Datum** GDA94

Vegetation structure

Median height of the EDL is to be measured
D *– dense,* ***M*** *– mid dense,* ***S*** *– sparse,* ***V*** *– very sparse*

Stratum	Median height	Height interval	Est. cover density (D,M,S,V) (%)
E			
T1	14.0	10.0 – 18.0	V (5%)
T2	4.0	3.0 – 7.0	V (1%)
T3			
S1	0.6	0.4 – 1.0	S (10%)
S2	0.3	0.2 – 0.4	M (50%)
S3			
G	0.2	0.05 – 0.3	V (5%)

Structural formation: Open woodland

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; **s -** subdominant, ***a*** – associated

Str.	Rel. dom.	Scientific Name
T1	D	*Callitris glaucophylla*
T1	S	*Eucalyptus crebra*
T1	A	*E.* sp. (indet.) (an infertile narrow-leaved ironbark)
T2	D	*Petalostigma pubescens*
S1	D	*Grewia latifolia*
S2	D	*Acacia longispicata*
S2	S	*Acacia leiocalyx*
G	D	Poaceae spp. (indet.)
G	S	*Sida* sp. (indet.)
G	A	*Panicum effusum*

Geology, landform, soils

Geology code and rock types: Sandstone

Landform: Hill slope

Soils: Brown sandy loam

DEHP Mapped RE Code:

Observed RE Code: 11.10.1 **Landzone:** 10

Vegetation Short Description

Eucalyptus crebra, Callitris glaucophylla woodland; midlayer dominated by *Petalostigma pubescens*; shrub layer dominated by *Grewia latifolia* and regenerating *Acacia* spp.; ground layer dominated by native perennial grasses and forbs

Connectivity/Patch Characteristics

Part of large remnant tract- recently fragmented in vicinity by linear clearing for gas infrastructure

Weeds: R = rare (<10 plants observed); U = uncommon (11 – 50 plants observed); C = common = (>50 plants observed)
Conyza bonariensis (U); *Opuntia tomentosa* (C); *Cenchrus ciliaris* (R); *Bidens pilosa* (R)

% Weed Cover: 5%

EVNT Flora Present: Nil

EVNT Flora Likely: Nil

Field Wpt Code:

Photo Nos. BBK3 4774-4785 (NEWS)

Additional Flora:		
Pterocaulon sp. (indet.) (U)	*Goodenia glabra* (U)	*Eriochloa pseudoacrotricha*
Brunoniella australis (R)	*Chamaesyce drummondii* (U)	
Pseuderanthemum variabile (C)	*Melhania* oblongifolia (C)	
Evolvulus alsinoides (R)	*Dianella longifolia* (R)	
Dodonaea viscosa subsp. *spatulata* (U)	*Alphitonia excelsa (*U)	
Themeda avenacea (U)	*Psydrax odorata* (R)	
Digitaria sp. (indet.) (U)	*Xerochrysum bracteatum* (R)	
Eragrostis sp. (indet.) (C)	*Vittadinia* sp. (indet.) (C)	
Rostellularia adscendens (C)	*Calotis cuneifolia* (C)	
Cyanthillium cinereum (C)	*Chrysocephalum apiculatum* (U)	
Jasminum didymum (R)	*Dodonaea heteromorpha* (off-site)	
Laxmannia compacta (R)	*Stylidium eriorhizum* (U)	
Hibiscus sturtii (C)	*Phyllanthus* sp. (indet.) (*carpentariae/ fuernrohrii* group) (U)	

Fauna Habitat Features – (note coarse/fine woody debris, rocks/boulders, mistletoe, termite mounds, hollows, leaf litter, burrows, shrubs, food trees, loose bark, soil cracks, caves/crevices)

Density Scores: 0 = 0%; 1 = <25%; 2 = 26-50%; 3 = 51-75%; 4 = 75-99%; 5 = 100%.

Rocks – embedded	0	Boulders	0	Shrub layer	2	Ground cover	3
Rocks – loose	0	Fallen bark	1	Leaf litter	1	Bare ground	1

Abundance Scores: 0 = absent; 1 = 1-5; 2 = 6-20; 3 = 21-50; 4 = 51-75; 5 = 76-100; 6 = >100

Crevices/ledges	0	Large logs (>30cm diameter)	0	Trees / logs bearing loose bark	1
Underhangs /overhangs / caves	0	Logs with hollows	0	Termite mounds	0
Small logs (<30cm diameter.)	2	Hollow bearing trees	1	Mistletoe	0

