

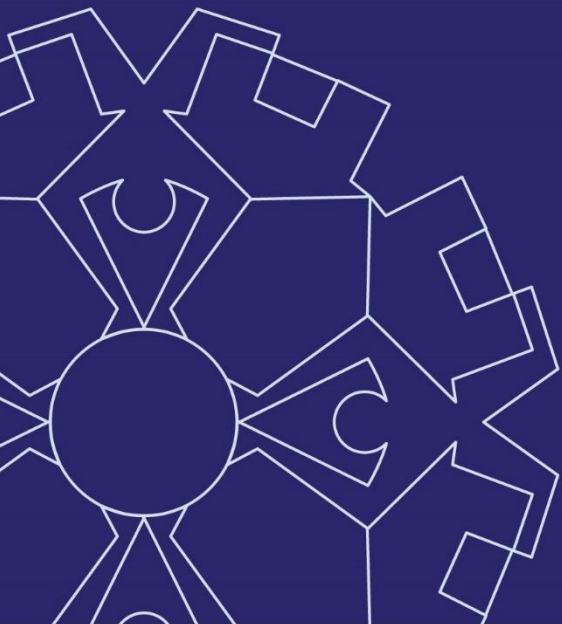


GEOLYSE

**STATEMENT OF ENVIRONMENTAL EFFECTS
DAROOBALGIE WASTE DEPOT EXPANSION**

**PREPARED FOR
FORBES SHIRE COUNCIL**

SEPTEMBER 2018



• Civil, Environmental & Structural Engineering • Surveying • Environmental • Planning • Architecture

STATEMENT OF ENVIRONMENTAL EFFECTS

DAROOBALGIE WASTE DEPOT

PROPOSED EXPANSION

PREPARED FOR:

FORBES SHIRE COUNCIL

SEPTEMBER 2018



POSTAL ADDRESS PO Box 1963
LOCATION 154 PEISLEY STREET
TELEPHONE 02 6393 5000
EMAIL ORANGE@GEOLYSE.COM

ORANGE NSW 2800
ORANGE NSW 2800
FACSIMILE 02 6393 5050
WEB SITE WWW.GEOLYSE.COM

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ABBREVIATIONS

Acronyms

BA	Biodiversity Assessment
BH	Borehole
BSAL	Biophysical Strategic Agricultural Land
CRTN	Calculation of Road Traffic Noise
DA	Development Application
DCP	Development Control Plan
DoE	Department of Environment
DIW	Department of Industry - Water
DPE	Department of Planning and Environment
DWD	Darroobalgie Waste Depot
EEC	Endangered Ecological Community
EPA	Environment Protection Authority
EPL	Environmental Protection Licence
ESD	Ecologically Sustainable Development
FSC	Forbes Shire Council
GDE	Groundwater Dependent Ecosystem
GTA	General Terms of Approval
ICNG	Interim Construction Noise Guideline
LEP	Local Environmental Plan
LEMP	Landfill Environmental Management Plan
NPfi	Noise Policy for Industry
OEH	Office Environment and Heritage
PCT	Plant Community Type
RFS	Rural Fire Service
RL	Relative Level
RMS	Roads and Maritime Service
RNP	Road Noise Policy
SEE	Statement of Environmental Effects
SEPP	State Environmental Planning Policy
SWL	Standing Water Level
TEC	Threatened Ecological Community
WRPP	Western Regional Planning Panel

Units of measure

Ha	Hectare
m	Metre
mAHD	Metres Australian Height Datum
ML	Megalitre

Introduction

1.1 BACKGROUND

Forbes Shire Council (FSC) has operated the Daroobalgie Waste Depot (DWD) at its current location since at least 1983 and now propose a lateral expansion to provide additional landfill life. The works required constitute additions and alterations to the existing DWD and require planning approval.

Development consent is required under the provisions of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The expansion also requires securing General Terms of Approval (GTA) from the Environment Protection Authority (EPA) as the DWD is a licenced premise under the provisions of the *Protection of the Environment Operations Act 1997* (POEO Act); and the alterations/additions trigger the need to vary the existing Environment Protection Licence (EPL). The Environment Protection Authority (EPA) has previously advised that an EPL variation triggers integrated development status pursuant to s.4.46 of the EP&A Act.

This Statement of Environmental Effects (SEE) has been prepared as the supporting documentation submitted with the Development Application (DA).

The SEE will provide information relevant to those matters that:

- Western Regional Planning Panel (WRPP) must consider in assessing the application pursuant to s.4.15 of the EP&A Act; and
- the EPA must consider in assessing the application pursuant s.45 of the POEO Act.

1.2 REPORT STRUCTURE

This SEE has been structured and prepared with reference to the (then) Department of Urban Affairs and Planning's (2000) guidelines *Is an EIS required for alterations and additions? A Guide for Applicants and Consent Authorities*.

- **Section 2** describes the existing operation and the development site locality.
- **Section 3** clarifies the approvals process.
- **Section 4** presents data relating to the impacts of the existing operation.
- **Section 5** describes the alterations/additions associated with the expansion.
- **Section 6** assesses the significance of likely impacts resulting from the expansion.
- **Section 7** identifies mitigation measures for managing environmental impacts.
- **Section 8** presents a justification for the development and address matters for consideration.
- **Section 9** presents a conclusion with regards to the significance of the environmental impact.

Existing Operation

2.1 DEVELOPMENT SITE

The DWD is situated approximately 9.5 km north of Forbes on the Daroobalgie Road, occupying an area of approximately 7.7 ha within Lots 7008 & 7009 in DP 1020396, Parish of Forbes, County of Ashburnham. The site and surrounding land is zoned RU1 – Primary Production under the *Forbes Local Environmental Plan 2013*.

The lateral expansion (ie. development footprint) is immediately to the west of the existing DWD and will extend into part of Lot 1472 DP 750158 and Lot 1 DP 120710. Through consultation with the landowner FSC is acquiring ~10.32ha from the above lots via a proposed plan of sub-division DP 1242538 (currently unregistered).

Land adjacent to the DWD includes woodland vegetation to the north and east, Daroobalgie Road to the south, and agricultural land to the west. Land uses in the locality are predominantly agricultural, such as cropping and grazing.

The closest residential zoned land is approximately 1.7 km west (R5 – Large Lot Residential) and the closest industrial land (Forbes Industrial Estate) is approximately 600 m east (IN1 – General Industrial).

There are a total of 13 receptors within a 1 km radius, with the closest receptor located approximately 320 m east of the DWD (refer **Figure 1**).

2.2 WASTE MANAGEMENT ACTIVITIES

2.2.1 WASTE STREAMS

Council commenced a new and expanded domestic waste collection contract in April 2016. The current collection service includes:

- Organics – weekly (green bin)
- Co-mingled recyclables – fortnightly (yellow bin)
- Residual general solid waste – fortnightly (red bin)

The organic wastes are processed by Australian Native Landscapes at a facility near Blayney as part of a regional organics collection and processing contract. Co-mingled recyclables are collected and processed in western Sydney. Residual wastes (red bin) are delivered to the DWD.

Waste stream data since the commencement of the new collection contract is summarised in **Table 2.1**. This data shows an average of 54% of the domestic waste stream is being diverted from landfill (34% organics and 20% recyclables).

Table 2.1 – Domestic waste stream

Year Ended	Organics (tonnes)	Recyclables (tonnes)	Residual Waste (tonnes)	Total (tonnes)
June 2016 (3 months)	177	137	258	572
June 2017	1,051	586	1,394	3,031
June 2018 (11 months)	849	534	1,158	2,541

Waste loads arriving at the DWD (municipal kerbside, municipal self-haul, commercial and industrial, and building and demolition waste) are recorded and EPA weight conversion factors applied to estimate the tonnes of waste being managed. Data for 2017 and 2018 are summarised in **Table 2.2**. In the absence of data specific to DWD, the waste types have been split to estimate the amount of putrescible and inert waste being managed using typical waste composition data from the Orange local government area. The composition of the municipal waste stream has been adjusted to reflect the organic kerbside collection service.

Table 2.2 – Waste Arriving at DWD

Sector/Waste Type	2017		2018	
	Putrescible	Inert	Putrescible	Inert
Municipal	2732	4098	1973	2959
Commercial and Industrial	606	909	343	515
Building and Demolition	296	1183	254	1017
VENM	0	8501	0	5463
Greenwaste	103	<i>1950</i>	57	<i>1085</i>
Recyclables	78	<i>442</i>	36	<i>204</i>
Animal Carcasses	35	0	32	0
Totals	3850	17085	2696	11244
Total landfilled	3850	14693	2696	9955

Note: wastes shown in italics in grey cells do not go to landfill

The DWD waste data for 2017 and 2018 shows:

- The average combined amount of putrescible and inert waste landfilled is 15,600 tonnes per year;
- The average amount of putrescible waste landfilled is approximately 3,300 tonnes per year; and
- The average amount of inert waste landfilled is approximately 12,300 tonnes per year.

Annual landfill surveys indicate that approximately 19,000 m³ of landfill space is used each year. The waste data and survey data combine to indicate an average landfill compaction rate of 0.82 t/m³.

2.2.2 PERMITTED WASTES AT LANDFILL

The existing EPL 6118 for DWD authorises three licenced activities to be undertaken at the premises. These include:

- Waste Disposal (application to land)
- Waste processing (non-thermal treatment)
- Waste storage (hazardous, restricted solid, liquid, clinical and related waste and asbestos waste)

Condition L2.1 states:

The licensee must not cause, permit or allow any waste to be received at the premises, except the wastes expressly referred to in the column titled "Waste" and meeting the definition, if any, in the column titled "Description" in the table below.

Any waste received at the premises must only be used for the activities referred to in relation to that waste in the column titled "Activity" in the table below.

Any waste received at the premises is subject to those limits or conditions, if any, referred to in relation to that waste contained in the column titled "Other Limits" in the table below.

This condition does not limit any other conditions in this licence.

Table 2.3 – Authorised Activities

Waste	Description	Activity	Other Limits
Liquid Waste	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste storage	The receipt and storage of this waste is only permitted for waste that originates in the Forbes local government area.
General solid waste (putrescible)	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	See Note following table
General solid waste (non-putrescible)	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	See Note following table
Asbestos waste	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	See Note following table
Waste tyres	As defined in Schedule 1 of the POEO Act, in force from time to time	Waste disposal (application to land)	See Note following table

Note: The total amount of waste listed under the 'Waste' heading of this table and disposed of at the premises must not exceed 20,000 tonnes per annum, including no more than 50 tonnes of waste tyres being stored at the premises at any one time.

Source: EPL 6118 Condition L2.1

DWD currently receives the following waste types:

- Municipal solid waste including:
 - Domestic solid waste (putrescible and non-putrescible).
 - Council waste.
 - Other domestic waste (delivered direct to the landfill by residents).
- Commercial and industrial solid waste.
- Building and construction solid waste.
- Contaminated soil (meeting the definition of general solid waste).
- Recyclable waste materials (separated) including:
 - Garden organics
 - Wood waste
 - Glass
 - Paper and cardboard
 - Concrete
 - Scrap metal
 - Plastics
 - E-waste
 - Mattresses
- Special wastes:
 - Asbestos
 - Waste tyres
- Liquid wastes:
 - Waste oil

2.2.3 CURRENT FACILITIES

Current site facilities include the following:

- site entrance and access road;
- gate house;
- designated areas for the receipt and separation of waste types;
- facilities for receipt of problem wastes; and
- the existing landfill.

Access to the DWD is via the Daroobalgie Road, which is a sealed road. From Daroobalgie Road the depot is accessed by a sealed internal access road. Within the landfill area partially-formed unsealed tracks lead to the various defined tipping areas.

The landfill is open 7 days per week from 8:30 am to 5:00 pm. It is manned by at least two staff members while open.

Landfill operations are permitted by EPL 6118 to occur:

- 7.00 am to 8.00 pm, Monday to Saturday; and
- 8.00 am to 8.00 pm, Sunday and Public Holidays.

This allows for landfill operations to occur outside of public access hours. The DWD is fully enclosed with 1.8 metre high fencing. Lockable security gates are in place at the access to the DWD. The gates are locked outside of operating hours.

2.2.4 EXISTING LANDFILL

The existing landfill has been constructed largely above the natural ground surface. The base of the existing landfill is unlined.

The landfill has been formed in two parts (eastern and northern) which are separated by an access road. Survey in March 2018 shows that the eastern side has reached an elevation of around RL 272.0 m and the western side an elevation of around 276 m. The natural ground surface is approximately RL 260 m which indicates the landfill cells are currently 12 to 16 m above the natural ground surface.

Landfill records indicate that the volume landfilled (including cover material) is approximately 19,000 m³/year. Staging calculations for the existing site based on this filling rate are summarised in **Table 2.4**. This indicates the existing site has a remaining life of approximately 5.1 years which takes it to around March 2023.

Table 2.4 – Existing landfill staging volumes

Stage	Landfill Volume m ³	Capping Volume m ³	Years Taken to Fill
3A	34,600	10,200	1.8
3B	12,300	3,700	0.6
3C	50,000	43,200	2.6
Total	96,900	57,100	5.1

The final landform of the existing landfill has been developed in consultation with the NSW Environment Protection Authority (EPA). The height of the landfill is limited to RL 280.50 m and the final landform is based on this maximum height and appropriate grading for surface water management.

Surface water and leachate are managed in two existing sedimentation basins located on the south eastern and south western side of the landfill.

2.3 LANDFILL ENVIRONMENTAL MANAGEMENT PLAN

Activities undertaken at the DWD are also regulated through a Landfill Environmental Management Plan (LEMP) (Forbes Shire Council, Version 2, April 2016).

The LEMP defines objectives, assigns responsibilities, outlines procedures for operational controls, and documents sampling requirements.

The LEMP provides operational controls for the following areas:

- Site supervision and control
- Landfill staging
- Waste receipt and management
- Surface water management
- Groundwater management
- Air quality management
- Noise control
- Litter control
- Pest, vermin and noxious weed control
- Fire management
- Document control
- Incident reporting
- Complaints reporting
- Annual returns



Figure 1: Surrounding Receptors

Statutory Planning

3.1 EXISTING LAND USE

Forbes Shire Council (FSC) has operated the DWD at its current location since at least 1983. It is an existing land use.

3.2 DEVELOPMENT DESCRIPTOR

Pursuant to definitions in the *Standard Instrument – Principal Local Environmental Plan* the expansion of the DWD constitutes a waste and resource management facility; as:

waste or resource management facility means any of the following:

- (a) a resource recovery facility,
- (b) a waste disposal facility,
- (c) a waste or resource transfer station,
- (d) a building or place that is a combination of any of the things referred to in paragraphs (a)–(c).

waste disposal facility means a building or place used for the disposal of waste by landfill, incineration or other means, including such works or activities as recycling, resource recovery and other resource management activities, energy generation from gases, leachate management, odour control and the winning of extractive material to generate a void for disposal of waste or to cover waste after its disposal. Note. Waste disposal facilities are a type of waste or resource management facility.

waste or resource transfer station means a building or place used for the collection and transfer of waste material or resources, including the receipt, sorting, compacting, temporary storage and distribution of waste or resources and the loading or unloading of waste or resources onto or from road or rail transport. Note. Waste or resource transfer stations are a type of waste or resource management facility.

3.3 REGIONAL DEVELOPMENT

Pursuant to Schedule 7 of the *State Environmental Planning Policy (State and Regional Development) 2011*, as the expansion of the DWD is a Council related development with a capital investment value of more than \$5 million (over the life of the development), the development is classified as a regional development.

FSC is the applicant for Development Consent, it will be the owner of any land on which the development is to be carried out, and the development is to be carried out by (or on behalf of) FSC.

Accordingly, the consent authority for the proposed development is the Western Regional Planning Panel (WRPP).

The DWD expansion is not State Significant Development (SSD) because, whilst it does constitute a waste and resource management facility:

- Notwithstanding it is for the purpose of an extension to a regional putrescible landfill, it will not have a capacity to receive more than 75,000 tonnes per year of putrescible waste, or a capacity to receive more than 650,000 tonnes of putrescible waste over the life of the site, and is not located in an environmentally sensitive area of State significance.
- It is not for the purpose of a resource recovery or recycling facility that will handle more than 100,000 tonnes per year of waste.
- It is not for the purpose of waste incineration.

- It is not for the purposes of a hazardous waste facility that will transfer, store or dispose of solid or liquid waste classified in the Australian Dangerous Goods Code or medical, cytotoxic or quarantine waste that will handle more than 1,000 tonnes per year of waste.
- It is not for the purpose of a liquid waste depot that will treat, store or dispose of industrial liquid waste and handle more than 10,000 tonnes per year of liquid food or grease trap waste, or handle more than 1,000 tonnes per year of other aqueous or non-aqueous liquid industrial waste.

3.4 INTEGRATED DEVELOPMENT

The proposed DWD expansion requires securing General Terms of Approval (GTA) from the Environment Protection Authority (EPA) as the DWD is a licenced premise under the provisions of the *Protection of the Environment Operations Act 1997*.

The licensed premises includes Lots 7008 and 7009, DP 020396.

While the proposed lateral expansion would not change the nature or scale of authorised activities undertaken at the DWD, the expansion would occupy part of a new parcel of land.

The EPL needs to be varied to permit this.

Further, the proposed expansion includes proposed additional groundwater monitoring locations.

The Environment Protection Authority (EPA) has previously advised that an EPL variation triggers integrated development status pursuant to s.4.46 of the EP&A Act.

3.5 DESIGNATED DEVELOPMENT

Notwithstanding that the proposed DWD expansion is a waste management facility and works that will entail landfilling more than 200 tonnes of waste material a year and is located within 100 m of an ephemeral, unnamed, Strahler Order 2 watercourse it is not considered designated development pursuant to Schedule 3 of the *Environmental Planning and Assessment Regulation 2000*.

The proposed development entails alterations/additions to an existing approved development and Clause 35, Schedule 3 of the *Environmental Planning and Assessment Regulation 2000* states:

Development involving alterations or additions to development (whether existing or approved) is not designated development if, in the opinion of the consent authority, the alterations or additions do not significantly increase the environmental impacts of the total development (that is the development together with the additions or alterations) compared with the existing or approved development.

The assessment undertaken in this Statement of Environmental Effects concludes that the proposed DWD expansion will not significantly increase the environmental impacts of the total development compared with the existing development.

3.6 CONSENT AUTHORITY

The consent authority is Western Regional Planning Panel (WRPP).

Impact of Existing Development

4.1 ENVIRONMENTAL PERFORMANCE REPORTING

Environmental reporting has been required pursuant to obligations as a licenced premise under the POEO Act since commencement of licenced operations. The EPL requires that an Annual Return, comprising a Statement of Compliance and a summary of monitoring (including the recording of complaints) be submitted annually to the EPA. The first annual return was submitted to the EPA in November 2000. Since then, three non-compliances have been recorded over its 17 year licenced history, with the last of these non-compliances recorded over ten years ago. Detail on when these occurred, the nature of the recorded non-compliance, and the recorded EPA action is summarised below (refer **Table 4.1**).

Table 4.1 – EPL Annual Returns

Reporting Period	Nature of Non-Compliance	Recorded EPA Action
2006-2007	Failed to undertake all monitoring required by licence due to absence of water to sample.	S.58 notice being negotiated to change licence conditions(s)
2005-2006	Failed to undertake all sampling associated with monitoring point 1.	Appropriate Action taken by licensee
2000-2001	Compliance audit was carried out and the site auditor was not satisfied that daily cover was being applied over all exposed landfilled waste at the ceasing of operations each day.	N/A
	One parameter (TSS) was only monitored on 1 occasion, when the licence required 4 samples	N/A

4.2 COMPLAINTS HISTORY

FSC is required to keep a record of any complaint made to them (or any of its employees) in relation to their operation. This is a requirement of the EPL (in relation to pollution complaints) and the *Daroobalgie Waste Depot Landfill Environmental Management Plan* (Geolyse, 2016) which requires all complaints to be recorded.

Since becoming a licenced premise in 2000 FSC has received one complaint relating to impacts associated with the DWD. This complaint was received in August 2016 following a protracted wet period. The complaint related to odour. The cause of the odour was the inability for the contractor to provide cover over deposited waste because of the wet conditions. When conditions permitted the cover was provided and the odour eliminated. The complaints recording and investigation process specified in the Landfill Environmental Management Plan (LEMP) was followed by FSC and the issue resolved to the satisfaction of the complainant.

4.3 BIOPHYSICAL IMPACTS

4.3.1 ENVIRONMENTAL MONITORING

The EPL requires quality monitoring of leachate and groundwater. An overview of the current requisite monitoring regime is provided below and **Figure 2** shows the location of the licensed monitoring points.



LEGEND

 DWD  Monitoring Points

Sources: SixMaps (Imagery) and Nearmap (Imagery)

Figure 2: EPL Monitoring Points

Table 4.2 – Existing Monitoring Regime

Type of Monitoring	Monitoring Points	What is monitored	Frequency of Monitoring
Groundwater	4	Alkalinity (as calcium carbonate), Aluminium, Ammonia, Bicarbonate, Calcium, Chloride, Conductivity, Copper, Fluoride, Iron, Magnesium, Manganese, Nitrate, Pesticides, pH, Phosphorus (total), Potassium, Sodium, Standing Water Level, Sulfate, Total Organic Carbon (TOC), Total Phenolics and TPH.	Inspect every 6 months and sample for analysis when liquid is present
Leachate	1	Alkalinity (as calcium carbonate), Ammonia, Biochemical Oxygen Demand (BOD), Conductivity, Nitrate and pH	

4.3.2 GROUNDWATER

The groundwater monitoring network comprises four piezometers which are used to monitor groundwater levels and quality biannually when liquid is present. Two piezometers are located within the DWD site and a further two are located 50 m and 75 m outside the DWD boundary, as shown in **Figure 2**.

The first piezometer (BH1) was installed in 1997, with subsequent piezometers installed in 2001 to ensure an accurate representation of both groundwater quality and levels in the area.

Groundwater levels and quality monitoring initially commenced in October/November 2000 with a routine monitoring program underway since November 2001.

The depth and top of piezometer RL is provided in **Table 4.3**.

Table 4.3 – Groundwater Monitoring Points

EPA Identification No.	Piezometer No.	Total Depth (m)	Top Piezometer (m) RL ¹
2	BH1	34.50	262.30
3	BH2	36.80	261.36
4	BH3	29.75	258.97
5	BH4	34.50	263.04

¹ Based on assumed site datum

Source: LEMP Version 2 (Geolyse, 2016)

A review of groundwater monitoring results is provided in the following section.

4.3.2.1 Monitoring Results

Standing Water Level

Groundwater levels are depicted in **Figure 3**.

Groundwater levels have maintained a relatively consistent trend over time and from the data it can be concluded that groundwater at the site flows south-easterly direction at a hydraulic gradient of 0.0015 m/m. This flow direction has been consistent throughout the period of monitoring. Groundwater levels from 2001 to 2018 are generally indicative of a flat water table and a flow direction to the south-east.

Groundwater monitoring wells BH3 and BH4 are considered to be upgradient of the DWD. Groundwater monitoring wells BH1 and BH2 are considered to be downgradient of the DWD.

