21 October 2020

Our Reference: 14017-20-BILR-1Rev0_201021

[redacted]

Woodside Energy Ltd
11 Mount St
Perth WA 6000

Dear [redacted]

Re: Pluto Haul Road Culvert Vegetation Survey – August 2020

1 Introduction

Astron Environmental Services (Astron) was engaged by Woodside Energy Ltd (Woodside) as part of the Pluto Domestic Fuel Supply Project to conduct a vegetation assessment of two existing culverts located along the Pluto Haul Road in the Burrup Peninsula region of the Pilbara, Western Australia. The results of this vegetation assessment will be used to inform the application for an exemption of a vegetation clearing permit to carry out maintenance of the culverts.

The assessment was conducted on 30 June 2020 by Associate Environmental Scientist [redacted]. The survey area included two previously disturbed Haul Road culverts and a 50 m buffer (by way of the centre of the culvert) from the edge of the haul road into the roadside vegetation.

2 Methods

At each site, all flora species occurring within the 50 m radial buffer were recorded. These were used to define vegetation type communities which have been classified according to the Aplin (1979) modification of the vegetation classification system of Specht (1970). Vegetation condition was also assessed at each site according to the vegetation condition classification adapted from Trudgen (1988). The location of any conservation significant and introduced species observed were recorded using a handheld GPS and population attributes noted. Additional field observations were recorded to supplement the above data.

Due to the steepness of the eastern side of culvert 004 and a land lease title change near the base access route, this area was only partially surveyed. The site was visually assessed from a safe location along the haul road for the presence of Priority or Threatened Ecological Communities (PECs or TECs) and conservation significant flora only.

3 Results

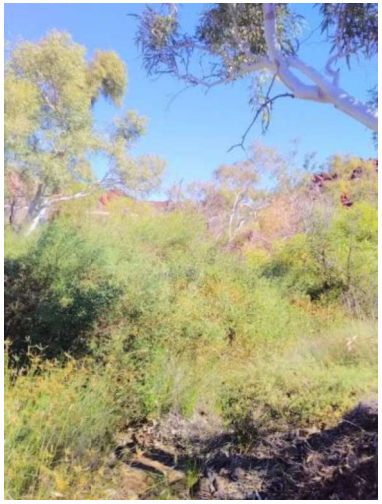
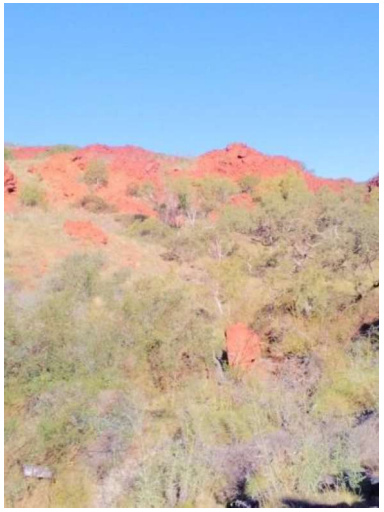
3.1 Vegetation

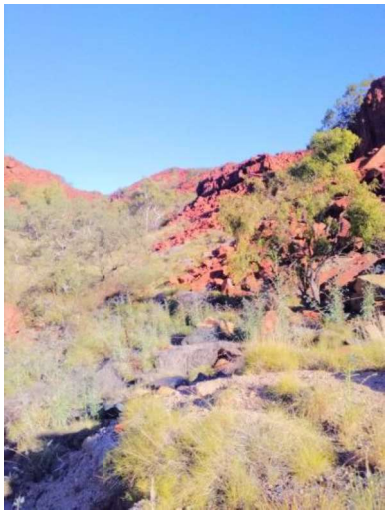
The vegetation surrounding the culverts of the eastern and western sides of the Haul Road consists of both habitat specific and opportunistic native species, which can be delineated into two distinct vegetation types. These are described in Table 1 and illustrated in Figure 1.