Other

Soil cracks	Nil
Water	Nil
Other (e.g. food trees):	-

Disturbances

Fire: severe; <1year

Incidental Fauna Observations (HE= heard, SE= seen, EV= evidence, FO= flying over)	**Structure of Woody Strata**		
	Str.	**Stems/ha**	**DBH (cm)**
Fan-tailed Cuckoo 1 x HE off-site	T1	120	30
Grey Shrike-thrush 1 x HE off-site	T2	20	15
White-throated Honeyeater 1 x HE off-site	S1	200	2
Eastern Koel 1 x HE off-site	S2	1600	1
White-eared Honeyeater 1 x HE on-site			
Orchard swallowtail 1 x SE FO			
Pied Currawong 1 HE off-site			
Peaceful Dove 1 x HE on-site			
Mistletoebird 1 x HE off-site			

Shining Bronze-cuckoo 1 x HE on-site, White-throated Treecreeper 1 x HE off-site,

Buff-rumped Thornbill 1 x SE with nest in dead *Alphitonia excelsa*, Striated Pardalote 1 x HE off-site

EVNT fauna likely: Dunmall's Snake, Brigalow Scaly-foot, Red Goshawk, Grey Goshawk, Square-tailed Kite, Koala,

Collared Delma (rocky edges), Eastern long-eared Bat, Large-eared Pied Bat, Little-pied Bat

Site No.	Q2-FV530	**Recorder:**	Craig Eddie, Angela Bendall	**Date**	18/12/2013
Purpose	Ecology Assessment, Moonah FV530			**Time**	1200

Locality:
(inc. distance/direction to nearest town) FV530 100m buffer

Zone: 55J 0690895 **E** 7151584 **N** **Datum** GDA94

Vegetation structure

Median height of the EDL is to be measured
D *– dense,* ***M*** *– mid dense,* ***S*** *– sparse,* ***V*** *– very sparse*

Stratum	Median height	Height interval	Est. cover density (D,M,S,V) (%)
E			
T1	16.0	14.0 – 20.0	V (5%)
T2	8.0	6.0 – 10.0	V (1%)
T3			
S1			
S2			
S3			
G	1.0	0.4 – 1.6	M (50%)

Structural formation: Open woodland

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; **s -** subdominant, ***a*** – associated

Str.	Rel. dom.	Scientific Name
T1	D	*Eucalyptus crebra*
T1	S	*Callitris glaucophylla*
T1	A	*Eucalyptus* sp. (a narrow-leaved ironbark)
T1	A	*Angophora leiocarpa*
T1	A	*E. chloroclada*
T2	D	*Lophostemon suaveolens*
T2	A	*Petalostigma pubescens*
G	D	*Themeda avenacea*
G	S	*Chrysopogon filipes*
G	A	*Imperata cylindrica*
G	A	*Capillipedium* sp. (indet.)

Geology, landform, soils

Geology code and rock types: Sandstone

Landform: Drainage feature

Soils: Brown sand and rock

DEHP Mapped RE Code: 11.3.2/11.3.25

Observed RE Code: 11.10.1 **Landzone:** 10

Vegetation Short Description

Eucalyptus crebra, Callitris glaucophylla open woodland; grassy ground layer dominated by native perennial spp.

Connectivity/Patch Characteristics

Part of large intact remnant

Weeds: R = rare (<10 plants observed); U = uncommon (11 – 50 plants observed); C = common = (>50 plants observed)
Conyza bonariensis (C); *Opuntia tomentosa* (R); *Melinis repens* (R); *Glandularia aristigera* (U); *Bidens pilosa* (U) *Sida rhombifolia* (R); *Cynodon dactylon* (U); *Gomphocarpus physocarpus* (R)

% Weed Cover: 5%

EVNT Flora Present: Nil

EVNT Flora Likely: Nil

Field Wpt Code:

Photo Nos. BBK3 4834 – 4845 (NEWS)

Additional Flora: R = rare (<10 plants observed); U = uncommon (11 – 50 plants observed); C = common = (>50 plants observed)	
Corymbia citriodora subsp. *variegata* (R)	*Calotis dentex* (C)
Themeda triandra (C)	*Panicum effusum* (C)
Arundinella nepalensis (R)	*Phyllanthus* sp. (indet.) *(carpentariae/fuernrohrii)*
Senna sophera var. (40 Mile Scrub J.R. Clarkson+ 6908)	*Dodonaea heteromorpha* (C)
Centipeda minima (C)	*Cymbopogon refractus* (U)
Acacia longispicata (C)	*Eragrostis elongata* (C)
Alphitonia excelsa (C)	*Sarga leiocladum* (R)
Heteropogon contortus (U)	*Portulaca filifolia* (U)
Scleria sphacelata (C)	*Centipeda minima* (C)
Pseuderanthemum variabile (C)	*Eleocharis cylindrostachys* (U)
Grevillea floribunda (R)	*Acacia macradenia* (U)
Leptospermum lamellatum (R)	

Fauna Habitat Features – (note coarse/fine woody debris, rocks/boulders, mistletoe, termite mounds, hollows, leaf litter, burrows, shrubs, food trees, loose bark, soil cracks, caves/crevices)

Density Scores: 0 = 0%; 1 = <25%; 2 = 26-50%; 3 = 51-75%; 4 = 75-99%; 5 = 100%.