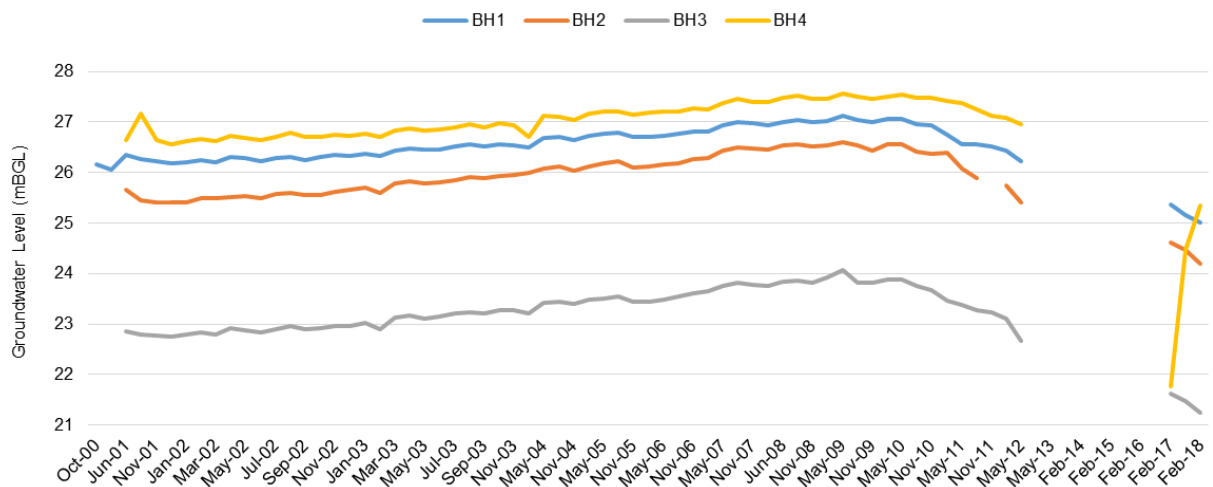


Figure 3: Groundwater Levels

Alkalinity (as calcium carbonate)

Groundwater alkalinity is depicted in **Figure 4**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for alkalinity.

Available data indicates groundwater alkalinity is generally higher than the guideline hardness value for potential fouling of waters (350 mg/L) at all monitoring locations.

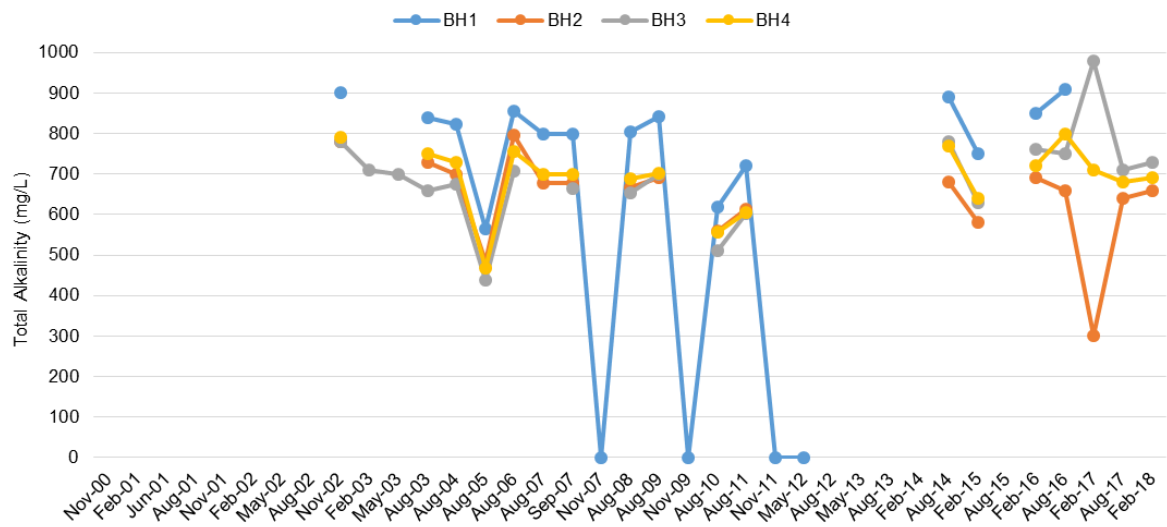


Figure 4: Groundwater Total Alkalinity

Aluminium

Groundwater aluminium levels are depicted in **Figure 5**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for aluminium.

Available data indicates aluminium concentrations in groundwater to consistently be below the long-term (up to 100 years) irrigation guideline concentration of 5 mg/L.

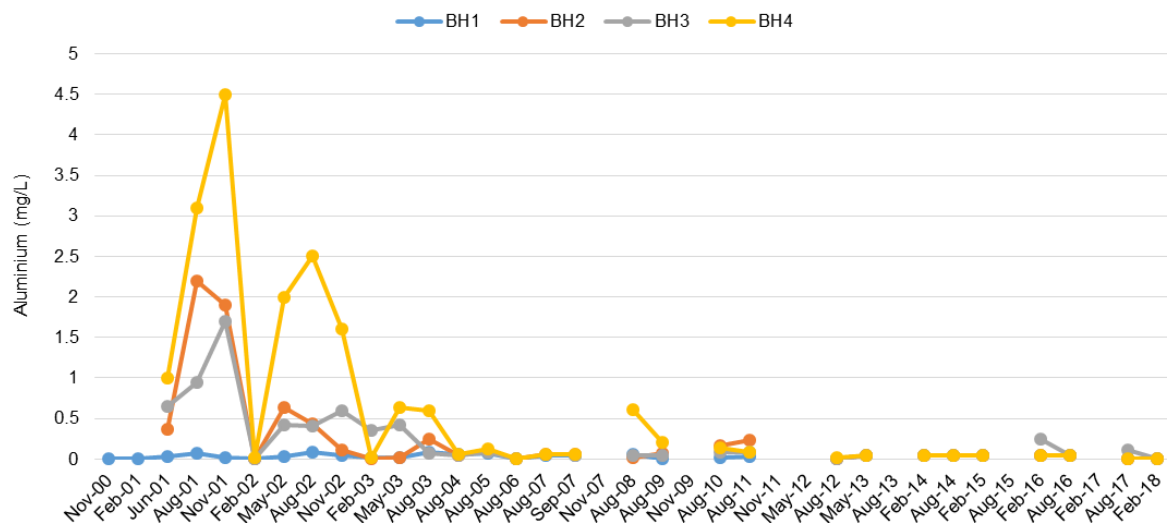


Figure 5: Groundwater Aluminium

Ammonia

Groundwater ammonia levels are depicted in **Figure 6**. As identified in Table 3.5.1 of the LEMP, the provisional limit for ammonia is 1 mg/L.

Available data indicates ammonia concentrations to be below the provisional limit, with the exception of the exceedance observed at BH1 in 2016-17. Ammonia concentrations at BH1 subsequently reverted

to below the provisional limit. As BH1 is considered to be hydraulically downgradient of the DWD, the source of the elevated ammonia observed in 2016-17 may be a result of landfilling at the DWD in combination with above average rainfall experience in the second half of 2016.

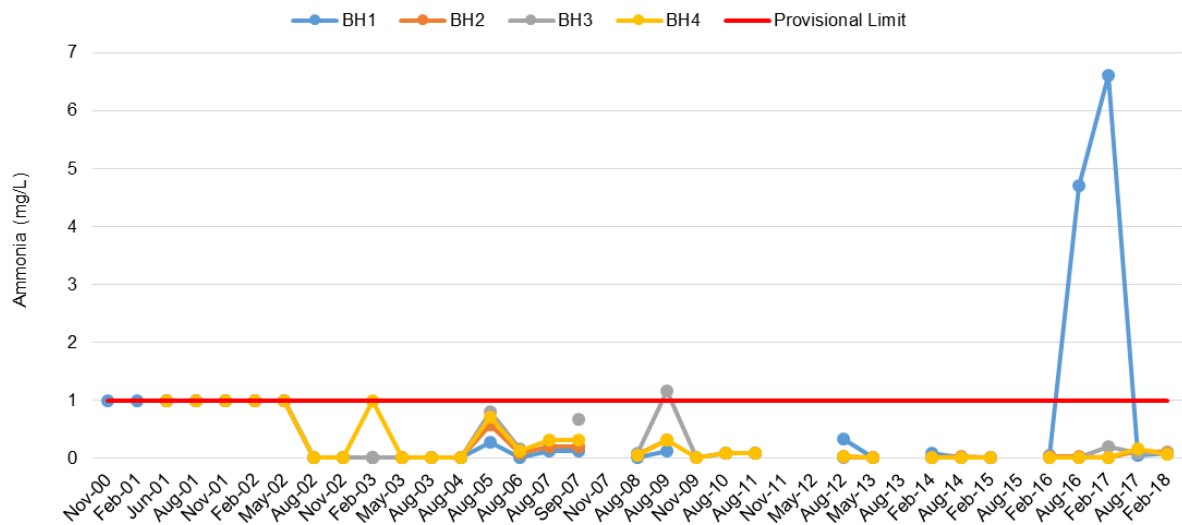


Figure 6: Groundwater Ammonia

Bicarbonate

Groundwater bicarbonate levels are depicted in **Figure 7**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for bicarbonate.

Available data indicates the higher bicarbonate concentrations to generally be recorded at BH1. This trend is apparent since monitoring commenced in 2000.

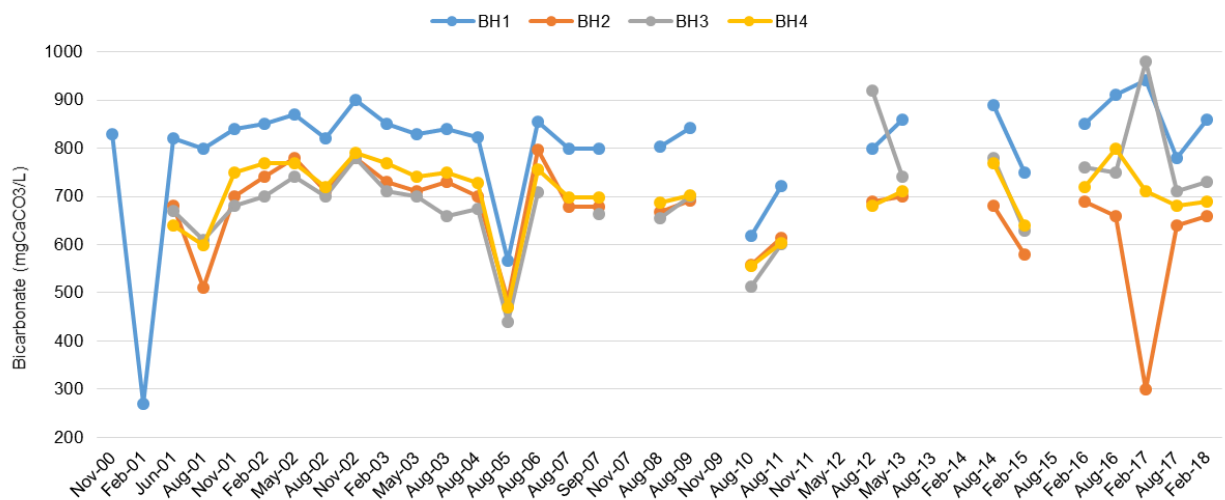


Figure 7: Groundwater Bicarbonate

Calcium

Groundwater calcium levels are depicted in **Figure 8**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for calcium.

Available data indicates the higher calcium concentrations to generally be recorded at BH3. This trend is apparent since monitoring commenced in 2000.

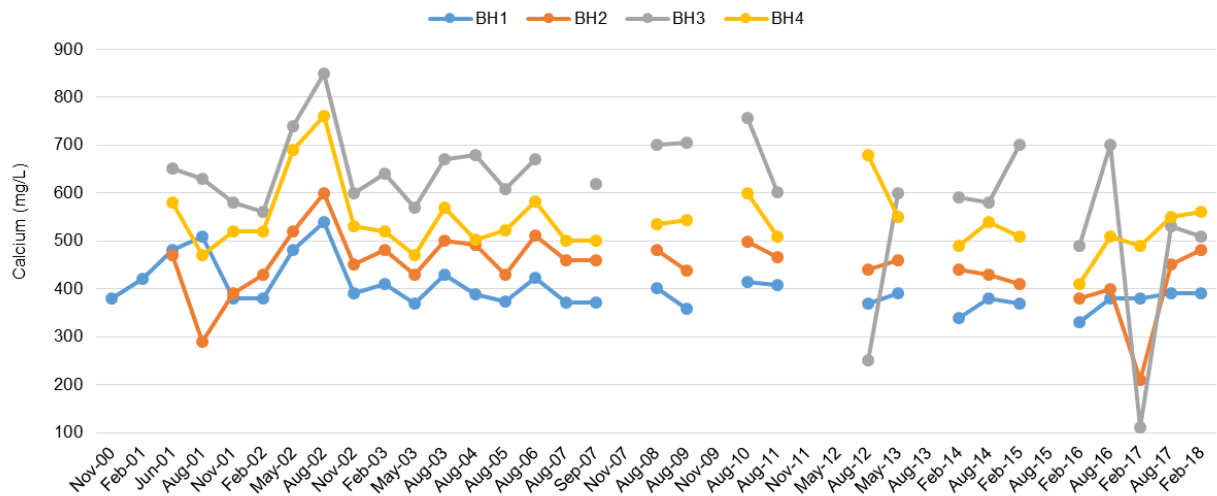


Figure 8: Groundwater Calcium

Chloride

Groundwater chloride levels are depicted in **Figure 9**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for chloride.

Available data indicates the higher chloride concentrations to generally be recorded at BH3. This trend is apparent since monitoring commenced in 2000.

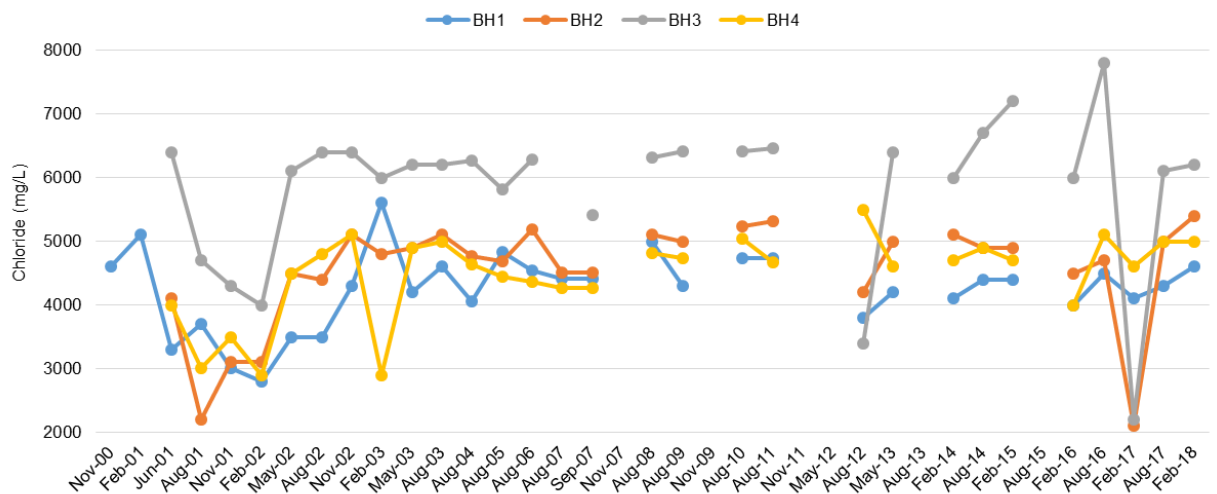


Figure 9: Groundwater Chloride

Conductivity

Groundwater conductivity is depicted in **Figure 10**. As identified in Table 3.5.1 of the LEMP, the provisional limit for conductivity is a deviation from the established control range.

Available data indicates the higher conductivity to generally be recorded at BH3. This trend is apparent since monitoring commenced in 2000.

The groundwater beneath the site is extremely saline. It is unsuitable for human use and of limited use for stock and agricultural purposes.

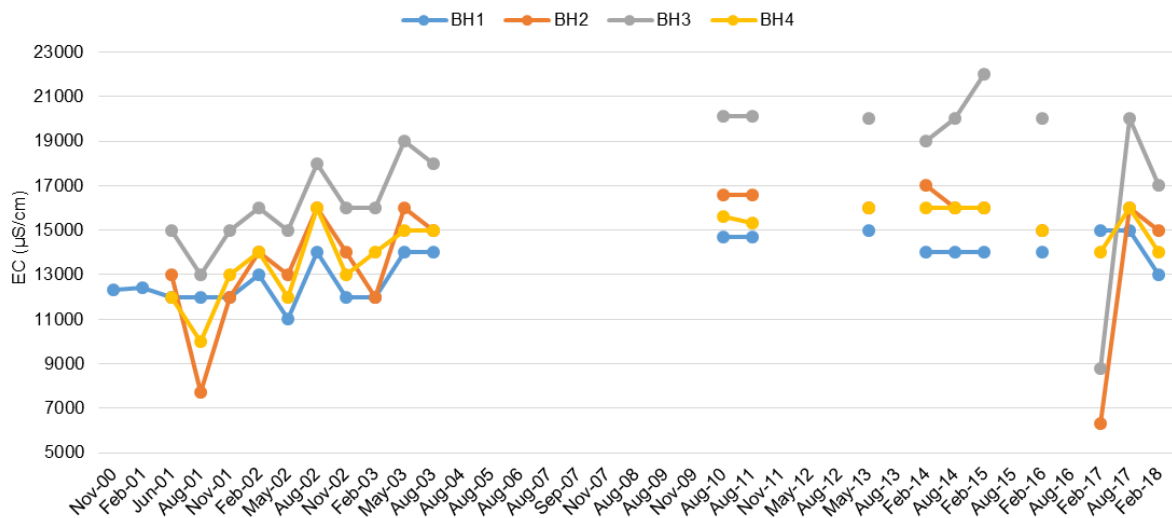


Figure 10: Groundwater Conductivity

Copper

Groundwater copper levels are depicted in **Figure 11**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for copper.

Available data indicates copper concentrations to generally be consistently low at all monitoring wells. Copper concentrations recorded in recent monitoring events were lower than the long-term (up to 100 years) irrigation guideline concentration of 0.2 mg/L.

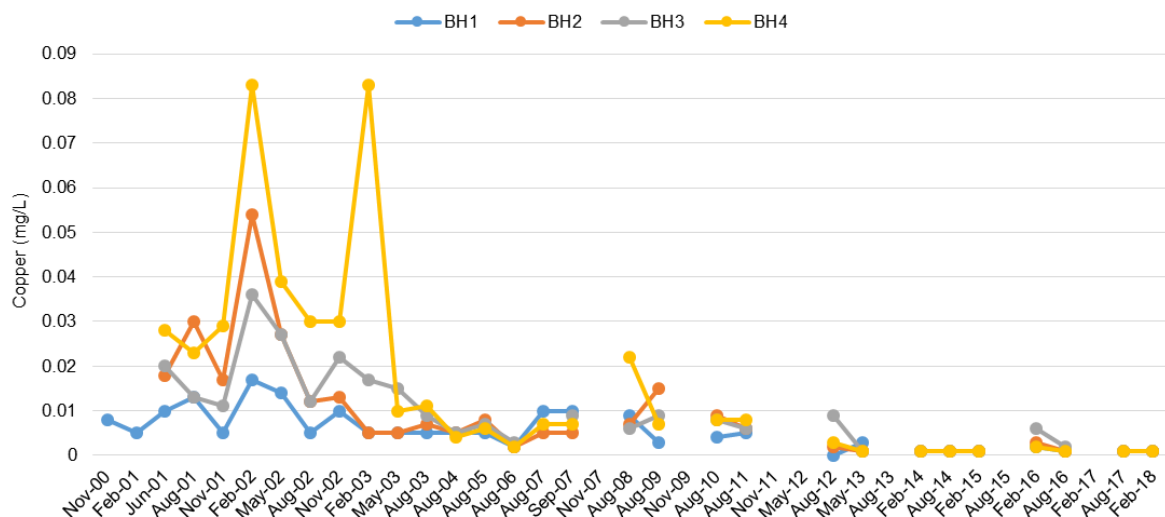


Figure 11: Groundwater Copper

Fluoride

Groundwater fluoride levels are depicted in **Figure 12**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for fluoride.

Available data indicates fluoride concentrations to generally be consistently low at all monitoring wells.

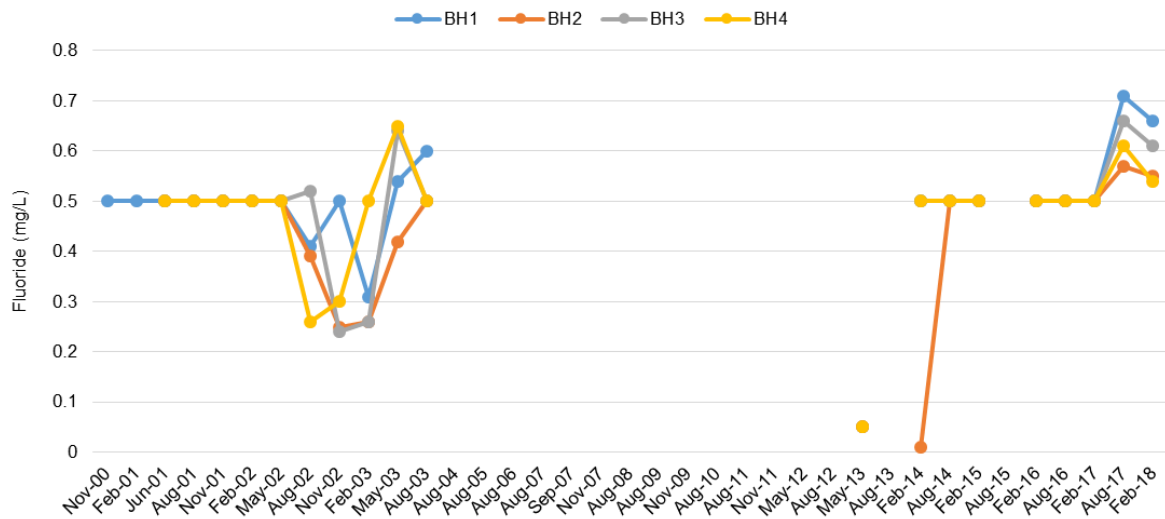


Figure 12: Groundwater Fluoride

Iron

Groundwater iron levels are depicted in **Figure 13**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for iron.

Available data indicates iron concentrations to generally be consistently low at all monitoring wells. Iron concentrations recorded in recent monitoring events were lower than the long-term (up to 100 years) irrigation guideline concentration of 0.2 mg/L.

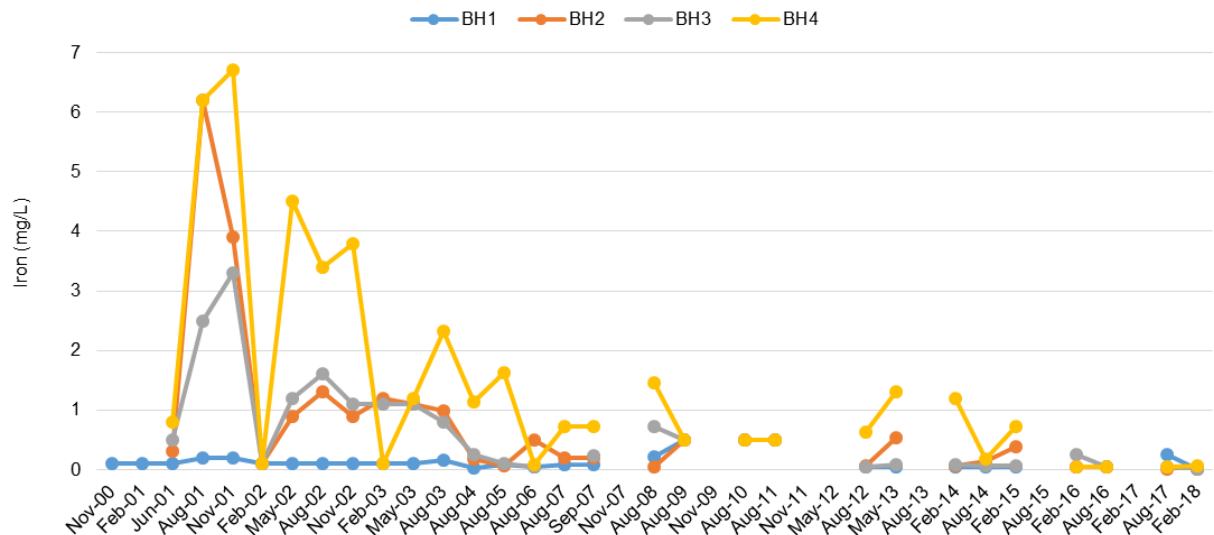


Figure 13: Groundwater Iron

Magnesium

Groundwater magnesium levels are depicted in **Figure 14**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for magnesium.

Available data indicates the higher magnesium concentrations to generally be recorded at BH3. This trend is apparent since monitoring commenced in 2000.