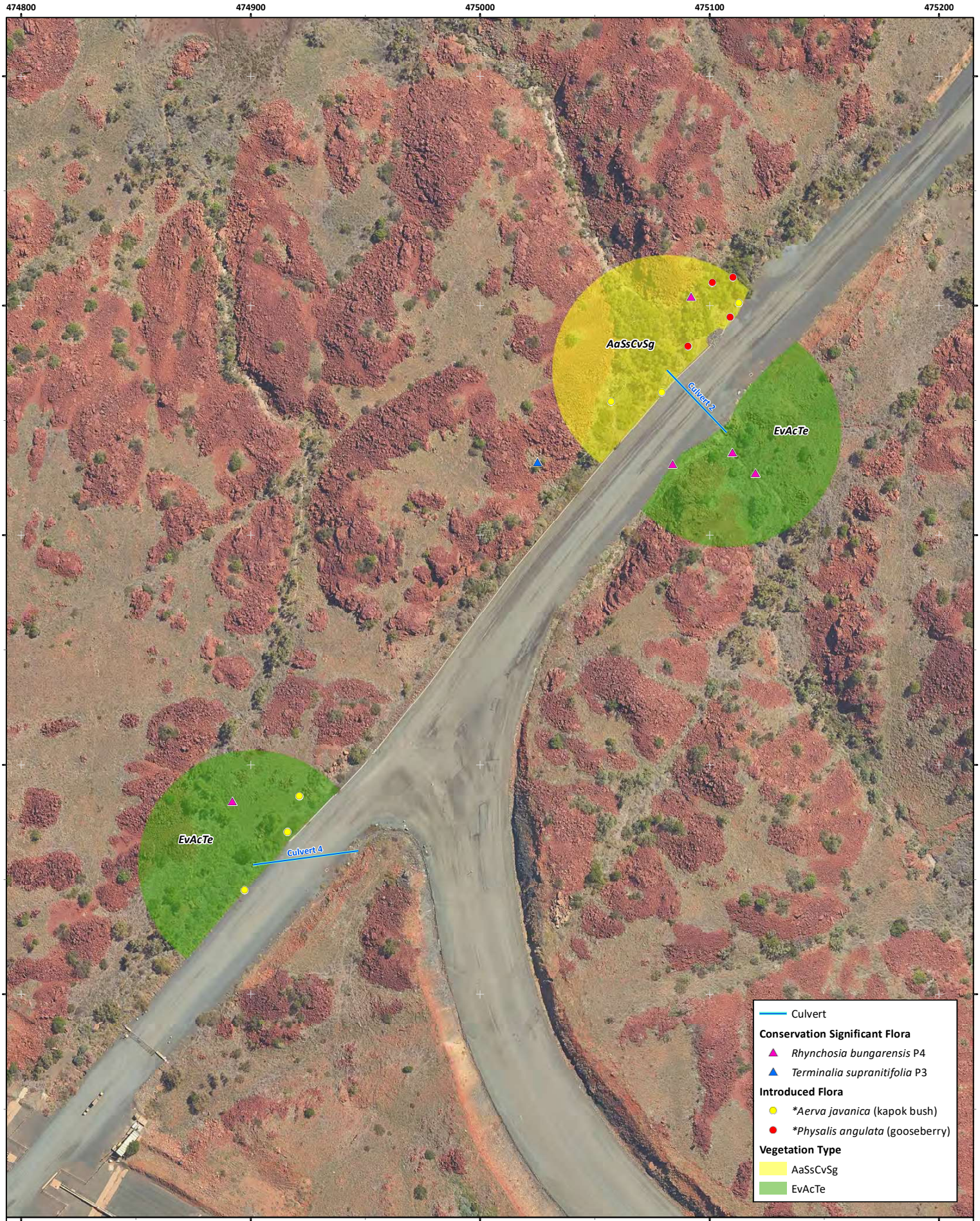
Vegetation was considered to be in excellent condition within the majority of the survey areas with the exception of the west site of culvert 002. Here, the *Acacia ampliceps* is extremely dense likely due to a change in drainage capacity, resulting in a vegetation type believed to be uncharacteristic of the Burrup area.

No PECs or TECs were observed within the survey sites.

Table 1: Site and vegetation type descriptions.

Culvert-Site-Orientation	Vegetation code	Vegetation type description	Vegetation condition	PECs/TECs	Photograph
002-1-West	AaSsCvSg	*Acacia ampliceps* low closed forest over *Stylobasium spathulatum* shrubland over *Cyperus vaginatus* sedgeland and *Stemodia grossa* herbland.	Good	None	
002-1-East	EvAcTe	*Eucalyptus victrix* with *Terminalia circumalata* low woodland over mixed *Acacia coriacea* and *Flueggea virosa* subsp. *melanthesoides* open shrubland over *Triodia epactia* (*Triodia angusta)* hummock grassland.	Excellent	None	

Culvert-Site-Orientation	Vegetation code	Vegetation type description	Vegetation condition	PECs/TECs	Photograph
004-2-West	EvAcTe	*Eucalyptus victrix* with *Terminalia circumalata* low woodland over mixed *Acacia coriacea* and *Flueggea virosa* subsp. *melanthesoides* open shrubland over *Triodia epactia* (*Triodia angusta)* hummock grassland.	Excellent	None	
004-2-East	Unable to Assess	Unable to Assess	Unable to Assess	None	



Woodside Energy Ltd
Pluto Haul Road Culvert Vegetation Survey

Figure 1: Survey sites, vegetation type mapping and location of conservation significant and introduced flora species

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Author: [redacted]	Date: 11-08-2020	Scale: 1:1,500 at A3 Coordinate System: GDA 1994 MGA Zone 50 0 20 40 60 80 100 Metres N
Drawn: [redacted]	Figure Ref: 14017-20-BIDR-1Rev0_200811_Fig1	

3.2 Flora

There were 53 confirmed plant taxa from 30 families and 46 genera recorded within the combined survey areas of culverts 002 and 004 (Table 2). The family represented by the most taxa was Fabaceae (10 taxa) while Acacia (3 taxa) was the most taxa-rich genus. Two confirmed weed taxa, **Aerva javanica* (kapok bush) and **Physalis angulata* were recorded within the combined survey areas (Figure 1).