Rocks – embedded	4	Boulders	0	Shrub layer	1	Ground cover	3
Rocks – loose	1	Fallen bark	0	Leaf litter	0	Bare ground	2

Abundance Scores: 0 = absent; 1 = 1-5; 2 = 6-20; 3 = 21-50; 4 = 51-75; 5 = 76-100; 6 = >100

Crevices/ledges	1	Large logs (>30cm diameter)	1	Trees / logs bearing loose bark	1
Underhangs /overhangs / caves	0	Logs with hollows	1	Termite mounds	0
Small logs (<30cm diameter.)	2	Hollow bearing trees	1	Mistletoe	0

Other

Soil cracks	Nil
Water	Present- temporary pools on rocks
Other (e.g. food trees):	-

Disturbances

Fire: shrub layer burnt

Incidental Fauna Observations
(HE= heard, SE= seen, EV= evidence, FO= flying over)

Structure of Woody Strata		
Str.	**Stems/ha**	**DBH (cm)**
T1	80	40
T2	20	10
S1	n/a	n/a
G	n/a	n/a

Weebill x 1 HE on-site
Torresian Crow x 1 SE FO
Meadow Argus x 1 SE FO

EVNT Fauna Likely: Eastern Long-eared Bat, Little-pied Bat, Large-eared Pied Bat, Squatter Pigeon, Red Goshawk, Grey Goshawk, Square-tailed Kite

Site No.	Q3-FV530	**Recorder:**	Craig Eddie, Angela Bendall	**Date**	18/12/2013
Purpose	Ecology Assessment, Moonah FV530			**Time**	1225

Locality:
(inc. distance/direction to nearest town) FV530 200m buffer

Zone: 55J 0704822 **E** 7160197 **N** **Datum** GDA94

Vegetation structure

Median height of the EDL is to be measured
D *– dense,* ***M*** *– mid dense,* ***S*** *– sparse,* ***V*** *– very sparse*

Stratum	Median height	Height interval	Est. cover density (D,M,S,V) (%)
E			
T1	18.0	16.0 – 25.0	S (25%)
T2	4.0	3.0 – 6.0	V (1%)
T3			
S1			
S2			
S3			
G	0.5	0.1 – 0.9	M (45%)

Structural formation: Woodland

Ecologically dominant layer: T1

Plant species

Record relative (numerical) dominance for each stratum;
d – dominant; ***c*** – codominant; **s -** subdominant, ***a*** – associated

Str.	Rel. dom.	Scientific Name
T1	D	*Corymbia citriodora* subsp. *variegata*
T1	A	*Callitris glaucophylla*
T1	A	*Angophora leiocarpa*
T1	A	*Eucalyptus crebra*
T2	D	*Petalostigma pubescens*
G	D	*Cleistochloa subjuncea*
G	S	*Lomandra multiflora*
G	A	*Goodenia delicata*

Geology, landform, soils

Geology code and rock types: Sandstone

Landform: Hill slope

Soils: Brown sand with surface rock

DEHP Mapped RE Code: 11.3.2/11.3.25

Observed RE Code: 11.10.1 **Landzone:** 10

Vegetation Short Description

Corymbia citriodora, Eucalyptus crebra, Angophora leiocarpa woodland; low tree layer dominated by *Petalostigma pubescens;* ground layer dominated by *Cleistochloa subjuncea* and forbs

Connectivity/Patch Characteristics

Part of large intact remnant area

Weeds: R = rare (<10 plants observed); U = uncommon (11 – 50 plants observed); C = common = (>50 plants observed)
Opuntia tomentosa (R)

% Weed Cover: <1%

EVNT Flora Present: Nil

EVNT Flora Likely: *Acacia islana, A. calantha*

Field Wpt Code:

Photo Nos. BBK3 4846 – 4857 (NEWS); 4580 – 4582 (clump from E)

Additional Flora: R = rare (<10 plants observed); U = uncommon (11 – 50 plants observed); C = common = (>50 plants observed)		
Dodonaea heteromorpha (C)	*Themeda triandra* (R)	
Dianella longifolia (R)	*Alphitonia excelsa* (R)	
Acacia longispicata (C)	*Calotis cuneifolia* (C)	
Hibbertia linearis (U)		
Daviesia filipes (C)		
Jacksonia scoparia (R)		
Callitris endlicheri (R)		
Coronidium oxylepis (U)		
Marsdenia viridiflora (R)		
Panicum effusum (C)		
Cyanthillium cinereum (C)		
Arundinella nepalensis (R)		

Fauna Habitat Features – (note coarse/fine woody debris, rocks/boulders, mistletoe, termite mounds, hollows, leaf litter, burrows, shrubs, food trees, loose bark, soil cracks, caves/crevices)

Density Scores: 0 = 0%; 1 = <25%; 2 = 26-50%; 3 = 51-75%; 4 = 75-99%; 5 = 100%.