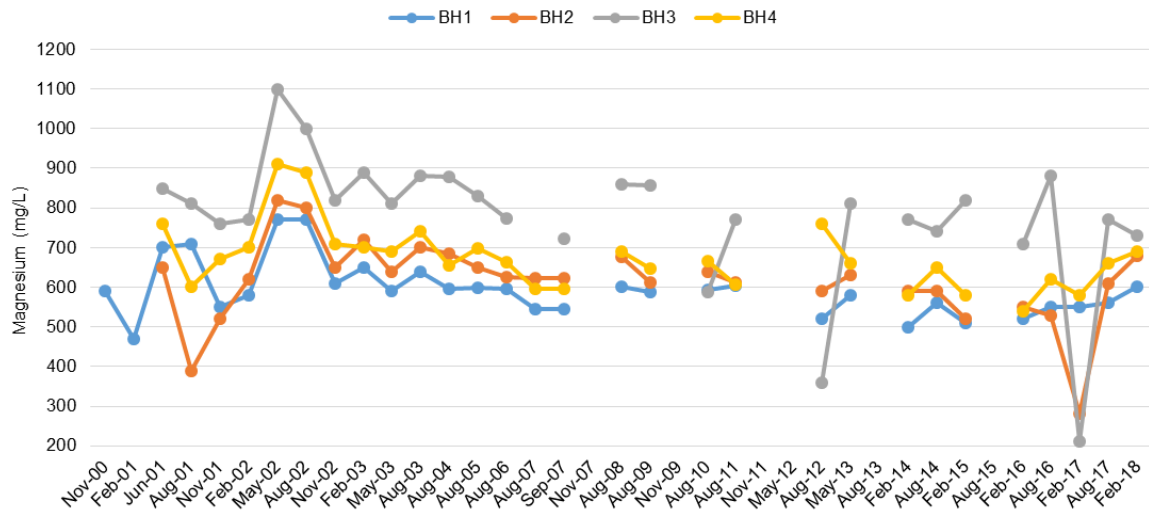


Figure 14: Groundwater Magnesium

Manganese

Groundwater manganese levels are depicted in **Figure 15**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for manganese.

Available data indicates the higher manganese concentrations to generally be recorded at BH4. This trend is apparent since monitoring commenced in 2000.

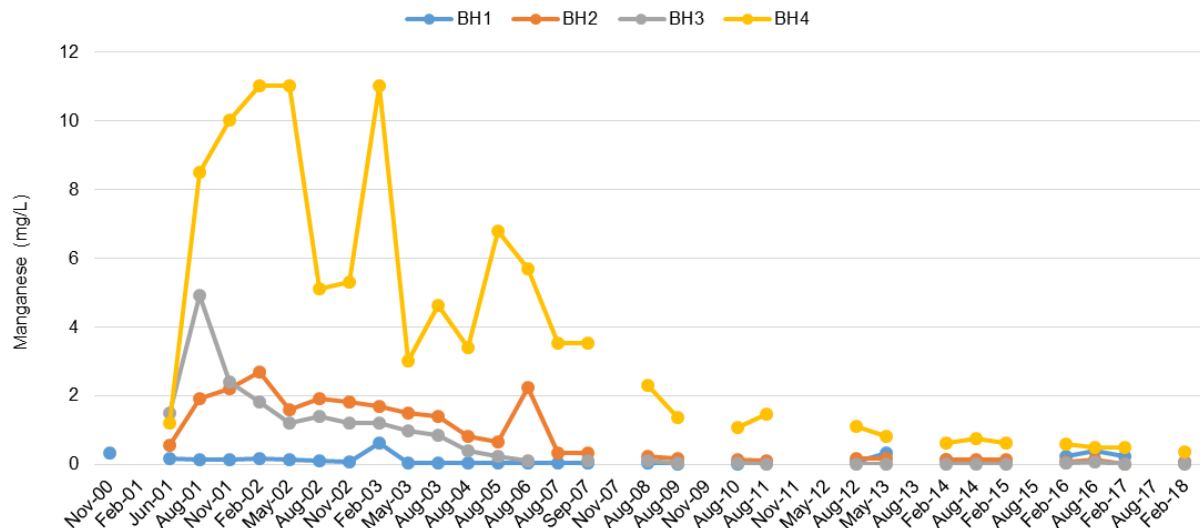


Figure 15: Groundwater Manganese

Nitrate

Groundwater nitrate levels are depicted in **Figure 16**. As identified in Table 3.5.1 of the LEMP, the provisional limit for nitrate is 10 mgN/L.

Available data indicates ammonia concentrations to be below the provisional limit. Iron concentrations have been recorded to be consistently low at all monitoring wells.

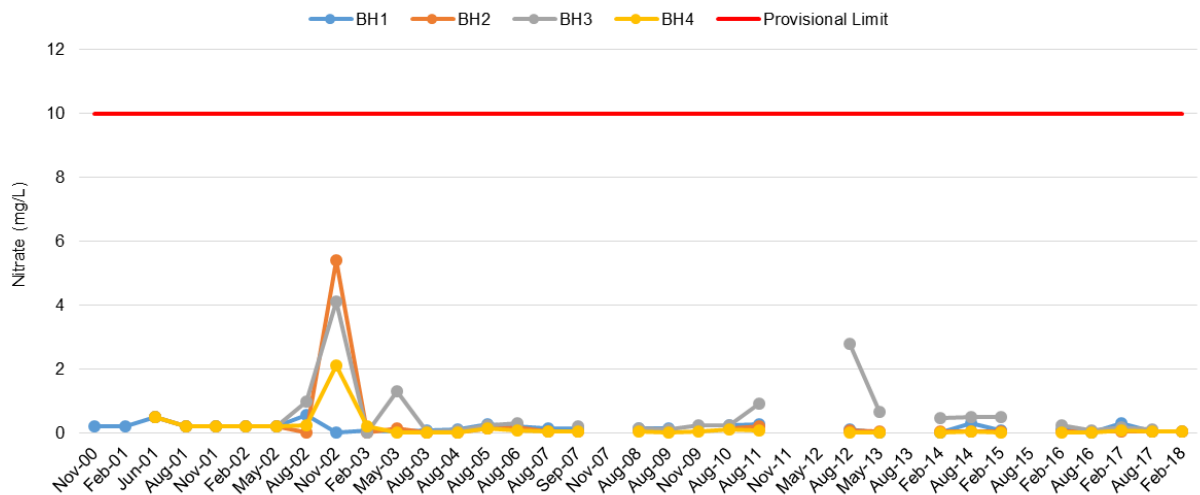


Figure 16: Groundwater Nitrate

pH

Groundwater pH is depicted in **Figure 17**. As identified in Table 3.5.1 of the LEMP, the provisional limit for pH is a deviation from the established control range.

Available data indicates little variation in pH between upgradient monitoring locations and downgradient monitoring locations.

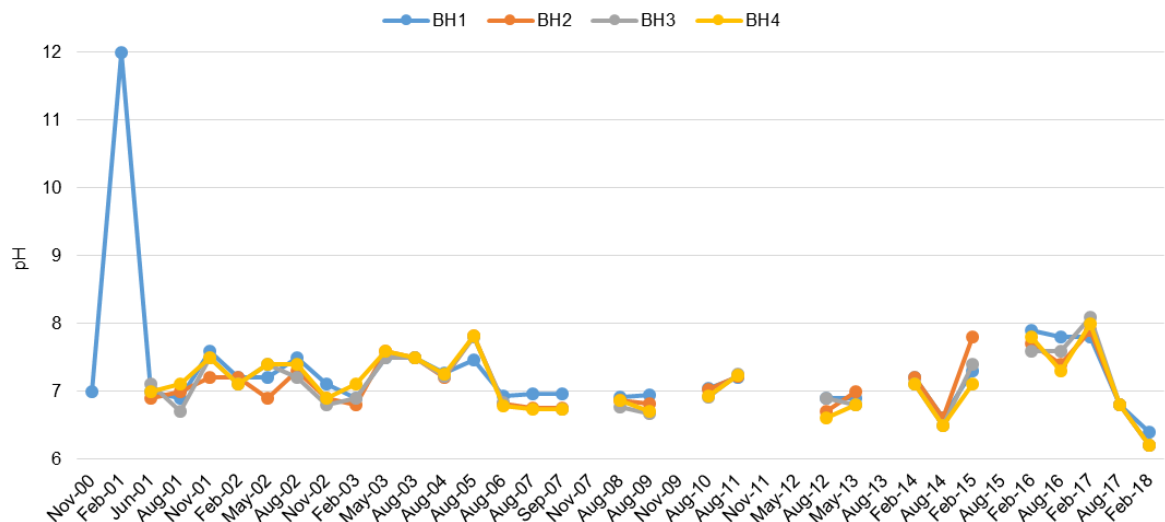


Figure 17: Groundwater pH

Phosphorus (total)

Groundwater phosphorus (total) levels are depicted in **Figure 18**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for phosphorus (total).

Available data indicates total phosphorus concentrations to generally be consistently low at all monitoring wells.

It is noted that the phosphorus Limit of Detection (LOD) value for samples collected from February 2014 – February 2015 is 5 mg/L, an order of magnitude higher than other sampling rounds.

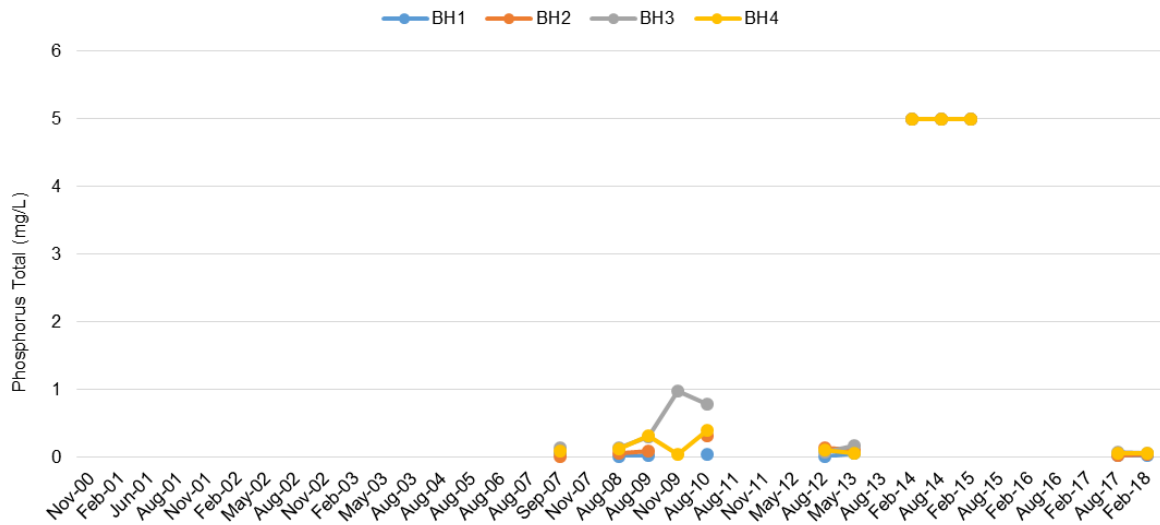


Figure 18: Groundwater Phosphorus (Total)

Potassium

Groundwater potassium levels are depicted in **Figure 19**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for potassium.

Available data indicates the higher potassium concentrations to generally be recorded at BH4. This trend is apparent since monitoring commenced in 2000.

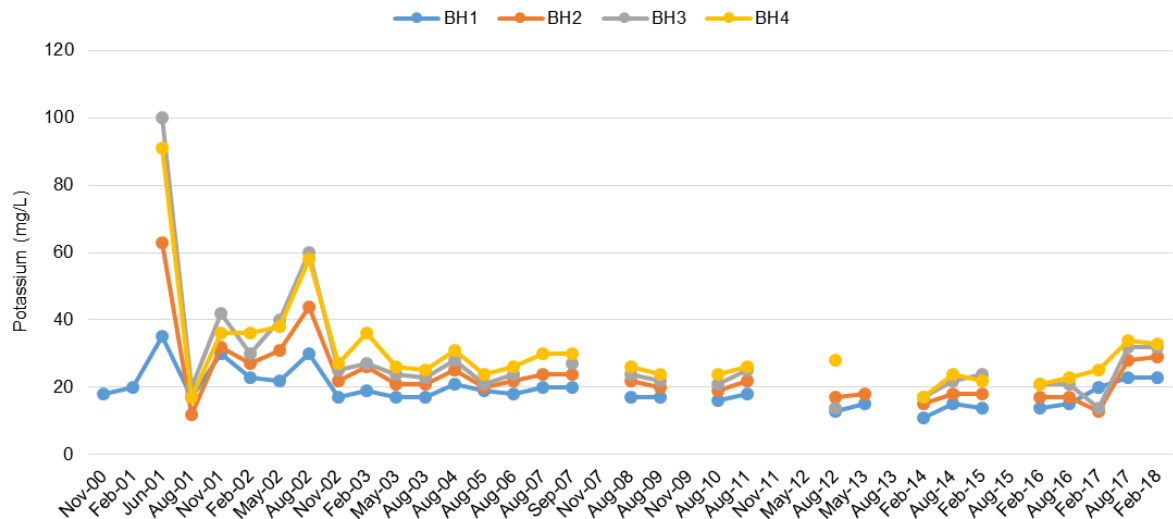


Figure 19: Groundwater Potassium

Sodium

Groundwater sodium levels are depicted in **Figure 20**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for sodium.

Available data indicates the higher sodium concentrations to generally be recorded at BH3. This trend is apparent since monitoring commenced in 2000.

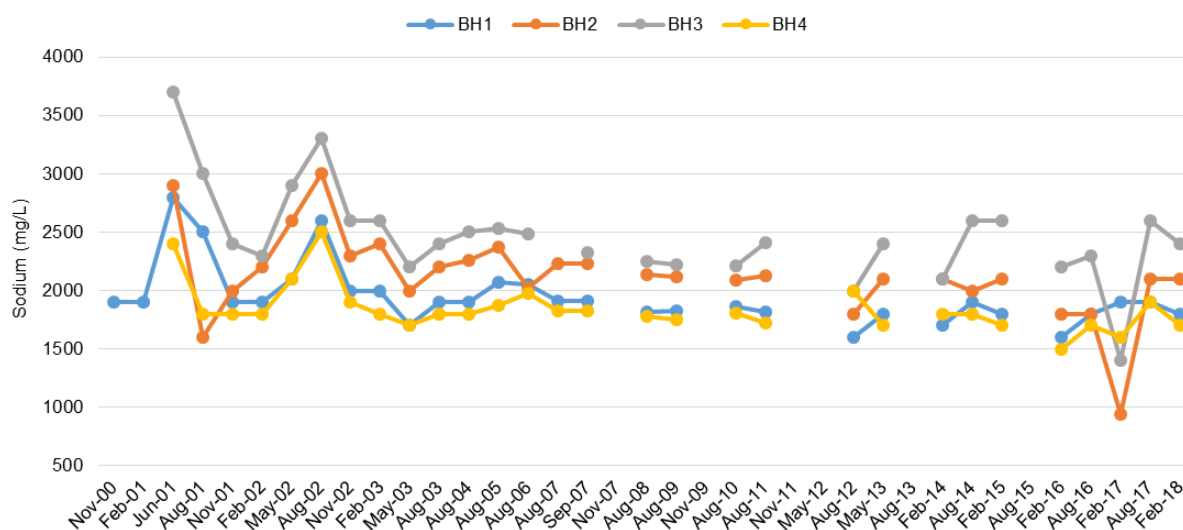


Figure 20: Groundwater Sodium

Sulfate

Groundwater sulfate levels are depicted in **Figure 21**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for sulfate.

Available data indicates a considerable degree of fluctuation in groundwater sulfate concentrations.

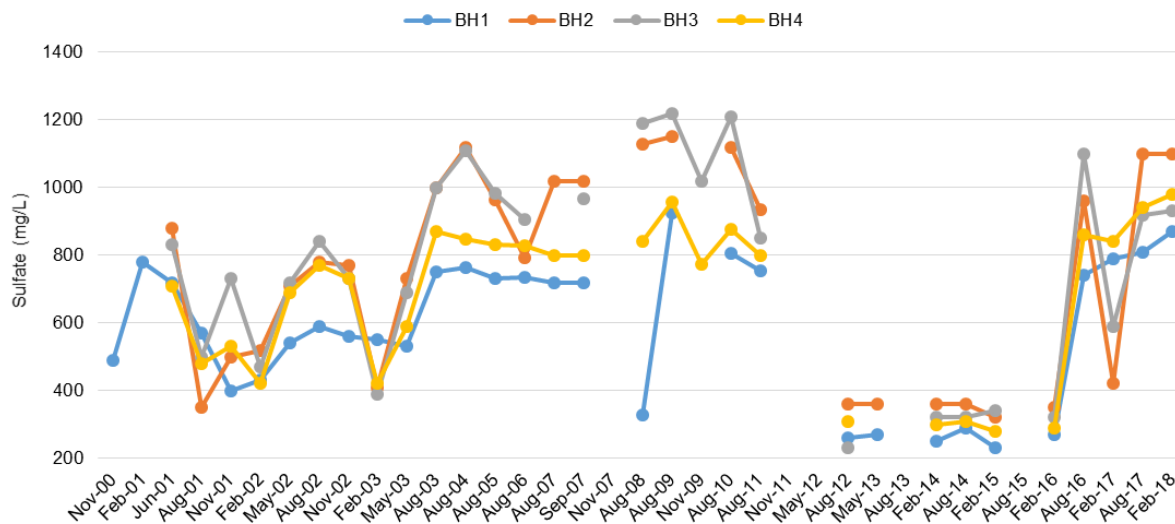


Figure 21: Groundwater Sulfate

TOC

Groundwater TOC levels are depicted in **Figure 22**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for TOC.

Available data indicates TOC concentrations at all monitoring wells to generally be consistently low since 2003.

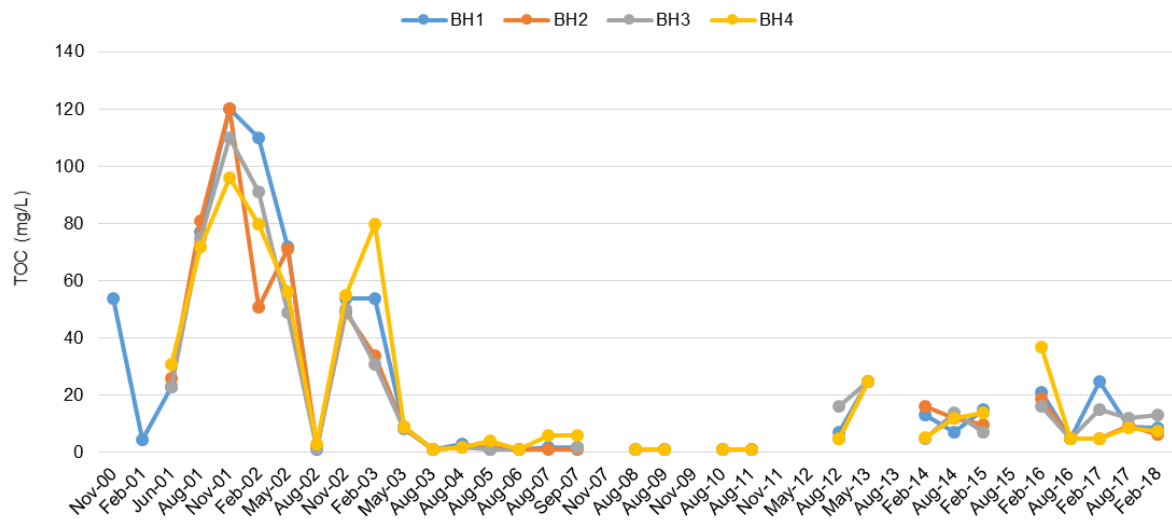


Figure 22: Groundwater TOC

Total Phenolics

Groundwater total phenolics levels are depicted in **Figure 23**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for total phenolics.

Available data indicates a considerable degree of fluctuation in groundwater sulfate concentrations, however phenolic concentrations recorded in recent monitoring events were below the laboratory LOD.

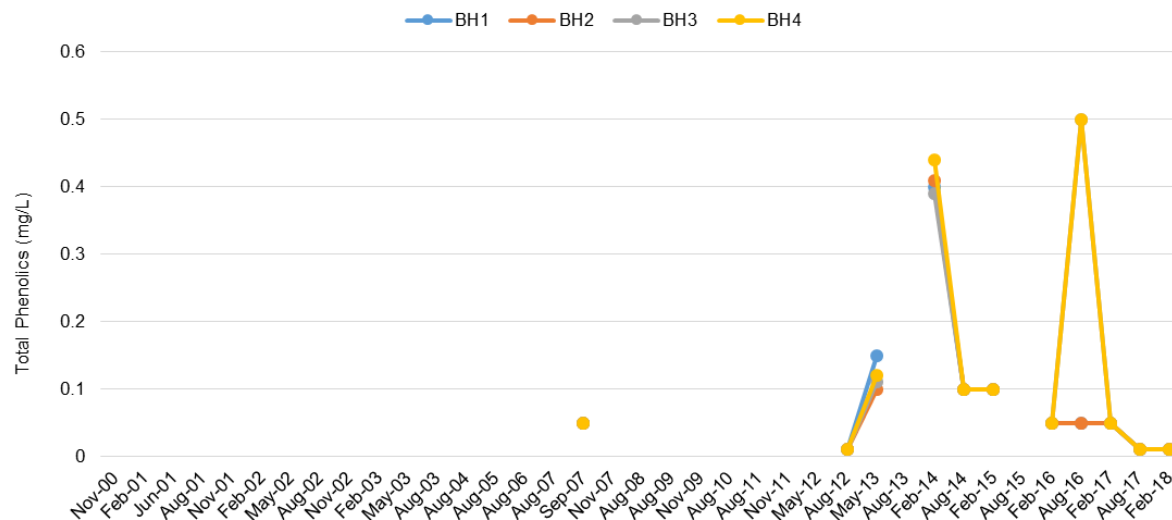


Figure 23: Groundwater Total Phenolics

Pesticides

As identified in Table 3.5.1 of the LEMP, there is no provisional limit for pesticides.

Monitoring data for organochlorine pesticides (OCPs) and organophosphorus pesticides (OPPs) is available from August 2012. All OCP and OPP results have been below the LOD.

Total Petroleum Hydrocarbons (TPH)

As identified in Table 3.5.1 of the LEMP, there is no provisional limit for TPH.

Monitoring data for TPH is available from August 2012. All TPH results have been below the LOD

Summary

Based on the findings of groundwater monitoring at the DWD, groundwater impacts have not been identified that may be conclusively attributable to operations at the DWD.

The highest concentrations of ammonia and bicarbonate were recorded at BH1 which is downgradient of the DWD, however the highest concentrations of calcium, chloride, magnesium, manganese, potassium and sodium were recorded at BH3 or BH4 which are upgradient of the DWD. Further, ammonia concentrations have reverted to below the provisional limit at BH1, and minimal variation of groundwater bicarbonate concentrations is apparent across all monitoring wells.

Landfilling operations at the DWD are not considered to have impacted groundwater quality hydraulically downgradient of the site.

4.3.3 LEACHATE

A surface water quality monitoring program (monitoring leachate at EPL 1) has been in place since September 2000. The location of this monitoring point is shown in **Figure 2**.

A review of leachate monitoring results is provided in the following section.

4.3.3.1 Monitoring Results

Alkalinity (as calcium carbonate)

Leachate alkalinity is depicted in **Figure 24**. As identified in Table 3.5.1 of the LEMP, there is no provisional limit for alkalinity.

Available data indicates alkalinity concentrations fluctuating throughout the monitoring period, and an increasing or decreasing trend is not apparent.