Table 2: Flora species list for Pluto Haul Road culverts 002 and 004 (excluding the east site at culvert 004).

Family	Species	Culvert-Site-Orientation		
		002-1-West	002-1-East	004-2-West
Acanthaceae	*Dicliptera armata*	X	X	
Aizoaceae	*Trianthema turgidifolium*	X		
Amaranthaceae	**Aerva javanica*	X		X
Apocynaceae	*Cynanchum floribundum*	X		X
Araliaceae	*Trachymene oleracea*	X	X	
Asteraceae	*Pluchea rubelliflora*		X	
Boraginaceae	*Ehretia saligna*	X	X	
	Trichodesma zeylanicum	X	X	X
Chenopodiaceae	*Enchylaena tomentosa*	X		
Cleomaceae	*Cleome viscosa*	X	X	
Combretaceae	*Terminalia circumalata*		X	
	Terminalia supranitifolia P3	X		
Convolvulaceae	*Ipomoea costata*	X	X	X
Cucurbitaceae	*Cucumis variabilis*	X	X	X
Cyperaceae	*Cyperus vaginatus*	X	X	X
Euphorbiaceae	*Euphorbia tannensis* subsp. *eremophila*	X		X
	Euphorbia trigonosperma	X	X	
Fabaceae	*Acacia ampliceps*	X		
	Acacia bivenosa		X	X
	Acacia coriacea	X	X	X
	Crotalaria medicaginea		X	
	Dichrostachys spicata			X
	Indigofera monophylla			X
	Rhynchosia bungarensis P4	X		X
	Sesbania cannabina	X	X	
	Swainsona formosa	X	X	X
	Tephrosia clementii		X	
Lamiaceae	*Clerodendrum tomentosum*	X		X
Lauraceae	*Cassytha capillaris*	X		
Malvaceae	*Abutilon lepidum*		X	
	Brachychiton acuminatus	X	X	X

Family	Species	Culvert-Site-Orientation		
		002-1-West	002-1-East	004-2-West
	Corchorus walcottii			X
	Triumfetta appendiculata	X	X	
	Triumfetta clementii	X		X
Menispermaceae	*Tinospora smilacina*	X		
Moraceae	*Ficus aculeata* var. *indecora*	X	X	
	Ficus brachypoda		X	
Myrtaceae	*Corymbia hamersleyana*			X
	Eucalyptus victrix	X	X	X
Nyctaginaceae	*Boerhavia gardneri*	X		X
Phyllanthaceae	*Flueggea virosa* subsp. *melanthesoides*	X	X	X
	Phyllanthus maderaspatensis	X		
Pittosporaceae	*Pittosporum phillyreoides*			X
Plantaginaceae	*Stemodia grossa*	X	X	X
Poaceae	*Cymbopogon ambiguus*	X	X	X
	Paspalidium tabulatum	X	X	X
	Triodia angusta	X	X	X
	Triodia epactia	X	X	X
Proteaceae	*Grevillea pyramidalis*			X
Solanaceae	**Physalis angulata*	X		
	Solanum cleistogamum	X		
Surianaceae	*Stylobasium spathulatum*	X		
Violaceae	*Hybanthus aurantiacus*		X	X

*Denotes an Introduced flora species.

3.3 Priority Flora

Two priority species, *Rhynchosia bungarensis* P4 and *Terminalia supranitifolia* P3 were recorded during the field survey (Figure 1). *Terminalia supranitifolia* P3 was opportunistically recorded approximately 25 m outside of the buffer zone at culvert 002 (west). *Rhynchosia bungarensis* P4 was found at the east and west sites of culvert 002, the west site of culvert 004, but not the east site which was only partially surveyed via visual inspection from the edge of the haul road.

No Threatened flora species were recorded during this survey.

4 Conclusions

The Pluto Haul Road culvert vegetation survey has provided the necessary information required for Woodside to inform their clearing permit exemption. The locations of priority flora and weed species should be taken into consideration when planning maintenance activities.

This letter was prepared by Environmental Scientist Holly Poole and technically reviewed by Senior Environmental Scientist [redacted]. If you have any queries please contact myself or [redacted] on [redacted]

Yours sincerely
ASTRON ENVIRONMENTAL SERVICES

[redacted]

References

Aplin, T. E. H. 1979. The flora. Page *in* B. J. O'Brien, editor. Environment and Science. University of Western Australia Press, Perth WA.

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