Rocks – embedded	1	Boulders	0	Shrub layer	1	Ground cover	2
Rocks – loose	1	Fallen bark	0	Leaf litter	2	Bare ground	1

Abundance Scores: 0 = absent; 1 = 1-5; 2 = 6-20; 3 = 21-50; 4 = 51-75; 5 = 76-100; 6 = >100

Crevices/ledges	1	Large logs (>30cm diameter)	1	Trees / logs bearing loose bark	0
Underhangs /overhangs / caves	0	Logs with hollows	0	Termite mounds	0
Small logs (<30cm diameter.)	1	Hollow bearing trees	0	Mistletoe	0

Other

Soil cracks	Nil
Water	Nil
Other (e.g. food trees):	*Corymbia citriodora*

Disturbances

Fire: Moderate; <1year (ground, shrub and low tree layers burnt)

Incidental Fauna Observations
(HE= heard, SE= seen, EV= evidence, FO= flying over)

Structure of Woody Strata

Str.	Stems/ha	DBH (cm)
T1	180	30
T2	20	10
S2	n/a	n/a
G	n/a	n/a

EVNT Fauna Likely: Little-pied Bat, Eastern Long-eared Bat, Large-eared Pied Bat, Red Goshawk, Grey Goshawk, Square-tailed Kite, Brigalow Scaly-foot, Collared Delma, Dunmall's Snake, Koala, Squatter Pigeon

Appendix B: Plant species list Zone and Buffer FV530-531-532

Key: * indicates non-native plant species; NCA = *Nature Conservation Act 1992* (Qld); EPBC = *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth); LC = least concern; Q = quaternary survey site; TAR = Type A restricted plant.

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status	Q1	Q2	Q3	W1	W2
Acanthaceae	*Brunoniella australis*	Blue Trumpet	LC		x				
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	LC		x	x			
Acanthaceae	*Rostellularia adscendens*	Pink Tongues	LC		x				
Apocynaceae	*Gomphocarpus physocarpus**	Balloon Cotton Bush	-			x			
Apocynaceae	*Marsdenia viridiflora*	Bush Banana	LC				x		
Asteraceae	*Bidens pilosa**	Cobbler's Pegs	-		x	x			
Asteraceae	*Calotis cuneifolia*	Blue Burr-daisy	LC		x		x		
Asteraceae	*Calotis dentex*	A Daisy	LC			x			
Asteraceae	*Centipeda minima*	Desert Sneezeweed	LC			x			
Asteraceae	*Conyza bonariensis**	Fleabane	-		x	x			
Asteraceae	*Chrysocephalum apiculatum*	Yellow Buttons	LC		x				
Asteraceae	*Coronidium oxylepis*	A Daisy	LC				x		
Asteraceae	*Cyanthillium cinereum*	Vernonia	LC		x		x		
Asteraceae	*Pterocaulon* sp. (indet.)	A Daisy	-		x				
Asteraceae	*Vittadinia* sp. (indet.)	A Daisy	-		x				
Asteraceae	*Xerochrysum bracteatum*	Golden Everlasting	LC		x				
Cactaceae	*Opuntia tomentosa**	Velvety Tree Pear	-		x	x	x		
Caesalpiniaceae	*Senna sophera* var. (40 Mile Scrub J.R. Clarkson+ 6908)	A Cassia	LC			x			
Celastraceae	*Denhamia cunninghamii*	Yellow-berry Bush	LC					x	
Convolvulaceae	*Evolvulus alsinoides*	Tropical Speedwell	LC		x				
Cupressaceae	*Callitris endlicheri*	Black Cypress Pine	LC				x		
Cupressaceae	*Callitris glaucophylla*	White Cypress Pine	LC		x	x	x	x	x
Cyperaceae	*Eleocharis cylindrostachys*	A Spike-rush	LC			x			
Cyperaceae	*Scleria sphacelata*	Iron Grass	LC			x			