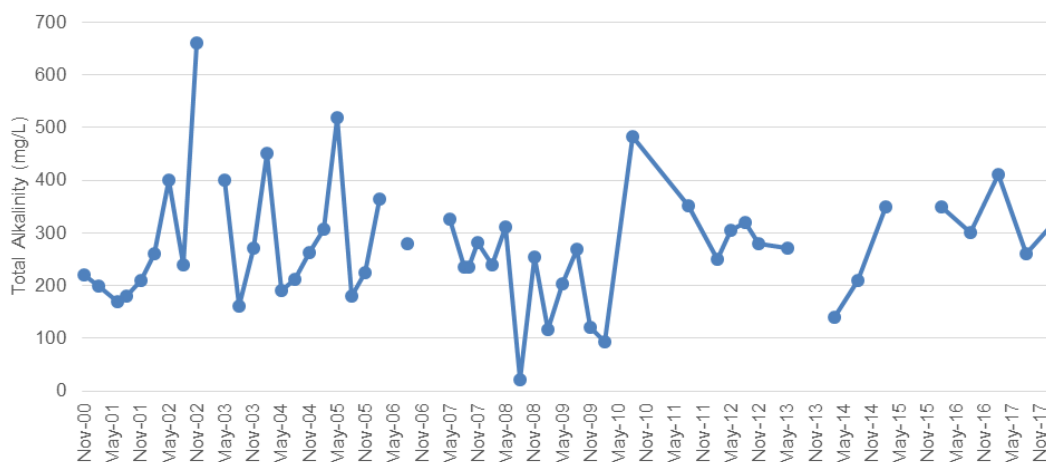


Figure 24: Leachate Alkalinity

Ammonia

Leachate ammonia levels are depicted in **Figure 25**. As identified in Table 3.5.1 of the LEMP, the provisional limit for ammonia is 1 mg/L.

Available data indicates ammonia concentrations fluctuating throughout the monitoring period, and an increasing or decreasing trend is not apparent.

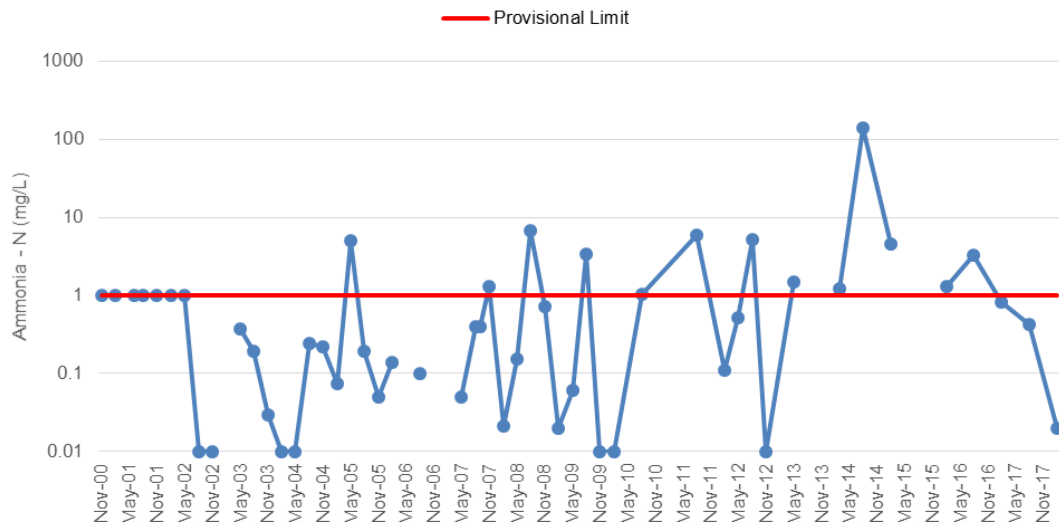


Figure 25: Leachate Ammonia (logarithmic scale)

Biochemical Oxygen Demand (BOD)

Leachate BOD levels are depicted in **Figure 26**. As identified in Table 3.5.1 of the LEMP, the provisional limit for ammonia is 10 mg/L.

Available data indicates the majority of leachate BOD concentrations to be low, however some elevated concentrations exceeding the provisional limit have been recorded.

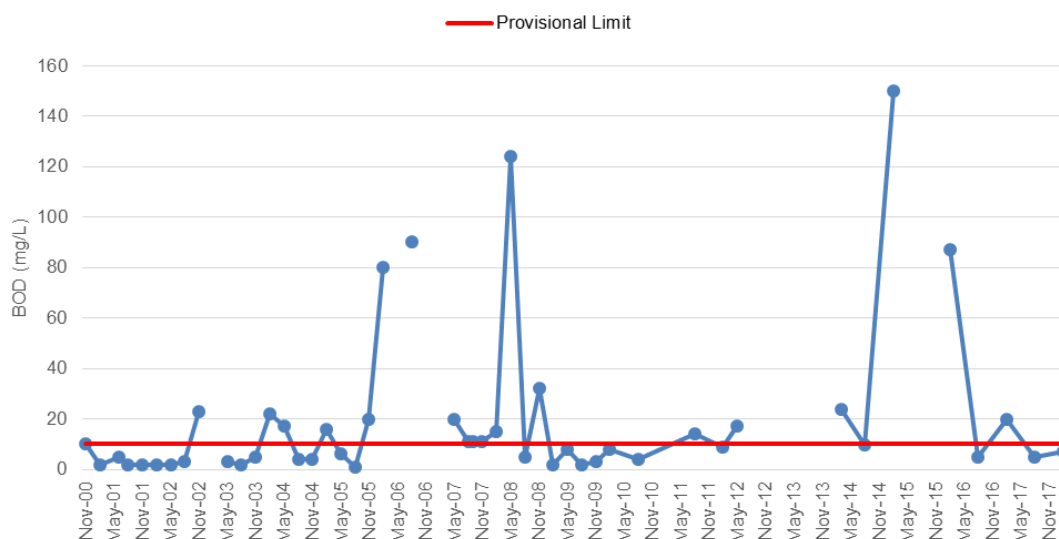


Figure 26: Leachate BOD

Conductivity

Leachate conductivity is depicted in **Figure 10**. As identified in Table 3.5.1 of the LEMP, the provisional limit for pH is a deviation from the established control range.

Available data indicates fluctuation of groundwater conductivity throughout the monitoring period, and an increasing or decreasing trend is not apparent.

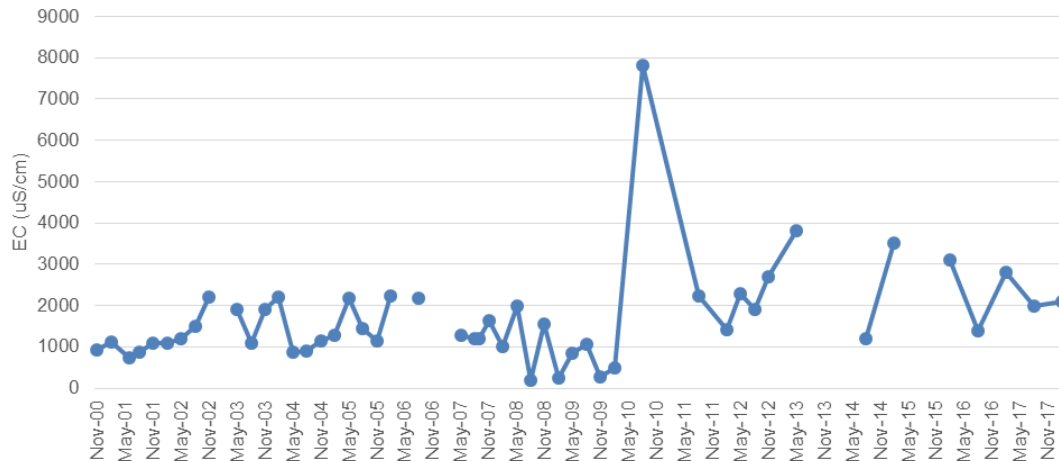


Figure 27: Leachate Conductivity

Nitrate

Leachate nitrate levels are depicted in **Figure 28**. As identified in Table 3.5.1 of the LEMP, the provisional limit for nitrate is 10 mgN/L.

Available data indicates nitrate concentrations to be generally low throughout the monitoring period, and below the provisional limit.

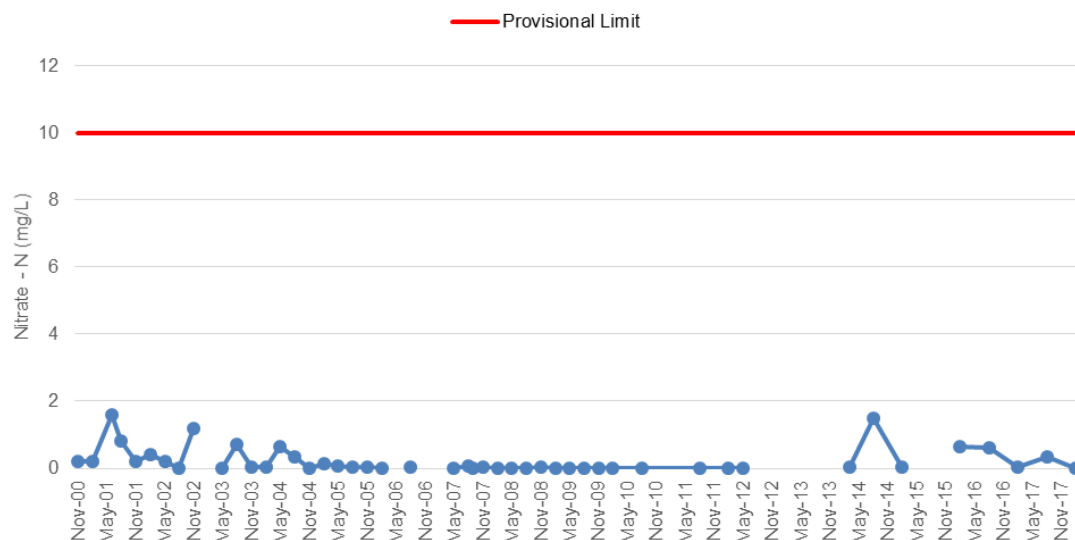


Figure 28: Leachate Nitrate

pH

Leachate pH is depicted in **Figure 29**. As identified in Table 3.5.1 of the LEMP, the provisional limit for pH is a deviation from the established control range.

Available data indicates groundwater pH to be slightly alkaline, averaging within the range of 8 to 8.5.

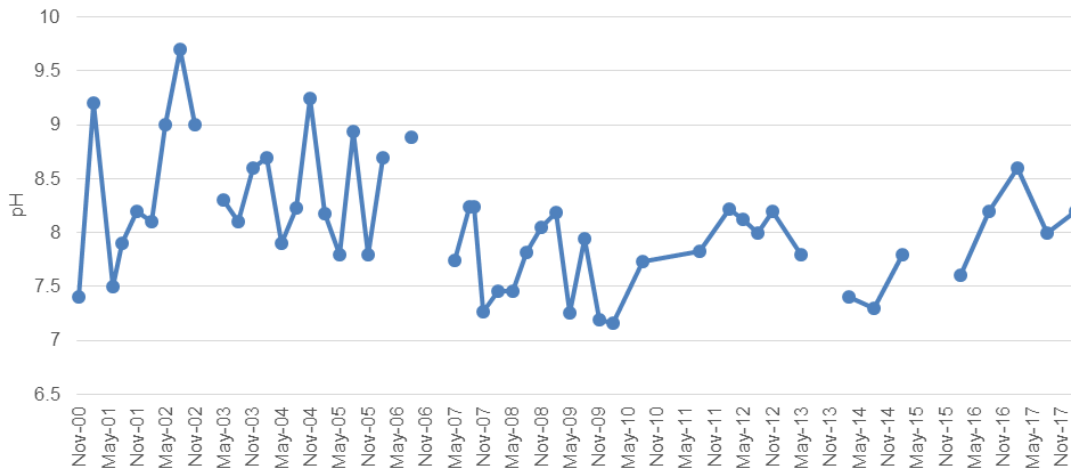


Figure 29: Leachate pH

Summary

Leachate monitoring results recorded at the DWD are indicative of oxygen-depleted conditions within the landfill, as evidenced by low nitrate concentrations in comparison to relatively higher (albeit fluctuating) ammonia concentrations. As the pH of leachate has consistently been recorded within the alkaline range, further breakdown of organic wastes is to be expected until low pH values (i.e. acidic conditions) limit biodegradation processes.

4.4 ENVIRONMENTAL RISK LEVEL

The EPA's risk-based licensing system aims to ensure that all environment protection licensees receive an appropriate level of regulation based on the level of risk they pose. The EPA undertakes risk assessments in consultation with each licensee and examine site specific risks posed by each licensed premises to identify any environmental issues that a licensee needs to address and where the EPA needs to focus its regulatory attention. The EPA also examines the licensees' environmental management performance. Based on the results from the risk assessments licensees are allocated an overall environmental risk level (1, 2 or 3 - with 3 being the highest risk). Licensees with a higher risk level receive an increased level of regulatory and compliance oversight, whereas licensees with a lower risk level benefit from reduced red tape and reduced regulatory burden.

The Environmental Risk Level assigned to the DWD is Level 1.

Proposed Development

5.1 OVERVIEW

Appendix A provides **Drawing Set 07F** and displays the conceptual layout of the proposed alterations/additions to the existing DWD incorporating the following components:

- A site entrance – the site entrance would be positioned at the location of the existing entrance and would be designed to meet intersection requirements specified by the *Austrroads Guide to Road Design* for the type of vehicles using the facility.
- A waste receival station – this facility would include a weighbridge and designated areas for the separation and drop off of differing waste types. There would be no public access to the landfill area.
- A landfill area – the landfill area would be located to the west of the existing landfill.
- An internal road network – the internal road network would be positioned to minimise disturbance and provide direct access, wherever possible, between all site components.
- An integrated surface water management system – this would include clean water diversion drains, dirty water collection drains and a surface water management pond.
- Vegetated buffers – these would be located along the southern, western and northern extents of the landfill area and would be established to provide a vegetative screen to neighbouring land uses.

Details of the proposed waste receival station are included in **Appendix B** as **Drawing Set 08D** and described in **Section 5.3**.

5.2 LANDFILL

5.2.1 WASTE TO BE LANDFILLED

The proposed landfill would continue to receive all waste types currently permitted at the existing facility.

It is estimated that up to 16,000 tonne of waste could be landfilled at the site per annum. This may decrease over time depending on the effectiveness of the resource recovery achieved at the waste receival station and other waste management initiatives implemented by Council.

The design capacity of the landfill is approximately 980,000 m³ which equates to approximately 800,000 tonne of waste (at a density of 0.82 t/m³ of landfill airspace). Based on the 2017 and 2018 waste data (refer to **Section 2.2.1**), the landfill is expected to receive 170,000 tonnes of putrescible waste and 630,000 tonnes of inert waste over the life of the facility.

5.2.2 LANDFILL LAYOUT AND STAGING

The landfill would be constructed using a cellular system to enable the gradual development of the landfill site, minimising the active footprint of the landfill and consequently minimising any potential impacts on the environment and allowing progressive rehabilitation throughout the life of the landfill. Conceptually, there would be six landfill stages which are shown **Drawing Set 07F**. Staging volumes are summarised in **Table 5.1**.

Table 5.1 – Landfill Staging

Stage	Excavation Volume m ³	Waste Volume m ³	Capping Volume m ³	Capacity (years)
Existing Landfill Cap	-	-	57,000	-
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D	-	170,000	14,000	9
4E	-	104,000	8,000	5
Final Cap	-	-	95,000	-
Total	231,000	982,000	231,000	52

The initial landfill cell (Stage 4A1) would be constructed in the south-eastern section of the expansion site and would involve construction of the following components:

- The stormwater management system (drains and surface water management pond);
- A gravel access road around the landfill area;
- The vegetation screening along the southern, western and northern extents of the landfill expansion area; and
- The Stage 4A1 landfill cell including the lining and leachate management system.

Excavated material from the Stage 4A1 cell construction would be used to cap finished areas of the existing landfill.

Upon nearing completion of Stage 4A1, the Stage 4A2 landfill cell would be constructed with excavated material used for capping finished areas of Stage 4A1 and the remainder of the existing landfill area.

Any excess excavated material that is not required for capping would be temporarily stockpiled within the landfill expansion area and within the controlled drainage area. This material would be used for operational purposes (daily and intermediate cover). Based on the conceptual design earthwork volumes, and quantity of VENM received at the facility, there would be no need to import additional soil to the site for landfill purposes.

5.2.3 LINER AND LEACHATE MANAGEMENT

5.2.3.1 Liner System

Leachate is deemed to include all water that has come into contact with waste. A range of appropriate measures would be implemented to minimise, contain, collect and dispose of leachate generated during landfilling at the site. All practicable measures would be undertaken to minimise the volume of leachate generated at the site, including:

- Diverting upstream, clean stormwater runoff around the landfilling operation, where possible;
- Staging the landfilling operation, to minimise the active footprint of the landfill;
- Minimising exposed areas at the active landfilling area by regular covering of the landfilled waste (at least daily);
- Grading filled areas to direct surface water runoff away from the active waste landfilling area;

- Applying intermediate cover on all areas of the landfill that are left inactive for periods greater than 90 days; and
- Progressive capping and rehabilitation of landfilled areas.

To manage leachate generated at the landfill site each stage of the landfill would include a lining system, a network of leachate collection pipes and a minimum 300 mm thick layer of leachate drainage aggregate. Leachate would be collected and stored within the lined landfill cell and irrigated back across landfill areas or removed offsite by tanker to the Forbes sewage treatment plant.

The *Environmental Guidelines: Solid Waste Landfills* (the Landfill Guidelines) (EPA, 2016) require:

- a compacted clay liner at least 1000 millimetres thick, with an in situ hydraulic conductivity of less than 1×10^{-9} m/s; and
- for landfills receiving more than 20,000 tonnes of waste per year, the liner should include a geomembrane over the compacted clay.

It is noted that the landfill is below the 20,000 tonne per year threshold (refer to **Section 2.2.1**). However, testing of the onsite soil shows that when it is compacted it has a permeability of 4×10^{-8} m/s, which does not meet the 1×10^{-9} m/s criteria required by the *Landfill Guidelines*. Therefore a composite liner system comprising a layer of compacted onsite material overlain by a high density polyethylene (HDPE) geomembrane is proposed.

The landfill lining/leachate collection system would comprise (from bottom to top):

- a 0.3 m thick layer of compacted subsoil to provide a foundation layer;
- a 2.0 mm thick high density polyethylene (HDPE) liner;
- a geotextile protection layer;
- a 300 mm thick layer leachate drainage aggregate; and
- a geotextile separation layer.

The exception to the above liner system would be for Stage 4E which would include placing a liner system over the western batter of the existing landfill. In this stage, the 0.3 m thick compacted subsoil would be replaced with a geosynthetic clay liner (GCL).

The proposed soil/HDPE composite liner system would have a combined hydraulic conductivity of 1.5×10^{-12} m/s which is substantially lower than the maximum required by the *Landfill Guidelines* for landfills receiving less than 20,000 tonnes per year of general solid waste.

The *Landfill Guidelines* provide guidance on the design of a landfill leachate collection system. In general the system should comply with the following criteria:

- Minimum longitudinal basal fall of 1%;
- Minimum transverse basal cross fall of 3%;
- Minimum 300 mm thick leachate drainage aggregate; and
- Leachate collection pipe work laid at minimum 50 m spacing.

The design for the leachate collection system for each stage of the landfill would comply with the above criteria.

5.2.3.2 Leachate Generation, Collection and Reuse

The leachate collection system would comprise a network of pipes discharging to a sump located at the lowest point of the landfill cell. As required, leachate would be extracted from the sump using a pump inserted into a 450 mm riser pipe (progressively installed as the landfill height increases).

Leachate would be extracted from the landfill on a regular basis (as required) to ensure adequate storage is available in the event of an extended wet period. Water level monitoring (at the leachate sump) would be undertaken at least weekly and leachate extracted as required to ensure that leachate levels within the landfill area kept at a minimum (< 0.75 m). Storage of leachate within the landfill would avoid the need for surface leachate storage ponds.

Potential leachate generation varies with the landfill staging and the amount of waste in each cell. When a cell is first constructed, it is open to collect direct rainfall with some losses through evapotranspiration. Internal diversion bunds would be used across the cell floor to minimise the volume of water entering the active waste cell. This water would be pumped out as required and irrigated across adjacent areas within the controlled drainage area.

Once waste and daily cover starts to fill the cell, the volume of leachate generated decreases. By observation, the greatest leachate generation potential would be at the construction of Stage 4C. At this time, 68% of the total landfill footprint would be filled (65% of this area would be capped) and approximately 30% of the Stage 4D cell open. Water balance modelling was undertaken to assess the quantity of leachate that may be generated by at this stage of the landfill operation. The modelling is based on 49 years of local daily climatic data (1969 to 2017) and estimates leachate generation during an average rainfall year and a 90 percentile wet year. The results of the water balance modelling show:

- Average generation 3,790 kL
- 90 percentile wet year 5,380 kL

Leachate would be stored in the floor of the active cell. A pump would be used to extract stored leachate for irrigation across completed landfill areas, which creates a closed loop system. Irrigation of the leachate would also assist with revegetation. Modelling of the above maximum leachate generation potential with irrigation across a 1 ha reuse area shows a maximum leachate storage of 2,900 kL. This can be accommodated in the floor of the active landfill cell.

The following mitigation measures would be implemented:

- Leachate would be applied at low application rates (approximately 5 mm/day).
- Leachate would only be applied across landfilling areas which are managed by the liner and leachate drainage system.
- Landfill staff would be trained and inducted with regards to operation of the leachate irrigation system and associated risks (e.g. spray drift).

Removal of leachate offsite to the Forbes sewage treatment plant would be a contingency measure used in the event of excess leachate production or if onsite irrigation is not possible.

5.2.4 SURFACE WATER MANAGEMENT

5.2.4.1 Overview

The fundamental approach to stormwater management would be as follows:

- Divert of all clean stormwater runoff from upstream undisturbed areas and revegetated areas around disturbed areas;
- Maintain undisturbed and rehabilitated/revegetated area as filters for sediment from disturbed areas;
- Minimise disturbed areas on the site by undertaking the landfilling in a staged manner;
- Maintain all stormwater runoff from disturbed areas as diffuse as possible to minimise sediment loads and maximise the opportunities for the vegetation to strip sediment from the runoff. Any concentration of flow would be avoided where possible;
- Implement and maintain appropriate erosion and sediment control measures on all disturbed areas as soon as practicable; and
- Capture all potentially contaminated runoff from disturbed areas of the landfill and treat such water in the proposed surface water pond;
- Following the closure of an area, intermediate covering and temporary re-vegetation would be applied to ensure that stormwater volumes are minimised and water quality improved; and
- Progressive capping and rehabilitation of the landfill, once the landfill has reached the final landform.

All drainage works would be designed and constructed in accordance with the requirements of the NSW EPA, including the requirements specified in *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and its *Volume 2B Waste Landfills* update (DECC, 2008).

5.2.4.2 Clean Water Diversion

The northern and western extents of the landfill expansion area would incorporate a clean water diversion drain. This would be located on the inside edge of the proposed tree corridor and generally on the outside of the perimeter access track. This drain and the perimeter access track would prevent clean water from entering the landfill area.

5.2.4.3 Surface Water Pond

A controlled drainage area would be formed within the clean water diversion drain and would extend across to the base of the existing landfill. The controlled drainage area is 10.1 ha.

All surface water runoff within the controlled drainage area would be directed to a 5 ML surface water control pond located in the south west corner.

The required sediment basin volume to manage a disturbed area of 10.1 ha was calculated in accordance with the requirements of *Managing Urban Stormwater: Soils and Construction Volume 1* as detailed below.

From Section 6.3.4 in *Managing Urban Stormwater, Volume 1 – Soils and Construction* for sediment basins for Type D soils:

Pond volume (V) = settling zone + sediment storage zone

Settling zone (S_z) = $10 \times C_v \times A \times R$ (*yr*, 5 day)

Sediment storage zone = 50% of capacity of settling zone

Therefore, $V = 1.5 \times S_z$, Equation (1)

From Table 6.1 in *Managing Urban Stormwater, Volume 2B –Waste Landfills* for sites with > 3 years disturbance:

ARI = 90 %ile

From Table 6.3a in *Managing Urban Stormwater, Volume 1 – Soils and Construction*:

R (90 %ile, 5 day) = 35.6 mm (Dubbo)

From Table F2 in *Managing Urban Stormwater, Volume 1 – Soils and Construction* for soil hydrologic group C:

$C_v = 0.64$

Therefore the volume required to manage 10.1 ha of disturbed catchment is:

$$\begin{aligned} \text{Volume (V)} &= 1.5 \times 10 \times 0.64 \times 10.1 \times 35.6 \\ &= 3,452 \text{ m}^3 \text{ (3.5 ML)} \end{aligned}$$

The proposed surface water pond would have a capacity of 5 ML to provide additional storage to balance reuse.

It is noted that the above assessment is conservative as:

- It assumes the entire area is disturbed which would not be the case due to staged cell footprints and progressive rehabilitation; and
- Runoff from some sections of the controlled drainage area would, at times, be captured and managed as leachate, rather than surface water (i.e. rainfall falling directly into active cells).

5.2.4.4 Use of Captured Surface Water

Surface water captured in the surface water pond would be used for dust suppression and irrigation of the onsite tree corridor (approximately 0.5 ha). There is an additional 0.9 ha of vegetated tree corridor that could be irrigated, if required, subject to approval from the adjoining landowner. The modelling presented below is based on irrigation of the onsite tree buffer area only.

A water tanker/cart would be used for dust control across the site. There would be approximately 1,100 m of internal access tracks and landfill areas where dust suppression would be required.

Water balance modelling was used to assess the water availability from the proposed 5 ML surface water pond using the following assumptions for water demand:

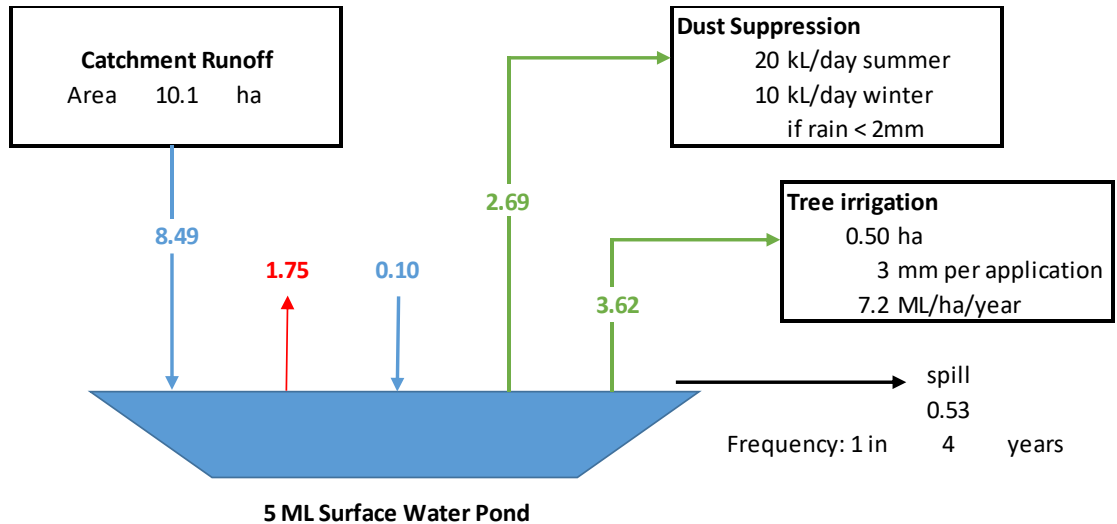
- Dust suppression: Apply 20 kL/day in summer months (October to April) when:
 - Rainfall on current day is < 2 mm, and
 - Evaporation on current day is > 3 mm

Apply 10 kL/day in winter months (May to September) when:

 - Rainfall on current day is < 2 mm, and
 - Evaporation on current day is > 3 mm
- Tree irrigation: Apply 3 mm when:
 - Rainfall on current day is < 1 mm; and
 - Soil moisture at least 5 mm below field capacity

The water balance results are shown in **Figure 30** and demonstrate that the proposed 5 ML surface water pond (sediment basin) would spill on average once every 4 years. It also shows that adequate water would be available to ensure effective dust control.

Table 6.2 of *Managing Urban Stormwater, Volume 2B –Waste Landfills* lists the indicative average annual sediment basin overflow frequency for a 90th percentile design basis as 2 to 4 spills per year. The water balance model shows that the proposed 5 ML surface water pond would discharge on average once every 4 years. This is much less frequent that suggested by the design guidelines.



all values are averages in ML/year

Figure 30: Surface Water Pond Water Balance

5.2.5 CAPPING AND FINAL LANDFORM

Waste disposal cells would be progressively capped with intermediate cover, with the final capping consisting of a 1.1 m phytocap (refer to **Drawing 07F_C012**) (1.0 m soil and 0.1 m topsoil). The final capping would generally be placed during excavation of landfill cells.

Drawing 07F_C011 shows the indicative final landfill cap contours. The maximum height of the finished landfill has been set at RL 279 m which is 1.5 m lower than the finished maximum height of the existing landfill.

5.2.5.1 Phytocap Performance

The water balance for a phytocap with a thickness of 1.0 m (soil) has been modelled for the site, utilising measured soil parameters for field capacity, wilting point and saturated hydraulic conductivity. Results are summarised in **Table 5.2**.

Table 5.2 – Results of Phytocap Modelling

Parameter	Data
Cap Thickness	1.0 m (soil)
Annual Rainfall (SILO data, 1969 – 2018)	510.8 mm
Evapo-Transpiration	483.5 mm
Run-Off	23.3 mm
Cap Infiltration	1.3 mm
	0.3% of annual rainfall

Figure 31 illustrates the modelled rate of infiltration (as a percentage of the annual rainfall) against a range of capping thickness. The proposed 1.0 m phytocap provides a conservative result.

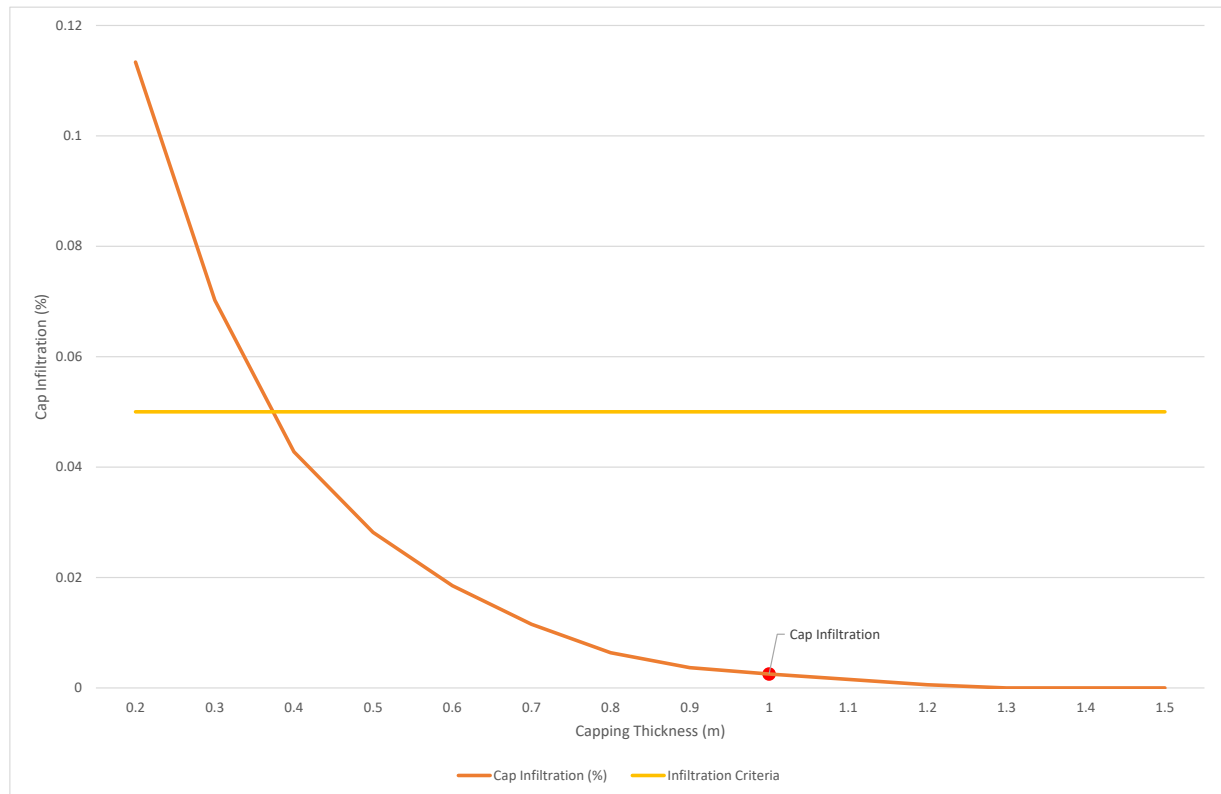


Figure 31: Infiltration and Phytocap Thickness

Water balance modelling indicates that the average phytocap thickness of 1.0 m would be sufficient to achieve the required outcome of reducing rainwater infiltration from the base of the final cap to less than 5% of the annual rainfall.

The modelling has been conducted using evapotranspiration factors applicable to grass. Once larger vegetation becomes established (e.g. shrubs and trees), the rate of rainwater infiltration would be further reduced.

5.2.6 LANDFILL GAS MANAGEMENT

Implementation of Council's waste management strategy (see **Section 2.2.1**) has resulted in diversion of a significant quantity of waste, including organic waste, from the landfill. This will result in reduced landfill gas generation at the proposed landfill expansion. Modelling of landfill gas generation for the proposed landfill expansion was undertaken in using the National Greenhouse and Energy Reporting (NGER) Solid Waste Emissions Calculator. The composition of the waste stream landfilled at the site was determined considering the current waste management strategy, projected waste quantities and the diversion of significant quantities of organic waste for composting. The estimated landfill gas generation is shown in **Figure 32**.

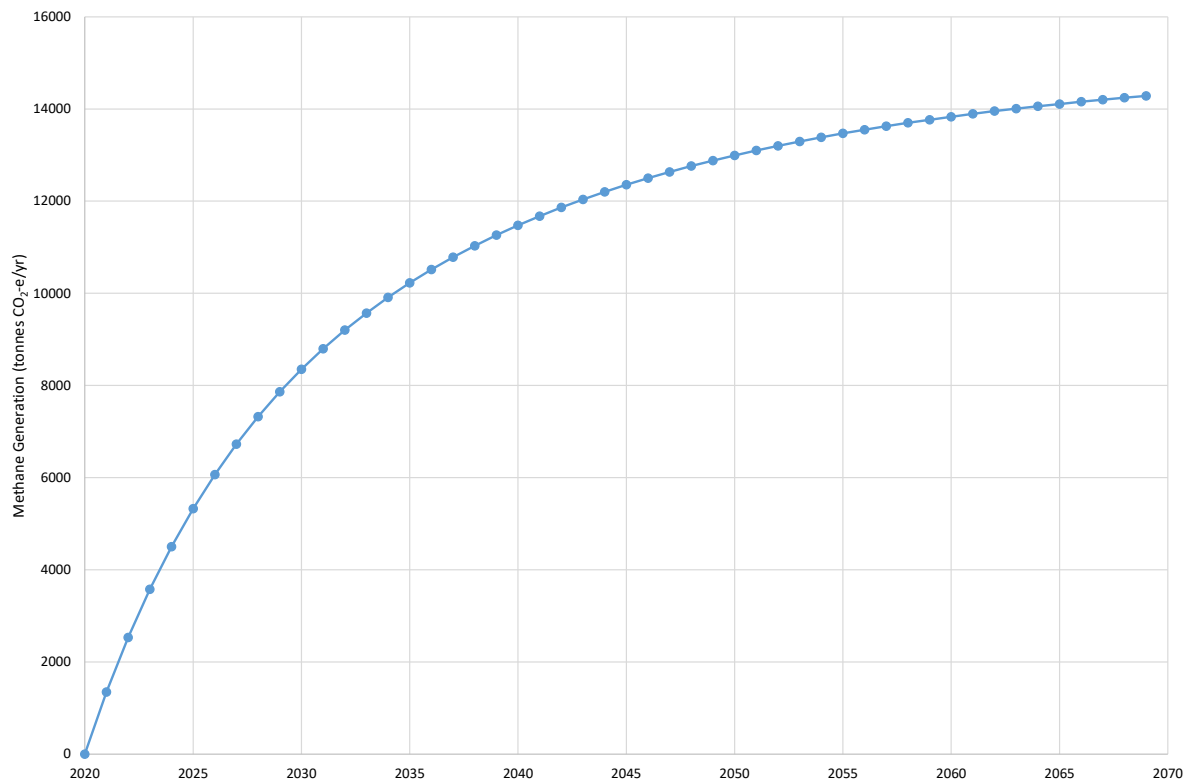


Figure 32: Estimated Landfill Gas Generation

The modelled landfill gas generation is relatively low and not sufficient for commercially viable recovery and energy (electricity) generation. It is proposed that an appropriate landfill gas management system would be developed during the detailed design of the final capping layer and would be informed by landfill gas monitoring. It is likely that the gas management system would involve passive landfill gas drainage (either through a select waste layer or constructed drainage layer) and a bio filtration system.

5.2.7 LANDFILL OPERATION

The active landfill area would be accessed by site staff and commercial waste operators. There would be no general public access to the landfill area. General public access would be restricted to the waste receival station.

The waste receival station would be used to bulk up general solid waste for landfill disposal. The waste transfer would be undertaken using either a roll-on/roll-off truck with hook lift bin or a dump truck loaded from the push pit.

Waste would be deposited in the active landfill cell in layers and compacted generally using the ramp method. A small working face would be maintained with other non-working areas covered with intermediate cover.

Landfill filling plans would be updated in the Landfill Environmental Management Plan (LEMP) as required for each stage.

5.3 VEGETATIVE SCREENING

A 20 m wide vegetated buffer would be planted along the southern, western and northern sides of the landfill site.

The land purchase agreement secured with the previous landowner specifies that the 20 m wide vegetated buffers on the western and northern sides of the landfill site are located on land outside of the lot occupied by the landfill. This is so that the landowner can use the vegetated areas as a stock shelter once they are established. Council would establish the proposed tree buffer in accordance with this agreement.

5.4 WASTE RECEIVAL STATION

A waste receival station is proposed to be located generally in front of the existing landfill area. The waste receival station would:

- Help promote waste diversion by providing dedicated waste separation and resource recovery areas;
- Keep public access away from the active landfill area;
- Improve waste data capture; and
- Provide greater control over wastes entering the facility.

5.4.1 COMPONENTS

The conceptual waste receival station layout is shown on Drawing Set 08D and would incorporate the following components:

- A site entry from Darroobalgie Road which would have gates that would be locked outside opening hours. All vehicles entering the facility would need to pass over the weighbridge;
- An un-tarping areas to allow vehicles to pull aside and remove tarps/covers from loads prior to reaching the weighbridge. This would facilitate inspection of loads;
- A 26 m weighbridge and associated weighbridge office;
- A site office which would include amenities for staff;
- A covered area for general waste drop-off – waste would either be dropped into skip bins or into a push pit for removal to the landfill;
- Dedicated storage areas for green waste, clean fill, scrap steel and tyres;
- A community recycling centre;
- A waste oil drop off facility (self bunded 3kL tanks);
- A resource recovery centre/shop;
- Car parking;
- Sealed road network with one way traffic flow; and
- An enclosed contractor's area for machinery and equipment storage.

All components of the waste receival station are subject to detailed design.

5.4.2 TRAFFIC AND TRANSPORT

Internal traffic management would be improved by the dedicated road network around the waste receival station and limiting access to the landfill cell.

5.4.3 UTILITIES AND SERVICES

The existing site has power, water and telecommunications. These would be extended as required (internally) to service the waste receival station. Domestic waste would be managed using an appropriately sized on site effluent management system.

5.4.4 HOURS OF OPERATION

The landfill would continue to operate 7 days per week from 8:30 am to 5:00 pm. Landfill operations are permitted by EPL 6118 to occur 7.00 am to 8.00 pm, Monday to Saturday; and 8.00 am to 8.00 pm, Sunday and Public Holidays. This allows for landfill operations to occur outside of public access hours.

Likely Impacts of Expansion

6.1 GROUNDWATER

6.1.1 RESOURCE

A detailed groundwater assessment report was prepared in October 2001 (Terra Consulting, 2001) following the installation of an expanded groundwater monitoring network. The assessment presented information collected during the installation of the groundwater monitoring network and assessed the potential for leachate impacts from the landfill. A summary of major findings is presented below.

Local Hydrogeology

Geophysical logging indicates that the geological profile surrounding and underneath the landfill site is comprised of silty claystone/claystone to a depth of 24 to 29 metres. Hydraulic conductivity testing indicates that the aquifer beneath the landfill has a very low conductivity. Groundwater level measurements indicate that the groundwater surface is between 22 and 27 metres depth.

The combination of these three physical characteristics for the site indicates that the potential for groundwater contamination by landfill leachate is minimal.

Aquifer Vulnerability

The vulnerability of groundwater resources to chemical and biological contamination is controlled by the lithology, thickness and continuity of the deposits overlying the aquifer horizon, and by the characteristics of the aquifer itself. Unconfined alluvial aquifers are most vulnerable, whilst confined alluvial aquifers and hard rock aquifers may be less vulnerable.

The geological logs for the four installed piezometers at the site indicate that silty claystone/claystone extends to 24 to 29 metres depth, underlain by clayey siltstone.

The piezometric level for the permeable units varied between 22 and 27 metres depth. The quality of groundwater derived from these weak aquifers is poor.

Aquifers under the site would be classified as having low groundwater vulnerability due to the relatively deep piezometric level, low hydraulic conductivity, and deep layer of silty claystone overlying the aquifer.

Aquifer Sensitivity

The aquifers beneath the site are assessed to have low sensitivity due to their expected low yields, high salinity and lack of potential use.

Groundwater Quality

Relatively low concentrations of ammonia and potassium, the absence of detectable chemical parameters normally associated with landfill leachate and the consistency across all four monitoring points indicate the groundwater has not been impacted by the existing landfill.

This would indicate that the rate of leachate movement from the landfill is restricted or that there is sufficient natural attenuation in the profile to assimilate landfill leachate.

The groundwater beneath the site is extremely saline. It is unsuitable for human use and of limited use for stock and agricultural purposes.

Groundwater monitoring has been undertaken at the DWD since November 2000 utilising four piezometers. Results of monitoring are presented in **Section 4.71** of this report.

Based on the review of all groundwater monitoring conducted between November 2000 and February 2018 there is no evidence to suggest that the groundwater beneath the site is being negatively impacted by the landfill operation. Furthermore, comparison of up-gradient to down-gradient piezometers continues to show no significant degradation of groundwater quality caused by the landfill.

6.1.2 IMPACT

On the basis of the data presented in the groundwater assessment report and continued groundwater monitoring, it is concluded that the risk of contamination of groundwater arising from continued operation and lateral expansion of the landfill is very low.

Despite the low risk, the proposed landfill expansion would include a composite liner system designed to meet performance objectives outlined in the Landfill Guidelines (EPA, 2016). The proposed liner system is described in **Section 5.2.3**.

6.1.3 MITIGATION MEASURES

The primary groundwater management controls would be:

- the installation of the proposed composite liner system; and
- effective storage (within the lined cell) and management of leachate.

The existing groundwater monitoring network would be expanded to provide coverage of the new landfill area. Two additional groundwater monitoring points would be established as follows:

- BH5 located in the north west corner (potential up gradient point); and
- BH6 located mid-way along the southern boundary of the landfill extension.

The proposed monitoring locations are shown in **Figure 33**.

The existing groundwater monitoring program specified by EPL 6118 would be expanded (through a licence variation) to include these monitoring points.



Figure 33: Proposed additional groundwater monitoring points

6.2 SURFACE WATERS

6.2.1 DESCRIPTION

The proposed landfill expansion site grade gently at 2% to 3% to the south west. There are no major drainage features on the expansion site.

An ephemeral drainage depression runs around the north and western side of the expansion site. This drainage depression is unnamed and conveys water from a small rural catchment to the north and east. This drainage depression is a first order stream along the northern boundary. It becomes a second order stream along the western boundary and discharges to an existing farm dam. The total catchment area to the farm dam is approximately 52 ha.

This drainage line would flow for short periods following heavy rain or during extended wet periods. Discharge estimates at the existing farm derived using the Regional Flood Frequency Estimation model are listed in **Table 6.1**.

The drainage line can be approximated by as a wide grass lined shallow channel. It is conservatively estimated that the 1% Annual Exceedance Probability (AEP) discharge would have a flow width of approximately 20 to 25 m. This flow would not interact with the proposed landfill site.

Table 6.1 – Flow Estimates in Unnamed Drainage Line

Annual Exceedance Probability (%)	Discharge m³/s
50	0.72
20	1.7
10	2.7
5	3.9
2	6.1
1	8.2

6.2.2 IMPACT

The existing drainage line around the north and west of the expansion site would not interact with the proposed development. All works would be located at least 40 m from the waterway and the perimeter access track and clean water diversion bank would divert all clean water around the site.

The disturbance area from the proposed expansion would be fully contained within a controlled drainage area and the water management facilities only need to cater for runoff generated within the site.

6.2.3 MITIGATION MEASURES

Design

The proposed landfill cell design provides effective stormwater diversion drains, leachate collection drains and a leachate sump. The design would ensure that leachate does not contaminate surface water.

The proposed 5 ML surface water pond provides sufficient capacity for effective sediment control and a source of water for dust suppression and irrigation. The modelled spill frequency from the surface water pond is much less frequent than suggested by the relevant design guidelines (DECC, 2016).

Mitigation Measures

The following measures would mitigate potential sedimentation and contamination of the catchment:

- Installation of erosion and sediment control measures during the construction phase – only to be removed once the area is restabilised;
- Construction of diversion drains around the top of the landfill cell as required to divert surface water away from the cell;
- Allow stormwater drainage to return to the catchment at non-erosive velocities; and
- Include a monitoring point on the outlet of the surface water pond. The existing surface water monitoring program specified by EPL 6118 would be expanded (through a licence variation) to include this monitoring point.

6.3 TRAFFIC

Traffic movements to and from the DWD are not expected to change. The development does not seek to increase the scale of the operation or change the number or type of vehicles, or the routes used, accessing the DWD. The DWD will continue to be accessed utilising the same route and access location off Daroobalgie Road.

FSC has consulted with Roads and Maritime Services (RMS) and been advised that as there is no change in the scale of the development (ie. size or capacity) the RMS has no comment pursuant to cl.104 of *State Environmental Planning Policy (Infrastructure) 2007*.

6.4 AMENITY VALUES

The DWD has operated for at least the last 35 years with just a single complaint; in circumstances that interrupted normal operational procedures and caused temporary odorous emissions (refer **Section 4.2**). The proposed expansion does not move activities significantly closer to any residential area, and the closest receptor to the west is the landowner who has entered into an agreement with FSC for the sale of this land for the purposes of the landfill expansion.

Continued operations in accordance with the EPL conditions and procedures specified in the LEMP will continue to protect local amenity values.

6.5 BIODIVERSITY

An ecological assessment of the development has been undertaken in accordance key biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999;*
- *Environmental Planning and Assessment Act 1979;*
- *Biodiversity Conservation Act 2017;*
- *Fisheries Management Act 1994, and*
- *Biosecurity Act 2015.*

The ecological assessment was undertaken to consider the impacts of the development and:

- assess the characteristics and ecological condition of the vegetation communities and habitat within the study area;
- determine occurrence, or likelihood of occurrence, of threatened species, populations and threatened ecological communities (TECs) listed under the *Biodiversity Conservation Act 2016* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*; and
- describe and quantify impacts on biodiversity resulting from the development.

A full copy of this assessment is provided in **Appendix A**. Provided below is a summary of the findings.

The site assessment identified that the majority of the study area is heavily disturbed due to past land use for grazing and cropping. A small area of PCT 76 *Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion* was mapped between the existing DWD and the proposed expansion area.