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status	Q1	Q2	Q3	W1	W2
Dilleniaceae	*Hibbertia linearis*	A Guinea-flower	LC				x		
Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed	LC		x				
Fabaceae	*Daviesia filipes*	A Pea	LC				x		
Fabaceae	*Jacksonia scoparia*	Dogwood	LC				x		
Goodeniaceae	*Goodenia delicata*	A Goodenia	LC				x		
Goodeniaceae	*Goodenia glabra*	Smooth Goodenia	LC		x				
Hemerocallidaceae	*Dianella longifolia*	Smooth Flax-lily	LC		x		x		
Laxmanniaceae	*Laxmannia compacta*	Wire Lily	LC		x				
Laxmanniaceae	*Lomandra multiflora*	Many-flowered Mat-rush	LC				x		
Malvaceae	*Hibiscus sturtii*	Hill Hibiscus	LC		x				
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne	-			x			
Malvaceae	*Sida* sp. (indet.)	A Flannel-flower	-		x				
Mimosaceae	*Acacia leiocalyx*	Early-flowering Black Wattle	LC		x				
Mimosaceae	*Acacia longispicata*	Slender-flowered Wattle	LC		x	x	x		
Mimosaceae	*Acacia macradenia*	Zig-zag Wattle	LC			x			
Myrtaceae	*Angophora leiocarpa*	Smooth-barked Apple	LC			x	x		
Myrtaceae	*Corymbia citriodora* subsp. *variegata*	Spotted Gum	LC			x	x		
Myrtaceae	*Eucalyptus chloroclada*	Baradine Red Gum	LC			x			
Myrtaceae	*Eucalyptus crebra*	Narrow-leafed Ironbark	LC		x	x	x	x	x
Myrtaceae	*Eucalyptus melanophloia*	Silver-leaved Ironbark	LC		x				x
Myrtaceae	*Eucalyptus* sp. (indet.)	A Narrow-leaved Ironbark	-		x	x		x	
Myrtaceae	*Leptospermum lamellatum*	Weeping Tea-tree	LC			x			
Myrtaceae	*Lophostemon suaveolens*	Swamp Mahogany	LC			x			
Oleaceae	*Jasminum didymum*	Native Jasmine	LC		x				
Pentapetaceae	*Melhania oblongifolia*	No common name	LC		x				
Phyllanthaceae	*Phyllanthus* sp. indet. (cf. *carpentariae/ fuernrohrii*)	A Spurge	-		x	x			
Picrodendraceae	*Petalostigma pubescens*	Quinine Tree	LC		x	x	x		x
Poaceae	*Arundinella nepalensis*	Reed Grass	LC			x	x		
Poaceae	*Capillipedium* sp.	A Spicy-top Grass	-			x			x

Family	Scientific Name	Common Name	NC Act Status	EPBC Act Status	Q1	Q2	Q3	W1	W2
	(indet.)								
Poaceae	*Cenchrus ciliaris**	Buffel Grass	-		x				
Poaceae	*Chrysopogon filipes*	River Grass	LC			x			
Poaceae	*Cleistochloa subjuncea*	A Grass	LC				x		
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass	LC			x			
Poaceae	*Cynodon dactylon**	Couch Grass	-			x			
Poaceae	*Digitaria* sp. (indet.)	A Grass	-		x				
Poaceae	*Eragrostis elongata*	Clustered Lovegrass	LC			x			
Poaceae	*Eragrostis* sp. (indet.)	A Lovegrass	LC		x				
Poaceae	*Eriochloa pseudoacrotricha*	Early Spring Grass	LC		x				
Poaceae	*Heteropogon contortus*	Black Speargrass	LC			x			
Poaceae	*Imperata cylindrica*	Blady Grass	LC			x			
Poaceae	*Melinis repens**	Red Natal Grass	-			x		x	
Poaceae	*Panicum effusum*	Hairy Panic	LC		x	x	x		
Poaceae	*Sarga leiocladum*	Native Sorghum	LC			x			
Poaceae	*Themeda avenacea*	Wild Oats	LC		x	x			
Poaceae	*Themeda triandra*	Kangaroo Grass	LC			x	x		x
Portulacaceae	*Portulaca filifolia*	Slender Pigweed	LC			x			
Proteaceae	*Grevillea floribunda*	Rusty Spider-flower	LC			x			
Rhamnaceae	*Alphitonia excelsa*	Red Ash	LC		x	x	x		
Rubiaceae	*Psydrax odorata*	Shiny-leaved Canthium	LC		x				
Sapindaceae	*Dodonaea heteromorpha*	A Hopbush	LC		x	x	x		
Sapindaceae	*Dodonaea viscosa* subsp. *spatulata*	Sticky Hopbush	LC		x				
Sparrmanniaceae	*Grewia latifolia*	Dysentery Plant	LC			x			
Stylidiaceae	*Stylidium eriorhizum*	A Trigger Plant	LC		x				
Verbenaceae	*Glandularia aristigera**	Mayne's Pest	-			x		x	

Appendix C: EVNT fauna occurring or potentially occurring at FV530-531-532 Zone and Buffer and presence of general habitat.

Key: NCA = *Nature Conservation Act 1992* (Qld); EPBC = *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth); E = endangered; V = vulnerable; NT = near threatened; SLC = special least concern.

Class	Scientific Name	Common name	Status		General Habitat Requirements	Presence of General Habitat	
			NCA	EPBC		Zone	Buffer
Amphibians	*Cyclorana verrucosa*	Rough Collared-Frog	NT		Within species known range (Robinson 1993); grasslands and woodlands on clay or clay-loam substrates with seasonally-filled shallow drainage depressions for breeding sites (Anstis 2013).	No	No
Birds	*Accipiter novaehollandiae*	Grey Goshawk	NT		Within species known range (Birdlife Australia 2013); woodlands, open and closed forests (including dry rainforest) (Marchant and Higgins 1993).	Yes	Yes
	Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Within species known range (Birdlife Australia 2013); food trees (e.g. Belah *Casuarina cristata* and other Casuarinaceae species); nesting habitat (hollow-bearing live or dead trees) (Higgins 1999).	No	No
	Erythrotriorchis radiata	Red Goshawk	E	V	Within species known range (Birdlife Australia 2013); woodlands and open forests, especially near permanent water bodies; high prey bird populations; tall trees for nest site (Marchant and Higgins 1993).	Yes	Yes
	Geophaps scripta scripta	Squatter Pigeon (southern)	V	V	Within species known range (Birdlife Australia 2013); grassy woodlands with open areas for foraging habitat, nearby water source (Higgins and Davies 1996).	Yes	Yes
	Grantiella picta	Painted Honeyeater	V		Within species known range (Birdlife Australia 2013); lives/breeds in woodlands and open forests with high densities of suitable food plants (mistletoes, family Loranthaceae) (Higgins et. al. 2001).	No	No
	Lophoictinia isura	Square-	NT		Within species known range (Birdlife Australia 2013); forages and breeds in woodlands and open forests and the species is	Yes	Yes

Class	Scientific Name	Common name	Status		General Habitat Requirements	Presence of General Habitat	
			NCA	EPBC		Zone	Buffer
		tailed Kite			known to forage along tree lines in cleared country (Marchant and Higgins 1993).		
	Melithreptus gularis	Black-chinned Honeyeater	NT		Within species known range (Birdlife Australia 2013); forages in tree canopy and prefers tall open forest and woodland habitats (Higgins et. al. 2001).	Yes	Yes
	Neochmia ruficauda ruficauda	Star Finch (eastern, southern)	E	E	Within species known historical range (Birdlife Australia 2013) but the subspecies is possibly extinct (Garnett *et al.* 2011). Formerly used tall grasslands associated with watercourses (DOE 2013).	No	No
	Ninox strenua	Powerful Owl	V		Within species known range (Birdlife Australia 2013); forages in open forests and woodlands with high prey abundance (e.g. gliders) and roosts in adjacent dense forest; breeds in hollow-bearing trees (Higgins 1999).	Yes	Yes
	Rostratula australis	Australian Painted Snipe	V	E	Within species known range (Birdlife Australia 2013); forages at shallow edges and adjacent vegetated margins of freshwater wetlands (DOE 2013).	No	No
	Turnix melanogaster	Black-breasted Button-quail	V	V	Marginally outside of known range (DEHP 2013); foraging habitat in Brigalow Belt South is primarily semi-evergreen vine thicket but may also include Brigalow open forest with dense understorey and suitable leaflitter (DOE 2013, Marchant and Higgins 1993).	No	No
Insects	*Jalmenus eubulus*	Pale Imperial Hairstreak	V		Within species known range (Braby 2000); adults and larvae usually associated with Brigalow (*Acacia harpophylla*) open forests and woodlands (Valentine and Johnson 2012) but larvae will also forage on other *Acacia* spp. (Common and Waterhouse 1981).	Yes	Yes
Mammals	*Chalinolobus*	Large-eared	V	V	Within species known range (Churchill 2008); forages in open forests and woodlands and roosts in adjacent caves	Yes	Yes