PCT 76 represents *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions*, an Endangered Ecological Community (EEC) listed under the *Biodiversity Conservation Act 2016* and *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*, an EEC under the *Environment Protection and Biodiversity Conservation Act 1999*. The impact of the proposed development will be limited to removal of 0.49 ha of this moderate quality woodland.

Assessments of significance under the BC Act concluded no significant impact, therefore the project does not need any further assessment under the Biodiversity Offset Scheme, nor does it require offsets. Significant impact criteria assessments under the EPBC Act concluded no significant impact; therefore referral to the Commonwealth is not required for the project.

6.6 HERITAGE

An Aboriginal Due Diligence archaeological assessment of the development has been undertaken in accordance with *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. A full copy of this assessment is provided in **Appendix B**. Provided below is a summary of the findings.

It was concluded that no Aboriginal objects or intact archaeological deposits will be harmed by the development and the expansion, subject to mitigation measures, can occur without further archaeological investigation.

These mitigation measures include:

- Should the disturbance footprint extend beyond the surveyed area, then further archaeological assessment may be required.
- All staff and contractors involved in works should be made aware of the legislative protection requirements for all Aboriginal sites and objects.
- During the course of works, if Aboriginal artefacts or skeletal material are noted, all work should cease and the procedures in the *Unanticipated Finds Protocol* should be followed;

Mitigation Measures

7.1 GROUNDWATER

The primary groundwater management controls would be:

- the installation of the proposed composite liner system; and
- effective storage (within the lined cell) and management of leachate.

The existing groundwater monitoring network would be expanded to provide coverage of the new landfill area. Two additional groundwater monitoring points would be established as follows:

- BH5 located in the north west corner (potential up gradient point); and
- BH6 located in the southern boundary of the landfill extension.

7.2 SURFACE WATERS

7.2.1 DESIGN

The proposed landfill cell design provides stormwater diversion drains, leachate collection drains and a leachate sump. The design would ensure that leachate does not contaminate surface water.

The proposed 5 ML surface water pond provides sufficient capacity for effective sediment control and a source of water for dust suppression and irrigation. The modelled spill frequency from the surface water pond is much less frequent than that suggested by the relevant design guidelines (DECC, 2016).

7.2.2 CONSTRUCTION/OPERATION

The following measures would mitigate potential sedimentation and contamination of the catchment:

- Installation of erosion and sediment control measures during the construction phase – only to be removed once the area is restabilised;
- Construction of diversion drains around the top of the landfill cell as required to divert surface water away from the cell;
- Allow stormwater drainage to return to the catchment at non-erosive velocities; and
- Inclusion of a monitoring point on the outlet of the surface water pond.

7.3 LEMP UPDATE

The Landfill Environmental Management Plan (LEMP) will be updated.

Justification

8.1 NEED

The existing landfill operation is, within the confines of its current site, constrained both laterally and vertically. There is no available residual land within the development site lots to permit expansion of landfilling laterally, and the height of the landfill has been limited to RL 280.50 m by the EPA.

Council is simply running out of room. Staging calculations for the existing site indicate a remaining life of approximately 5 years.

8.2 ALTERNATIVES

Council has limited options.

One option would be to develop a new waste management facility at a new green field site elsewhere within the Shire. However, as a long established land use at this location, and with a demonstrated history of operation of over 35 years without detected adverse impacts to water quality (groundwater or surface waters) or recurring neighbouring landowner complaints, the inherent challenges of identifying and establishing a new greenfield site is not warranted.

Similarly, the option of establishing a waste transfer station and then exporting waste for disposal to a neighbouring Council is not considered appropriate. The provision of a waste management facility, including a landfill for waste disposal, within the Forbes local government area, is considered by Council an essential Council service for its community.

Finally, doing nothing is not an option.

8.3 MATTERS FOR CONSIDERATION

Pursuant to cl.123 of *State Environmental Planning Policy (Infrastructure) 2007*, in determining a DA for development for the purpose of the construction, operation or maintenance of a landfill for the disposal of waste, including putrescible waste, the consent authority must take specific matters into consideration.

These matters, and factors relevant to their consideration, are discussed below.

(a) whether there is a suitable level of recovery of waste, such as by using alternative waste treatment or the composting of food and garden waste, so that the amount of waste is minimised before it is placed in the landfill,

Council commenced a three bin collection system in April 2016 and collects municipal organics and recyclables on a weekly basis and residual on a fortnightly basis. Monthly waste data shows an average of 54% of the domestic waste stream is being diverted from landfill (34% organics and 20% recyclables). This waste management initiative will help minimise residual waste from the municipal waste stream going to landfill.

(b)(i) whether the development adopts best practice landfill design and operation,

The proposed landfill expansion has been conceptually designed to be consistent with the *Environmental Guidelines: Solid Waste Landfill* (the Landfill Guidelines) (EPA, 2016) which are the best practice guidelines for NSW.

The design incorporates appropriate liner, leachate and surface water management systems consistent with the Landfill Guidelines. The current landfill operates under an Environment Protection Licence and a Landfill Environmental Management Plan (LEMP) which would be updated to include operational practices for the landfill expansion.

(b)(ii) whether the development reduces the long term impacts of the disposal of waste, such as greenhouse gas emissions or the offsite impact of odours, by maximising landfill gas capture and energy recovery,

The diversion of organics from the municipal waste stream will reduce greenhouse gas emissions from the landfill. An assessment of greenhouse gas emissions shows that the potential methane generation is relatively low and not sufficient for commercially viable recovery and energy (electricity) generation.

(c)(i) whether the land on which the development is located is degraded land such as a disused mine site,

The development site is not degraded land.

(c)(ii) whether the development is located so as to avoid land use conflicts, including whether it is consistent with any regional planning strategies or locational principles included in the publication EIS Guideline: Landfilling (Department of Planning, 1996), as in force from time to time,

The development site is not located near an area of significant conservation value identified under legislation or planning instruments; within 250 m of a residential zone or a dwelling not associated with the development; within 40 m of a permanent or intermittent waterbody; in an area overlying an aquifer which contains drinking water quality groundwater which is vulnerable to pollution; within a karst region; at a site with substrata prone to landslip or subsidence or within a floodway which may be subject to washout during a major flood event.

(d) whether transport links to the landfill are optimised to reduce the environmental and social impacts associated with transporting waste to the landfill.

The proposed development will result in no change to the existing transport routes used for accessing the waste management facility.

Conclusion

The assessment undertaken in this Statement of Environmental Effects concludes that the proposed DWD expansion will not significantly increase the environmental impacts of the total development compared with the existing development.

References

Department of Environment and Climate Change (DECC) (2008) *Managing Urban Stormwater: Soils and Construction, Volume 2B Waste Landfills*

Department of Urban Affairs and Planning (1996) *Landfilling – EIS Guideline*

Landcom (2004) *Managing Urban Stormwater: Soils and Construction Volume 1*

Forbes Shire Council (April 2016) *Landfill Environmental Management Plan Version 2.*

(EPA, 2016) *Environmental Guidelines: Solid Waste Landfill*

NSW Environment Protection Authority (2016) *Environmental Guidelines: Solid Waste Landfills*

Terra Consulting (2001) *Groundwater Assessment: Darroobalgie Landfill*

Appendix A

CONCEPTUAL STAGING PLANS

DAROOBALGIE LANDFILL EXTENSION

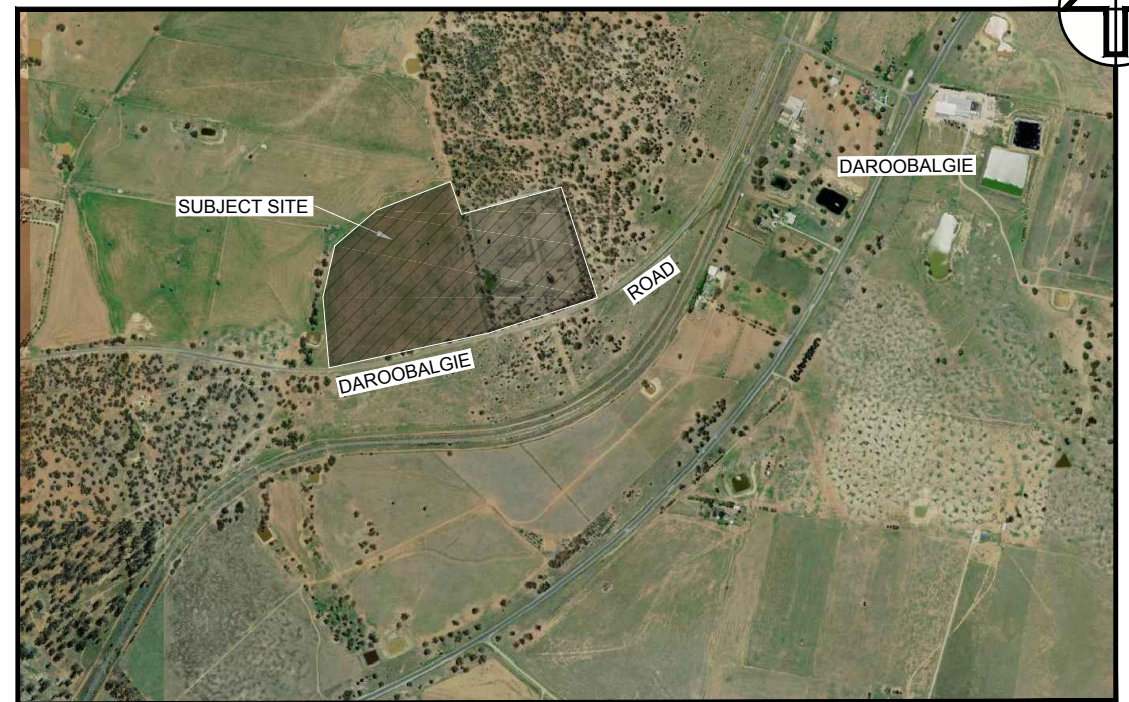
DAROOBALGIE ROAD, FORBES

FORBES SHIRE COUNCIL

CONCEPTUAL STAGING PLANS



SCHEDULE OF DRAWINGS	
DRAWING	TITLE
C001	TITLE SHEET AND SCHEDULE OF DRAWINGS
C002	EXISTING SITE LAYOUT
C003	EXISTING SITE FINISHED SURFACE
C004	EXCAVATION STAGE 4A1
C005	EXCAVATION STAGE 4A2 & FILLING STAGE 4A1
C006	EXCAVATION STAGE 4B & FILLING STAGE 4A2
C007	EXCAVATION STAGE 4C & FILLING STAGE 4B
C008	FILLING STAGE 4C
C009	FILLING STAGE 4D
C010	FILLING STAGE 4E
C011	OVERALL FINISHED SURFACE
C012	TYPICAL CROSS SECTION AND CAPPING DETAILS
C013	TYPICAL LINER DETAILS



SITE LOCALITY
1:1250

CONCEPT DESIGN
NOT FOR CONSTRUCTION

REV.	DATE	DFTD	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT BDY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-

DRAWING SCALE
DO NOT SCALE FROM THESE DRAWINGS. ALL MEASUREMENTS SHALL BE CONFIRMED ON SITE AND WITH GEOLYSE PTY. LTD. PRIOR TO CONSTRUCTION

APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

**GEOLYSE**
ORANGE

154 PEISLEY STREET
P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6393 5000
Fx. (02) 6393 5050

orange@geolyse.com
www.geolyse.com

DRAWING TITLE SHEET AND SCHEDULE OF DRAWINGS			
PROJECT NUMBER 213141	DRAWING FILE 213141_07F_C001-C013.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	SET 07
IMAGE SOURCE			
STATUS FOR REVIEW	SHEET C001 OF C013		

NOTES:

1. THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
2. VISIBLE SERVICES HAVE BEEN LOCATED ONLY. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITIES SHOULD BE CONTACTED FOR LOCATION OF FURTHER UNDERGROUND SERVICES AND DETAILED LOCATIONS OF ALL SERVICES.
3. CONTOUR INTERVAL 0.5m.
4. DATUM IS ASSUMED
5. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

CONCEPT DESIGN
NOT FOR CONSTRUCTION

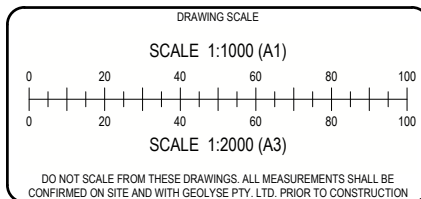
LEGEND:

- EXISTING BOTTOM OF BANK
- EXISTING BOUNDARY
- EXISTING CONTOUR (0.5m INTERVAL)
- EXISTING EDGE OF BITUMEN
- EXISTING EXISTING ACCESS TRACK CENTRELINE
- EXISTING FENCE LINE
- EXISTING OVERHEAD POWERLINE
- EXISTING STOCK PILES
- EXISTING TOP OF BANK
- EXISTING OUTLINE OF VEGETATION
- EXISTING BORE HOLE
- EXISTING GATE
- EXISTING HYDRANT
- EXISTING POWER POLE
- EXISTING SIGN POST
- EXISTING TAP
- EXISTING WATER METER
- EXISTING GRAVEL ACCESS ROAD



REV.	DATE	DFTD	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT BOY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL	-	-	-



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

GEOLYSE

ORANGE

154 PEISLEY STREET
P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6393 5000
Fx. (02) 6393 5050

orange@geolyse.com
www.geolyse.com

DRAWING			
EXISTING SITE LAYOUT			
PROJECT NUMBER	213141	DRAWING FILE	213141_07F_C001-C013.dwg
SURVEY MARK	-	R.L.	-
IMAGE SOURCE	-	DATUM	A.H.D.
STATUS	FOR REVIEW	SHEET	C002 OF C013
SET	07		

NOTES:

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3. NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
4. DATUM IS ASSUMED
5. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

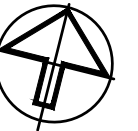
CONCEPT DESIGN
NOT FOR CONSTRUCTION

LEGEND:

- | | | | |
|-----------|---|-------|--------------------------------|
| — 290 — | CONTOUR (0.5m INTERVAL) | — — — | EXISTING TOP OF BANK |
| - - - - - | EXISTING APPROXIMATE ASBESTOS AREA | ~~~~~ | EXISTING OUTLINE OF VEGETATION |
| - . - . - | EXISTING BOTTOM OF BANK | ⊕ | EXISTING BORE HOLE |
| — — — | EXISTING BOUNDARY | ⊗ | EXISTING GATE |
| — — — | EXISTING EDGE OF BITUMEN | FH | EXISTING HYDRANT |
| - - - - - | EXISTING EXISTING ACCESS TRACK CENTRELINE | PP | EXISTING POWER POLE |
| - / - / - | EXISTING FENCE LINE | △ | EXISTING SIGN POST |
| — ε — | EXISTING OVERHEAD POWERLINE | TAP | EXISTING TAP |
| — — — | EXISTING STOCK PILES | WMR | EXISTING WATER METER |

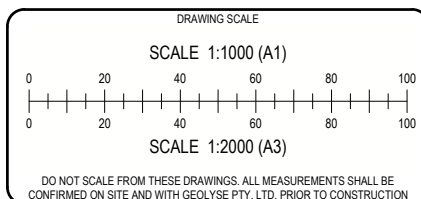
LEVELS SHOWN ARE FINAL FINISHED
TOP OF CAPPING SURFACE LEVELS

LOCATION AND EXTENT OF WORKS IN THIS AREA
SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT
TO DETAILED DESIGN.




REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT BOY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL	-	-	-



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

 **GEOLYSE**

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orange@geolyse.com
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DRAWING			
EXISTING SITE FINISHED SURFACE			
PROJECT NUMBER 213141	DRAWING FILE 213141_07F_C001-C013.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	SET
IMAGE SOURCE			07
STATUS FOR REVIEW	SHEET C003	OF C013	

1. THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
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3. NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
4. DATUM IS ASSUMED
5. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

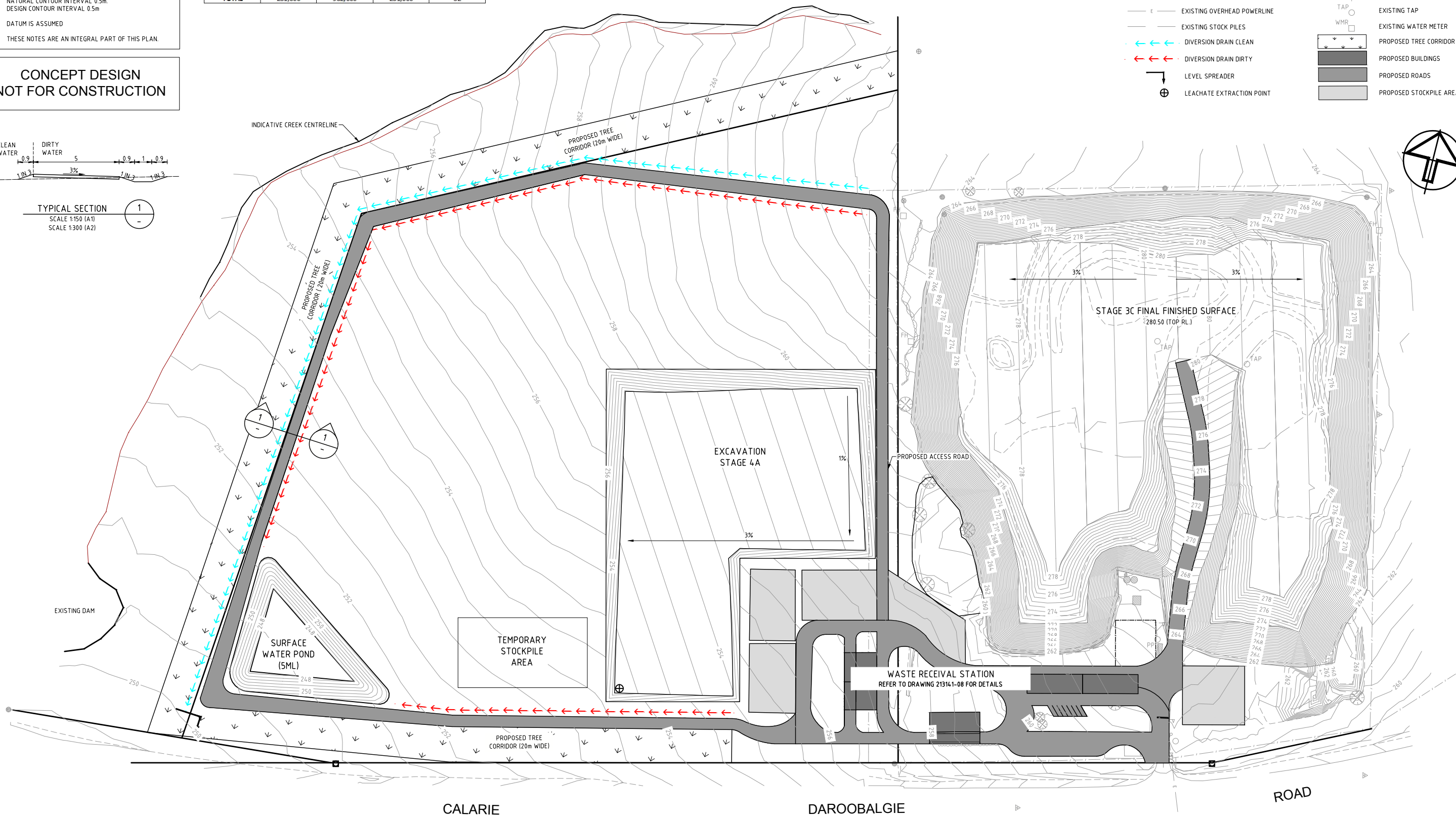
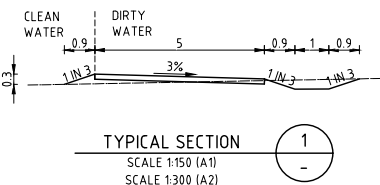
STAGE VOLUMES				
STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING			57,000	
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING			95,000	
TOTAL	231,000	982,000	231,000	52

1. VOLUMES STATED ARE BASED ON FINAL FINISHED DESIGN SURFACE FOR EXISTING LANDFILL SITE AS SHOWN ON SHEET C003.
2. YEARS TAKEN TO FILL BASED ON AN AVERAGE YEARLY VOLUME OF 19,000m³
3. ALL VOLUMES ARE IN-SITU QUANTITIES AND DO NOT MAKE ALLOWANCES FOR ANY BULKING OR COMPACTION FACTORS
4. NO ALLOWANCE HAS BEEN MADE FOR STRIPPING OF EXISTING TOPSOIL / UNSUITABLE MATERIAL.

LEGEND:

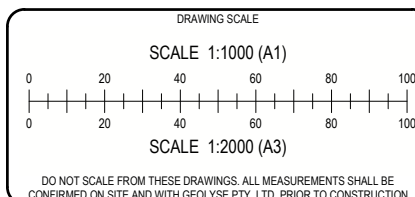
- | | | | |
|--|---|--|--------------------------------|
| | CONTOUR (0.5m INTERVAL) | | EXISTING TOP OF BANK |
| | EXISTING APPROXIMATE ASBESTOS AREA | | EXISTING OUTLINE OF VEGETATION |
| | EXISTING BOTTOM OF BANK | | EXISTING BORE HOLE |
| | EXISTING BOUNDARY | | EXISTING GATE |
| | EXISTING EDGE OF BITUMEN | | EXISTING HYDRANT |
| | EXISTING EXISTING ACCESS TRACK CENTRELINE | | EXISTING POWER POLE |
| | EXISTING FENCE LINE | | EXISTING SIGN POST |
| | EXISTING OVERHEAD POWERLINE | | EXISTING TAP |
| | EXISTING STOCK PILES | | EXISTING WATER METER |
| | DIVERSION DRAIN CLEAN | | PROPOSED TREE CORRIDOR |
| | DIVERSION DRAIN DIRTY | | PROPOSED BUILDINGS |
| | LEVEL SPREADER | | PROPOSED ROADS |
| | LEACHATE EXTRACTION POINT | | PROPOSED STOCKPILE AREAS |

CONCEPT DESIGN
NOT FOR CONSTRUCTION

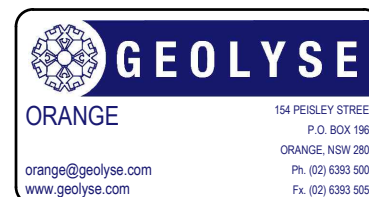


REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT BDY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-



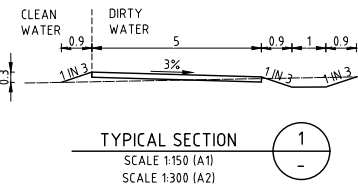
APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION



DRAWING		EXCAVATION STAGE 4A1	
PROJECT NUMBER	213141	DRAWING FILE	213141_07F_C001-C013.dwg
SURVEY MARK	-	R.L.	-
IMAGE SOURCE		DATUM	A.H.D.
STATUS	FOR REVIEW	SHEET	C004 OF C013

NOTES:

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DESIGN CONTOUR INTERVAL 0.5m
- DATUM IS ASSUMED
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CONCEPT DESIGN
NOT FOR CONSTRUCTION

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING				57,000
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING				95,000
TOTAL	231,000	982,000	231,000	52

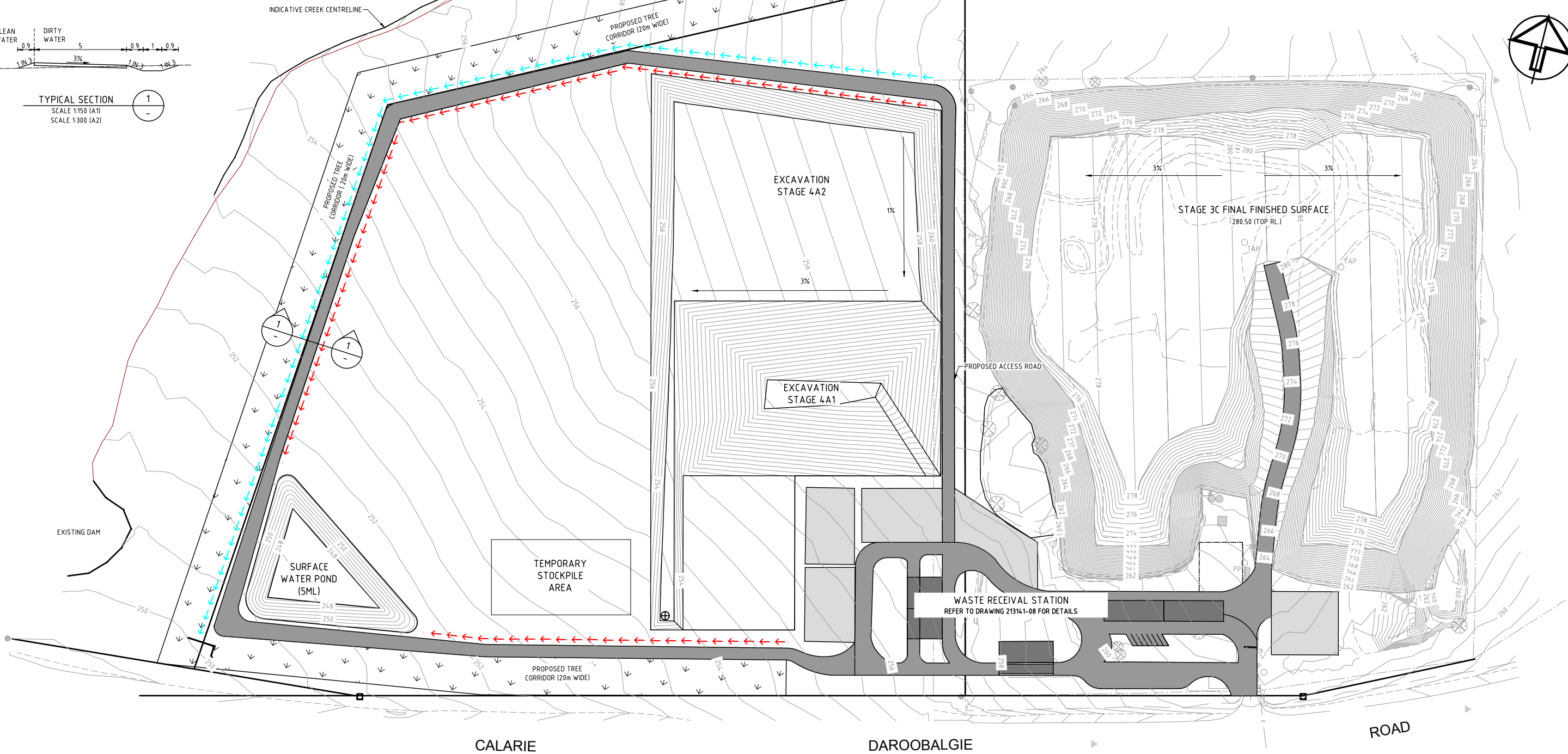
NOTE:

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LOCATION AND EXTENT OF WORKS IN THIS AREA SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT TO DETAILED DESIGN.

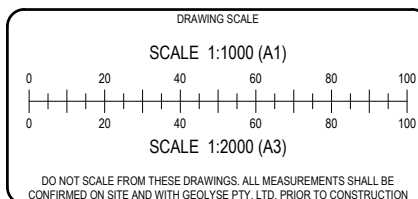
LEGEND:

— 290 —	CONTOUR (0.5m INTERVAL)	—	EXISTING TOP OF BANK
- - - - -	EXISTING APPROXIMATE ASBESTOS AREA	~ ~ ~ ~ ~	EXISTING OUTLINE OF VEGETATION
- - - - -	EXISTING BOTTOM OF BANK	⊕	EXISTING BORE HOLE
—	EXISTING BOUNDARY	⊕	EXISTING GATE
—	EXISTING EDGE OF BITUMEN	FH	EXISTING HYDRANT
- - - - -	EXISTING EXISTING ACCESS TRACK CENTRELINE	PP	EXISTING POWER POLE
- - - - -	EXISTING FENCE LINE	⊕	EXISTING SIGN POST
— E —	EXISTING OVERHEAD POWERLINE	TAP	EXISTING TAP
—	EXISTING STOCK PILES	WHR	EXISTING WATER METER
← →	DIVERSION DRAIN CLEAN	↓	PROPOSED TREE CORRIDOR
← →	DIVERSION DRAIN DIRTY	■	PROPOSED BUILDINGS
⊕	LEVEL SPREADER	■	PROPOSED ROADS
⊕	LEACHATE EXTRACTION POINT	■	PROPOSED STOCKPILE AREAS



REV.	DATE	DFTD	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT BOY
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E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

FILE	INITIALS	DATE
SURVEY 213141 SURVEY MARCH 2018 MUJ	GW	13/03/18
DESIGN 213141_02F_TIP_EXTENSION project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DARROOBALGIE LANDFILL EXTENSION

GEOLYSE

ORANGE

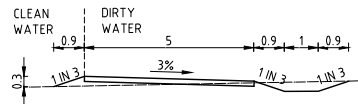
154 PEISLEY STREET
P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6393 5000
Fx. (02) 6393 5050

orange@geolyse.com
www.geolyse.com

DRAWING EXCAVATION STAGE 4A2 & FILLING STAGE 4A1			
PROJECT NUMBER 213141	DRAWING FILE 213141_07F_C001-C013.dwg	ORIGINAL	A1
SURVEY MARK	R.L.	DATUM A.H.D.	SET
IMAGE SOURCE			07
STATUS FOR REVIEW	SHEET C005	OF C013	

NOTES:

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- NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
- DATUM IS ASSUMED
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CONCEPT DESIGN
NOT FOR CONSTRUCTIONTYPICAL SECTION
SCALE 1:150 (A1)
SCALE 1:300 (A2)1
-

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING				57,000
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
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4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING				95,000
TOTAL	231,000	982,000	231,000	52

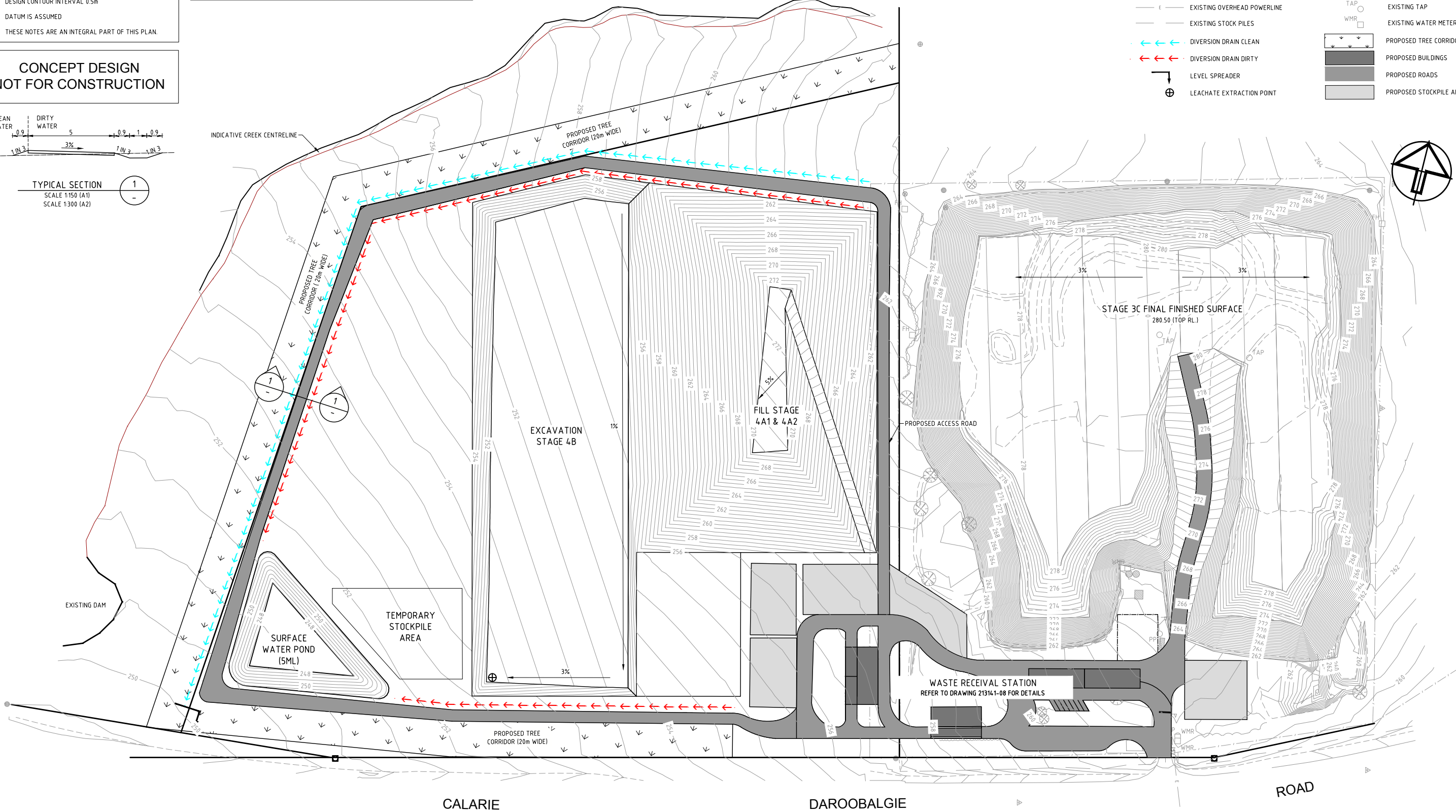
NOTE:

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- YEARS TAKEN TO FILL BASED ON AN AVERAGE YEARLY VOLUME OF 19,000m³
- ALL VOLUMES ARE IN-SITU QUANTITIES AND DO NOT MAKE ALLOWANCES FOR ANY BULKING OR COMPACTION FACTORS
- NO ALLOWANCE HAS BEEN MADE FOR STRIPPING OF EXISTING TOPSOIL / UNSUITABLE MATERIAL.

LOCATION AND EXTENT OF WORKS IN THIS AREA SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT TO DETAILED DESIGN.

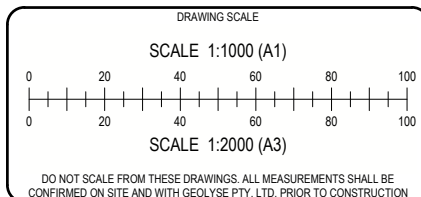
LEGEND:

290	CONTOUR (0.5m INTERVAL)	—	EXISTING TOP OF BANK
---	EXISTING APPROXIMATE ASBESTOS AREA	~	EXISTING OUTLINE OF VEGETATION
---	EXISTING BOTTOM OF BANK	⊕	EXISTING BORE HOLE
---	EXISTING BOUNDARY	⌵	EXISTING GATE
---	EXISTING EDGE OF BITUMEN	FH	EXISTING HYDRANT
---	EXISTING EXISTING ACCESS TRACK CENTRELINE	PP	EXISTING POWER POLE
---	EXISTING FENCE LINE	⌵	EXISTING SIGN POST
E	EXISTING OVERHEAD POWERLINE	TAP	EXISTING TAP
---	EXISTING STOCK PILES	WMR	EXISTING WATER METER
---	DIVERSION DRAIN CLEAN		PROPOSED TREE CORRIDOR
---	DIVERSION DRAIN DIRTY		PROPOSED BUILDINGS
---	LEVEL SPREADER		PROPOSED ROADS
⊕	LEACHATE EXTRACTION POINT		PROPOSED STOCKPILE AREAS



REV.	DATE	DFTD	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT BOY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018 MJU	GW 13/03/18
DESIGN	213141_02F_TIP_EXTENSION project	PPO 13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



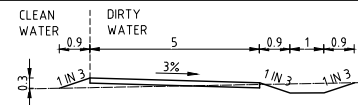
APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DARROOBALGIE LANDFILL EXTENSION

GEOLYSE
ORANGE
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P.O. BOX 1963
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Ph. (02) 6393 5000
Fx. (02) 6393 5050
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www.geolyse.com

DRAWING		EXCAVATION STAGE 4B & FILLING STAGE 4A2			
PROJECT NUMBER 213141		DRAWING FILE: 213141_07F_C001-C013.dwg			ORIGINAL
SURVEY MARK -		R.L. -		DATUM A.H.D.	A1
IMAGE SOURCE					SET
STATUS FOR REVIEW		SHEET C006		OF C013	07

NOTES:

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- NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
- DATUM IS ASSUMED
- THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

CONCEPT DESIGN
NOT FOR CONSTRUCTIONTYPICAL SECTION
SCALE 1:150 (A1)
SCALE 1:300 (A2)1
-

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING			57,000	
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
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4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING			95,000	
TOTAL	231,000	982,000	231,000	52

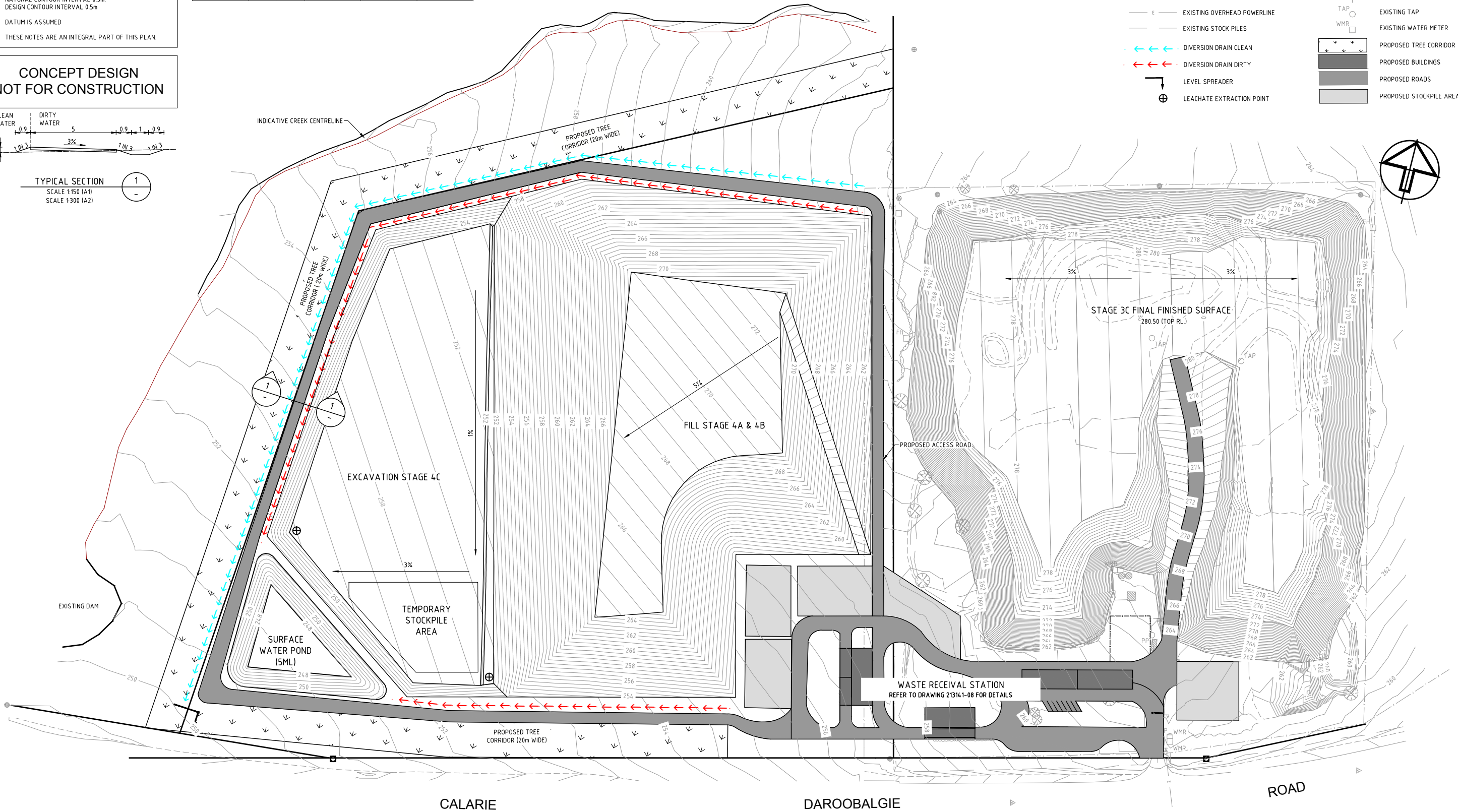
NOTE:

- VOLUMES STATED ARE BASED ON FINAL FINISHED DESIGN SURFACE FOR EXISTING LANDFILL SITE AS SHOWN ON SHEET C003.
- YEARS TAKEN TO FILL BASED ON AN AVERAGE YEARLY VOLUME OF 19,000m³
- ALL VOLUMES ARE IN-SITU QUANTITIES AND DO NOT MAKE ALLOWANCES FOR ANY BULKING OR COMPACTION FACTORS
- NO ALLOWANCE HAS BEEN MADE FOR STRIPPING OF EXISTING TOPSOIL / UNSUITABLE MATERIAL.

LOCATION AND EXTENT OF WORKS IN THIS AREA SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT TO DETAILED DESIGN.

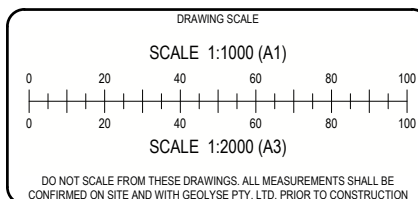
LEGEND:

- 290 CONTOUR (0.5m INTERVAL)
- EXISTING APPROXIMATE ASBESTOS AREA
- EXISTING BOTTOM OF BANK
- EXISTING BOUNDARY
- EXISTING EDGE OF BITUMEN
- EXISTING EXISTING ACCESS TRACK CENTRELINE
- EXISTING FENCE LINE
- EXISTING OVERHEAD POWERLINE
- EXISTING STOCK PILES
- DIVERSION DRAIN CLEAN
- DIVERSION DRAIN DIRTY
- LEVEL SPREADER
- LEACHATE EXTRACTION POINT
- EXISTING TOP OF BANK
- EXISTING OUTLINE OF VEGETATION
- EXISTING BORE HOLE
- EXISTING GATE
- EXISTING HYDRANT
- EXISTING POWER POLE
- EXISTING SIGN POST
- EXISTING TAP
- EXISTING WATER METER
- PROPOSED TREE CORRIDOR
- PROPOSED BUILDINGS
- PROPOSED ROADS
- PROPOSED STOCKPILE AREAS



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT BOY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

FILE	INITIALS	DATE
SURVEY 213141 SURVEY MARCH 2018 MUJ	GW	13/03/18
DESIGN 213141_02F_TIP_EXTENSION project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DARROOBALGIE LANDFILL EXTENSION

GEOLYSE

ORANGE

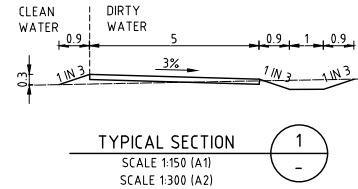
154 PEISLEY STREET
P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6393 5000
Fx. (02) 6393 5050

orange@geolyse.com
www.geolyse.com

DRAWING	EXCAVATION STAGE 4C & FILLING STAGE 4B	ORIGINAL
PROJECT NUMBER 213141	DRAWING FILE 213141_07F_C001-C013.dwg	A1
SURVEY MARK	R.L.	DATUM A.H.D.
IMAGE SOURCE		SET
STATUS FOR REVIEW	SHEET C007 OF C013	07

- NOTES:**
- THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
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 - NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
 - DATUM IS ASSUMED
 - THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

**CONCEPT DESIGN
NOT FOR CONSTRUCTION**



STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING			57,000	
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING			95,000	
TOTAL	231,000	982,000	231,000	52

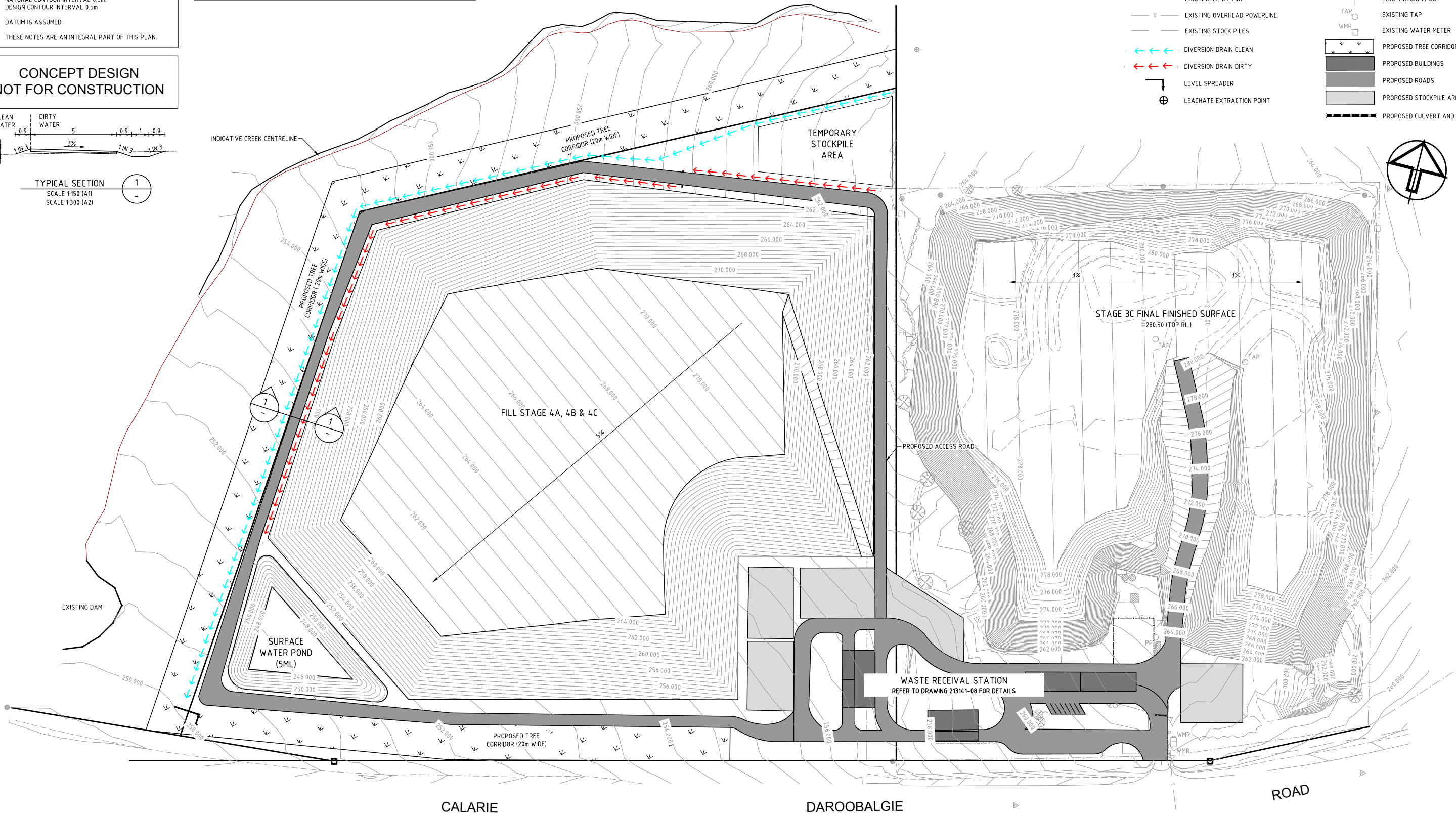
NOTE:

- VOLUMES STATED ARE BASED ON FINAL FINISHED DESIGN SURFACE FOR EXISTING LANDFILL SITE AS SHOWN ON SHEET C003.
- YEARS TAKEN TO FILL BASED ON AN AVERAGE YEARLY VOLUME OF 19,000m³
- ALL VOLUMES ARE IN-SITU QUANTITIES AND DO NOT MAKE ALLOWANCES FOR ANY BULKING OR COMPACTION FACTORS
- NO ALLOWANCE HAS BEEN MADE FOR STRIPPING OF EXISTING TOPSOIL / UNSUITABLE MATERIAL.