Class	Scientific Name	Common name	Status		General Habitat Requirements	Presence of General Habitat	
			NCA	EPBC		Zone	Buffer
	dwyeri	Pied Bat			and overhangs of cliffs and rocky hills; occasionally shelters in disused Fairy Martin nests (Hoye and Schultz 2008).		
	Chalinolobus picatus	Little Pied Bat	NT		Within species known range (Churchill 2008); forages in woodlands and open forest; roosts in tree hollows and under loose bark sheets (Ford et. al. 2008).	Yes	Yes
	Dasyurus hallucatus	Northern Quoll	LC	E	Within species historical range (Oakwood 2008) though recent records are lacking (DEHP 2013). Shelter in crevices in rocky hills and escarpments, forage here and associated woodland and forest habitats (DOE 2013).	No	Yes
	Nyctophilus corbeni	Eastern Long-eared Bat	V	V	Within species known range (Churchill 2008); inhabits woodlands and roosts in tree hollows and crevices and under loose bark (DOE 2013).	Yes	Yes
	Phascolarctos cinereus	Koala	SLC	V	Within species known range (Martin *et al.* 2008); requires eucalypt woodland and forest habitat with suitable food trees (primarily *Eucalyptus* spp.) (DOE 2013).	Yes	Yes
Reptiles	*Acanthophis antarcticus*	Common Death Adder	NT		Within species known range (Wilson 2005); occupies woodlands, open forests, heathlands, requires abundant shelter/ambush predation cover e.g. low shrubs, rocks, logs, dense leaflitter (Wilson 2005).	No	Yes
	Delma torquata	Collared Delma	V	V	Within species known/predicted range (DSEWPaC 2011) though occupancy within range apparently patchy; occupies eucalypt woodlands and open forests; lives under surface rock and large woody debris (Wilson 2005).	Yes	Yes

Class	Scientific Name	Common name	Status		General Habitat Requirements	Presence of General Habitat	
			NCA	EPBC		Zone	Buffer
	Denisonia maculata	Ornamental Snake	V	V	Within species known range (DSEWPaC 2011); lives in woodland and grassland with cracking clay soils, usually in close proximity to at least seasonally wet areas e.g. billabongs, gilgais, floodplains, riparian corridors (DOE 2013).	No	No
	Egernia rugosa	Yakka Skink	V	V	Within species known range (Wilson 2005); lives in woodland and open forests, also grassland with regrowth trees; requires suitable soils for burrows, sinkholes, abandoned rabbit warrens or large fallen woody material for shelter (Eddie 2012).	Yes	Yes
	Furina dunmalli	Dunmall's snake	V	V	Within species known range (DSEWPaC 2011); occupies woodlands and open forests, may be reliant on presence of abundant fallen woody debris (Hobson 2012).	Yes	Yes
	Paradelma orientalis	Brigalow Scaly-foot	V		Within species known range (Wilson 2005); occupies woodland and open forests, shelters under woody debris and surface rock (DSEWPaC 2011).	Yes	Yes
	Rheodytes leukops	Fitzroy River Turtle	V	V	At margin of species known range (Fitzroy River drainage) (DSEWPaC 2011); almost entirely aquatic, dependent on permanent streams with a preference for deep pools with intervening riffle zones (DOE 2013).	No	No
	Strophurus taenicauda	Golden-tailed Gecko	NT		Within species known range (Wilson 2005). Lives in dry open forest and woodlands, especially those with well-developed shrub layer; shelters in tree hollows and splits, under loose bark (QMDC 2008).	Yes	Yes

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Appendix D: EVNT flora occurring or potentially occurring at FV530-531-532 Zone and Buffer and the likelihood of occurrence.

Key: NCA = *Nature Conservation Act 1992* (Qld); EPBC = *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth); E = endangered; V = vulnerable; NT = near threatened; LC = least concern.

Family	Scientific Name	Common name	Status		Likelihood of Occurrence
			NCA	EPBC	
Acanthaceae	*Xerothamnella herbacea*		E	E	Unlikely to be present – the nearest collection site is within 30km north-northwest of FV530-531-532 at Lonesome Holding (DEHP 2013a) but potentially suitable habitat in Brigalow (*Acacia harpophylla*) communities (TSSC 2008a) is absent within the Zone and Buffer.
Apocynaceae	*Tylophora linearis*	Slender Tylophora	E	E	Unlikely to be present –the only known collection site in Queensland (AVH 2013) is about 180km southeast of FV530-531-532 though potentially suitable habitat (dry sclerophyll woodland: TSSC 2008b) is present within the Zone and Buffer.
Caesalpiniaceae	*Senna acclinis*	Rainforest Cassia	NT		Unlikely to be present – FV530-531-532 is within 60km of the nearest known collection site (AVH 2013) but no populations are known within the Fairview gas field (Santos 2012); potentially suitable habitat (Harden et. al. 2006) is absent within the Zone and Buffer.
Campanulaceae	*Wahlenbergia islensis*	Cliff Bluebell	NT		Unlikely to be present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) but potentially suitable habitat of sandstone cliffs and boulders (Santos 2012) is absent within the Zone and Buffer.
Celastraceae	*Apatophyllum teretifolium*	Sandstone Prickle-bush	NT		Potentially present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) but potentially suitable woodland habitat on sandstone cliffs and ridges (Santos 2012) is absent within the Zone and Buffer.
Ericaceae	*Leucopogon grandiflorus*	Large-flowered Beard Heath	NT		Potentially present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) and potentially suitable woodland habitat on sandstone ridges (Santos 2012) is present within the Zone and Buffer. Recorded within 10km of FV530-531-532 (DEHP 2013b).
Euphorbiaceae	*Bertya opponens*	A Bertya	LC	V	Potentially present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) and potentially suitable woodland habitat on sandstone ridges (DEHP 2013a) is present within the Zone and Buffer.
Mimosaceae	*Acacia calantha*	Cracow Wattle	NT		Potentially present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) and

					potentially suitable woodland habitat on sandstone ridges (Santos 2012) is present within the Zone and Buffer. Recorded within 500m of FV530-531-532 (DEHP 2013b).
Mimosaceae	*Acacia islana*	Isla Gorge Wattle	V		Potentially present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) and potentially suitable woodland habitat on sandstone ridges (Santos 2012) is present within the Zone and Buffer. Recorded within 10km of FV530-531-532 (DEHP 2013b).
Mimosaceae	*Acacia spania*	Western Rosewood	NT		Unlikely to be present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) but potentially suitable habitat (DEHP 2013a) is absent from the Zone and Buffer.
Myrtaceae	*Eucalyptus beaniana*	An ironbark	V	V	Potentially present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) and potentially suitable woodland habitat on sandstone ridges (Santos 2012) is present within the Zone and Buffer.
Myrtaceae	*Eucalyptus curtisii*	Plunkett Mallee	NT		Potentially present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) and potentially suitable woodland habitat on sandstone ridges (Santos 2012) is present within the Zone and Buffer.
Myrtaceae	*Eucalyptus virens*	Shiny-leaved Ironbark	V	V	Potentially present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) and potentially suitable woodland habitat on sandstone ridges (Santos 2012) is present within the Zone and Buffer.
Myrtaceae	*Melaleuca irbyana*	Swamp Paperbark	E		Unlikely to be present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) but woodland habitat with potentially suitable soil type (Santos 2012) is absent within the Zone and Buffer; recorded within 10km of FV530-531-532 (DEHP 2013b).
Myrtaceae	*Sannantha brachypoda*	A Heath-myrtle	NT		Potentially present – FV530-531-532 is within the species range (AVH 2013, DEHP 2013a) and potentially suitable woodland habitat on sandstone ridges (Santos 2012) is present within the Zone and Buffer. Recorded within 10km of FV530-531-532 (DEHP 2013b).
Surianaceae	*Cadellia pentastylis*	Ooline	V	V	Unlikely to be present – FV530-531-532is within the broader species range (AVH 2013) but no populations are known within the Fairview gas field (Santos 2012); potentially suitable habitat (TSSC 2008c) is absent within the Zone and Buffer.

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Appendix E: Table of Evidence of Wetland Assessment at FV530-531-532 Zone and Buffer.

Step No.	Assessment Criteria	Checklist	Assessment Comments
Does the feature meet the Santos GLNG Environmental Authority Definition?			
1	The wetland must be identified on the 'Map of Referable Wetlands'.	☐ **Yes** – Site is a wetland. **No further assessment required.** ***or*** ☐ **Yes** – Verify the mapping (optional). Continue to step 2 X☐ **No** – Site is not a wetland. **No further assessment required.**	
Does the feature meet the hydrology criteria of the wetland definition in the Queensland Wetland Program?			
2	Hydrology - permanent or periodic / intermittent inundation, with water that is static or flowing fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six (6) metres.	☐ **Yes**, continue to Step 3 X☐ **No**, feature does not meet minimum requirements of the "*Wetland Mapping and Classification Methodology"*. **No further assessment required.**	Queensland Wetlands Program mapping shows the presence of Wetlands of General Ecological Significance which correspond with the mapped boundaries of two RE (11.3.2 and 11.3.25) which frequently contain wetland features. No evidence of the presence of these RE or wetlands was obtained within the mapped wetland area.
Does the feature meet the biotic or soils criteria of the wetland definition in the Queensland Wetland Program?			
3	**3a** Biotic (flora) - At least periodically, the land supports plants that are adapted to and dependent on living in wet conditions for at least part of their life cycle. **3a** Biotic (fauna) - At least periodically, the land supports animals that are adapted to and dependent on living in wet conditions for at least part of their life cycle. **3c** Soils - The substratum is predominantly undrained soils	☐ **Yes to** ANY (3a, 3b or 3c), wetland meets the definition of a wetland under the "*Wetland Mapping and Classification Methodology*" and the EA. **No further wetland assessment required.** X☐ **No** to ALL (3a, 3b and 3c), feature does **not**	

	that are saturated, flooded or ponded long enough to develop anaerobic conditions in the upper layers; *or* Substratum is not soil and is saturated with water, or covered by water at some time (i.e. rock).	meet minimum requirements of the "*Wetland Mapping and Classification Methodology"*. **No further wetland assessment required.**	