LOCATION AND EXTENT OF WORKS IN THIS AREA SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT TO DETAILED DESIGN.

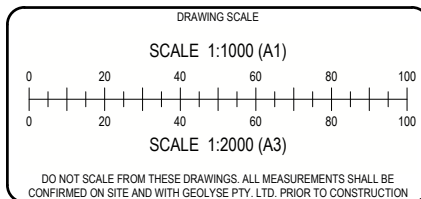
LEGEND:

- 290 — CONTOUR (0.5m INTERVAL)
- - - - - EXISTING APPROXIMATE ASBESTOS AREA
- - - - - EXISTING BOTTOM OF BANK
- — — — — EXISTING BOUNDARY
- — — — — EXISTING EDGE OF BITUMEN
- - - - - EXISTING EXISTING ACCESS TRACK CENTRELINE
- - - - - EXISTING FENCE LINE
- - - - - EXISTING OVERHEAD POWERLINE
- — — — — EXISTING STOCK PILES
- ← — — — — DIVERSION DRAIN CLEAN
- ← — — — — DIVERSION DRAIN DIRTY
- ⊥ — — — — LEVEL SPREADER
- ⊕ — — — — LEACHATE EXTRACTION POINT
- — — — — EXISTING TOP OF BANK
- — — — — EXISTING OUTLINE OF VEGETATION
- ⊕ — — — — EXISTING BORE HOLE
- ⊕ — — — — EXISTING GATE
- ⊕ — — — — EXISTING HYDRANT
- ⊕ — — — — EXISTING POWER POLE
- ⊕ — — — — EXISTING SIGN POST
- ⊕ — — — — EXISTING TAP
- ⊕ — — — — EXISTING WATER METER
- ⊕ — — — — PROPOSED TREE CORRIDOR
- ⊕ — — — — PROPOSED BUILDINGS
- ⊕ — — — — PROPOSED ROADS
- ⊕ — — — — PROPOSED STOCKPILE AREAS
- ⊕ — — — — PROPOSED CULVERT AND HEADWALL



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
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F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018 MUJ	GW 13/03/18
DESIGN	213141_02F_TIP_EXTENSION project	PPO 13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

GEOLYSE

ORANGE

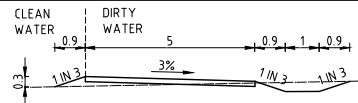
154 PEISLEY STREET
P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6393 5000
Fx. (02) 6393 5050

orange@geolyse.com
www.geolyse.com

DRAWING		FILLING STAGE 4C	
PROJECT NUMBER 213141	DRAWING FILE 213141_07F_C001-C013.dwg	ORIGINAL	A1
SURVEY MARK	R.L.	DATUM	A.H.D.
IMAGE SOURCE		SET	07
STATUS FOR REVIEW	SHEET C008 OF C013		

NOTES:

- THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
- VISIBLE SERVICES HAVE BEEN LOCATED ONLY. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITIES SHOULD BE CONTACTED FOR LOCATION OF FURTHER UNDERGROUND SERVICES AND DETAILED LOCATIONS OF ALL SERVICES.
- NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
- DATUM IS ASSUMED
- THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

CONCEPT DESIGN
NOT FOR CONSTRUCTIONTYPICAL SECTION
SCALE 1:150 (A1)
SCALE 1:300 (A2)1
-

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING				
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING				
TOTAL	231,000	982,000	231,000	52

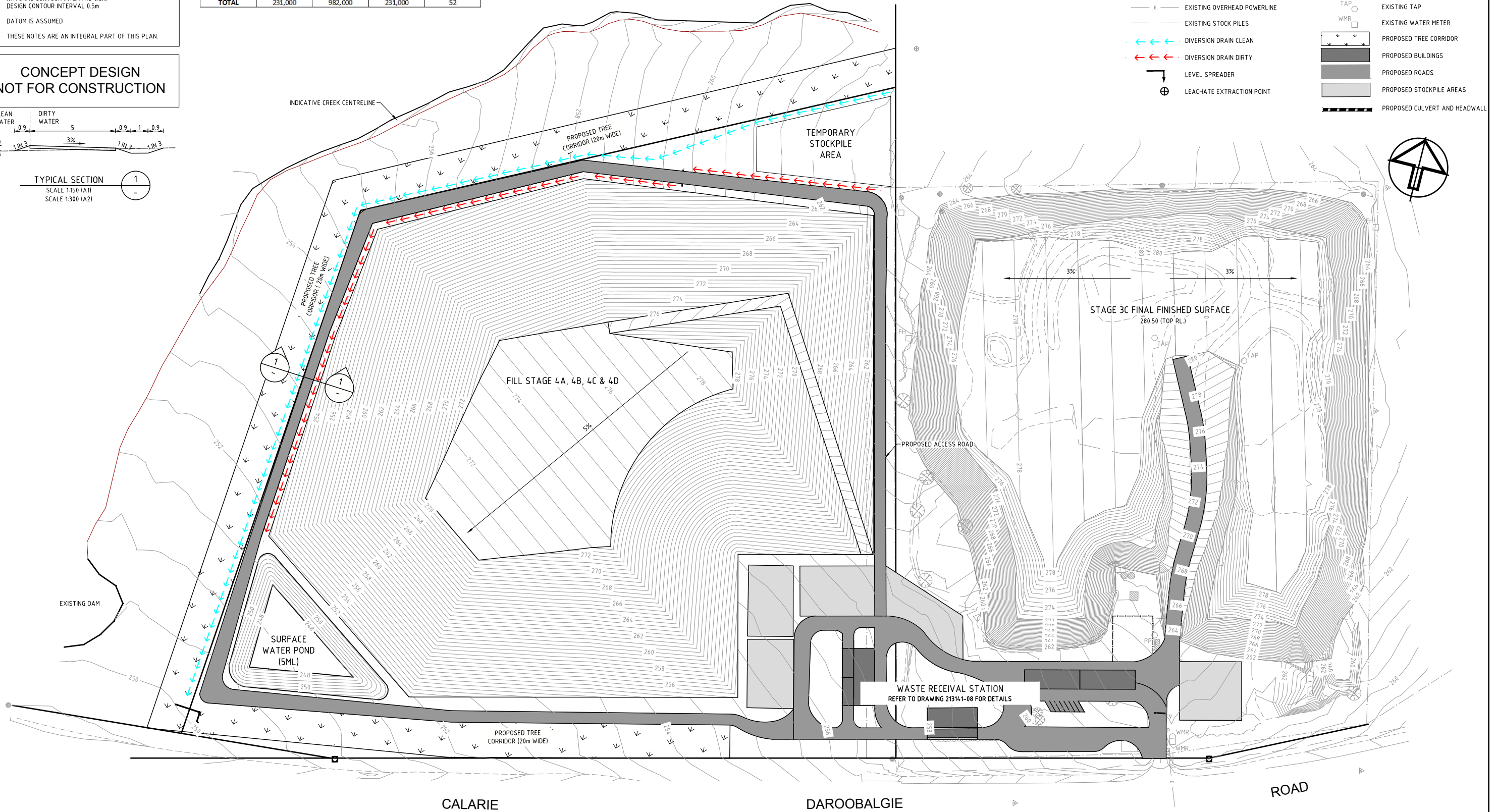
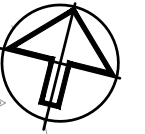
NOTE:

- VOLUMES STATED ARE BASED ON FINAL FINISHED DESIGN SURFACE FOR EXISTING LANDFILL SITE AS SHOWN ON SHEET C003.
- YEARS TAKEN TO FILL BASED ON AN AVERAGE YEARLY VOLUME OF 19,000m³
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LOCATION AND EXTENT OF WORKS IN THIS AREA SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT TO DETAILED DESIGN.

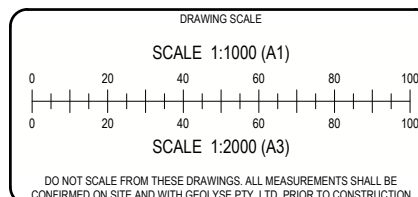
LEGEND:

- 290 CONTOUR (0.5m INTERVAL)
- EXISTING APPROXIMATE ASBESTOS AREA
- EXISTING BOTTOM OF BANK
- EXISTING BOUNDARY
- EXISTING EDGE OF BITUMEN
- EXISTING EXISTING ACCESS TRACK CENTRELINE
- EXISTING FENCE LINE
- E EXISTING OVERHEAD POWERLINE
- EXISTING STOCK PILES
- DIVERSION DRAIN CLEAN
- DIVERSION DRAIN DIRTY
- LEVEL SPREADER
- LEACHATE EXTRACTION POINT
- EXISTING TOP OF BANK
- EXISTING OUTLINE OF VEGETATION
- EXISTING BORE HOLE
- EXISTING GATE
- EXISTING HYDRANT
- EXISTING POWER POLE
- EXISTING SIGN POST
- EXISTING TAP
- EXISTING WATER METER
- PROPOSED TREE CORRIDOR
- PROPOSED BUILDINGS
- PROPOSED ROADS
- PROPOSED STOCKPILE AREAS
- PROPOSED CULVERT AND HEADWALL



REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
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E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

FILE	INITIALS	DATE
SURVEY 213141 SURVEY MARCH 2018 MUJ	GW	13/03/18
DESIGN 213141_02F_TIP_EXTENSION project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING APPROVAL		



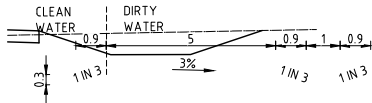
APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

GEOLYSE
ORANGE
154 PEISLEY STREET
P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6393 5000
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orange@geolyse.com
www.geolyse.com

DRAWING			FILLING STAGE 4D		
PROJECT NUMBER 213141		DRAWING FILE 213141_07F_C001-C013.dwg		ORIGINAL	
SURVEY MARK _		R.L. _		DATUM A.H.D.	
IMAGE SOURCE				A1	
STATUS FOR REVIEW		SHEET C009 OF C013		SET 07	

NOTES:

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- NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
- DATUM IS ASSUMED
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CONCEPT DESIGN
NOT FOR CONSTRUCTIONTYPICAL SECTION
SCALE 1:150 (A1)
SCALE 1:300 (A2)1
-

STAGE VOLUMES

STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING				
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
4B	65,000	224,000	18,000	12
4C	64,000	296,000	24,000	16
4D	170,000	170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING				
TOTAL	231,000	982,000	231,000	52

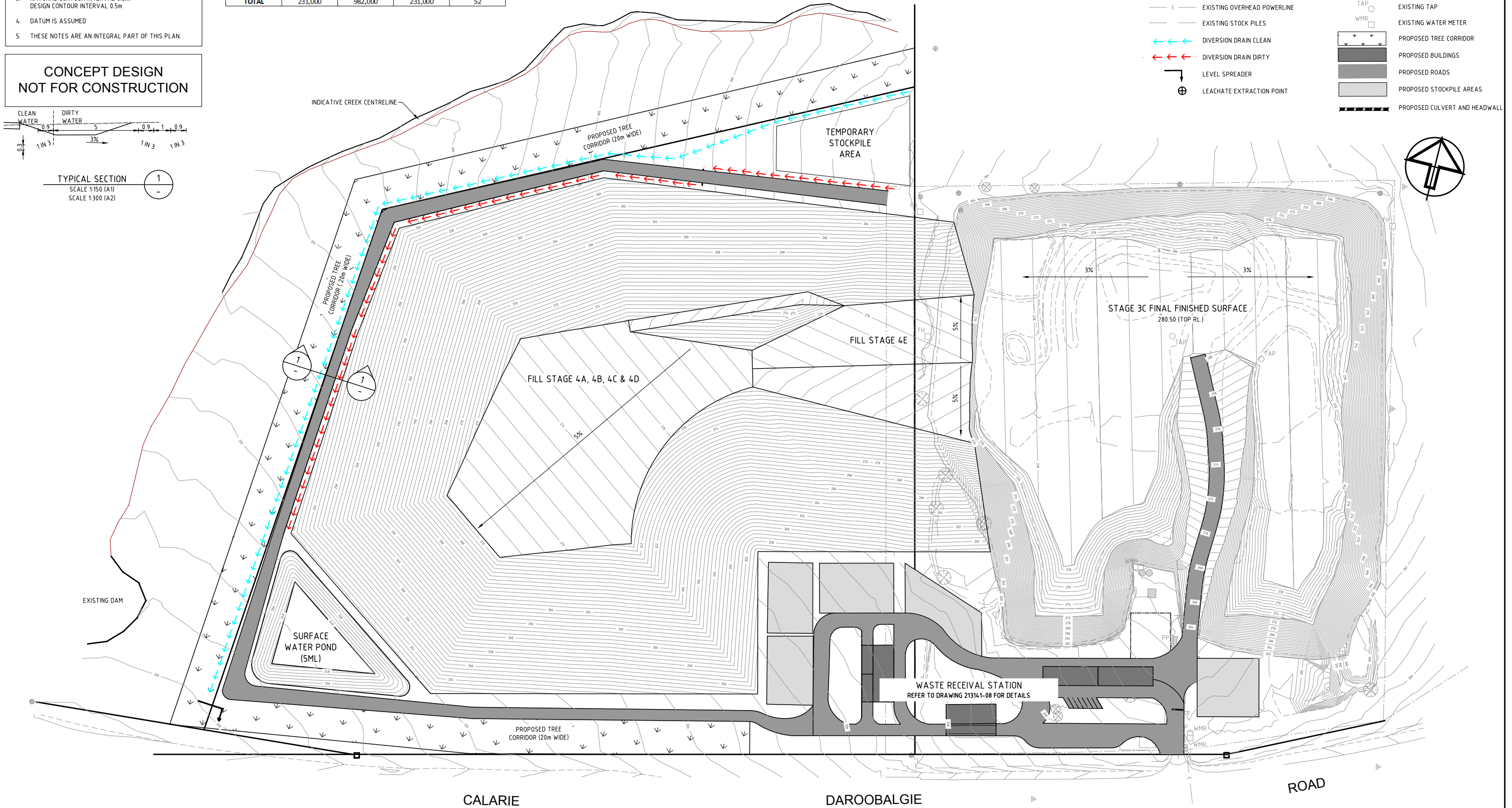
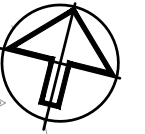
NOTE:

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LOCATION AND EXTENT OF WORKS IN THIS AREA
SHOWN INDICATIVELY. FINAL LANDFILL SUBJECT
TO DETAILED DESIGN.

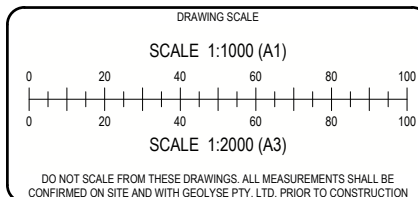
LEGEND:

- 290 CONTOUR (0.5m INTERVAL)
- EXISTING APPROXIMATE ASBESTOS AREA
- EXISTING BOTTOM OF BANK
- EXISTING BOUNDARY
- EXISTING EDGE OF BITUMEN
- EXISTING EXISTING ACCESS TRACK CENTRELINE
- EXISTING FENCE LINE
- E EXISTING OVERHEAD POWERLINE
- EXISTING STOCK PILES
- DIVERSION DRAIN CLEAN
- DIVERSION DRAIN DIRTY
- LEVEL SPREADER
- LEACHATE EXTRACTION POINT
- EXISTING TOP OF BANK
- EXISTING OUTLINE OF VEGETATION
- EXISTING BORE HOLE
- EXISTING GATE
- EXISTING HYDRANT
- EXISTING POWER POLE
- EXISTING SIGN POST
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- PROPOSED BUILDINGS
- PROPOSED ROADS
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- PROPOSED CULVERT AND HEADWALL



REV.	DATE	DFTD.	APPD.	DETAILS
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E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018 MUJ	GW 13/03/18
DESIGN	213141_02F_TIP_EXTENSION project	PPO 13/08/18
DRAINS/ HEC-RAS MODELLING		
ENGINEERING/ SURVEYING/ APPROVAL		



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DARROOBALGIE LANDFILL EXTENSION

GEOLYSE
ORANGE
154 PEISLEY STREET
P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6393 5000
Fx. (02) 6393 5050
orange@geolyse.com
www.geolyse.com

DRAWING			FILLING STAGE 4E		
PROJECT NUMBER 213141		DRAWING FILE 213141_07F_C001-C013.dwg		ORIGINAL	
SURVEY MARK -		R.L. -		DATUM A.H.D.	
IMAGE SOURCE				SET	
STATUS FOR REVIEW		SHEET C010 OF C013		07	

1. THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
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3. NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
4. DATUM IS ASSUMED
5. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

STAGE VOLUMES

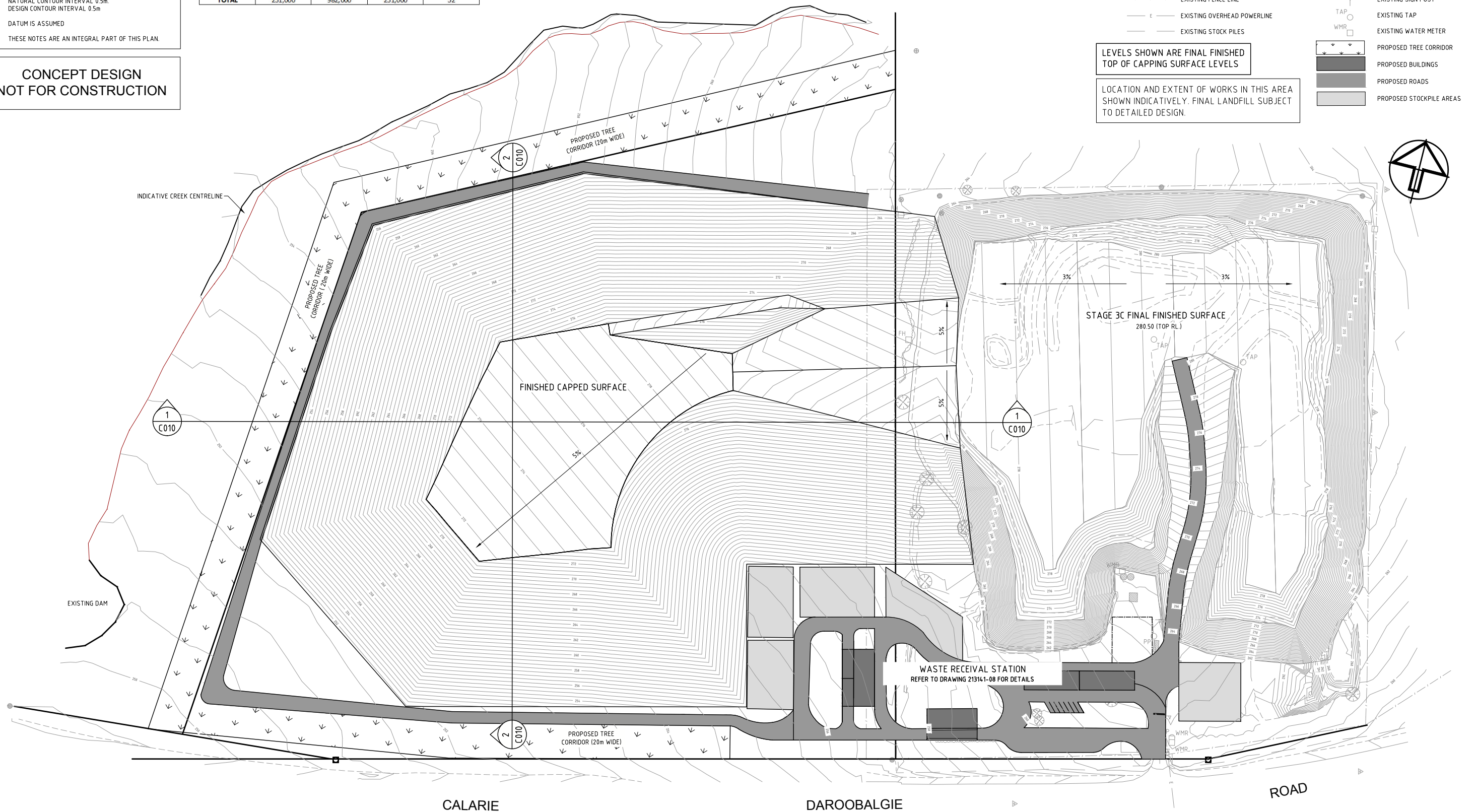
STAGE	EXCAVATION VOLUME (cu.m.)	VOID VOLUME (cu.m.)	CAPPING VOLUME (cu.m.)	YEARS TAKEN TO FILL (yrs)
STAGE 3 FINAL CAPPING			57,000	
4A1	54,000	60,000	5,000	3
4A2	48,000	128,000	10,000	7
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4C	64,000	296,000	24,000	16
4D		170,000	14,000	9
4E		104,000	8,000	5
STAGE 4 FINAL CAPPING			95,000	
TOTAL	231,000	982,000	231,000	52

NOTE:

1. VOLUMES STATED ARE BASED ON FINAL FINISHED DESIGN SURFACE FOR EXISTING LANDFILL SITE AS SHOWN ON SHEET CO03.
2. YEARS TAKEN TO FILL BASED ON AN AVERAGE YEARLY VOLUME OF 19,000m³
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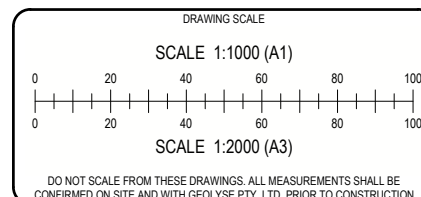
LEGEND:

- | | | | |
|--|---|--|--------------------------------|
| | CONTOUR (0.5m INTERVAL) | | EXISTING TOP OF BANK |
| | EXISTING APPROXIMATE ASBESTOS AREA | | EXISTING OUTLINE OF VEGETATION |
| | EXISTING BOTTOM OF BANK | | EXISTING BORE HOLE |
| | EXISTING BOUNDARY | | EXISTING GATE |
| | EXISTING EDGE OF BITUMEN | | EXISTING HYDRANT |
| | EXISTING EXISTING ACCESS TRACK CENTRELINE | | EXISTING POWER POLE |
| | EXISTING FENCE LINE | | EXISTING SIGN POST |
| | EXISTING OVERHEAD POWERLINE | | EXISTING TAP |
| | EXISTING STOCK PILES | | EXISTING WATER METER |
| <div style="border: 1px solid black; padding: 5px;"> <p>LEVELS SHOWN ARE FINAL FINISHED
TOP OF CAPPING SURFACE LEVELS</p> </div> | | | PROPOSED TREE CORRIDOR |
| | | | PROPOSED BUILDINGS |
| | | | PROPOSED ROADS |
| | | | PROPOSED STOCKPILE AREAS |
| | | | PROPOSED WORKS AREAS |



REV.	DATE	DFTD.	APPD.	DETAILS
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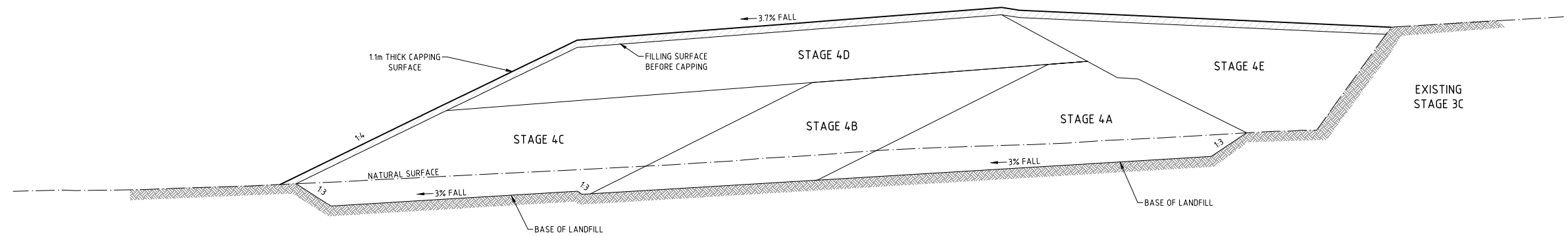
	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

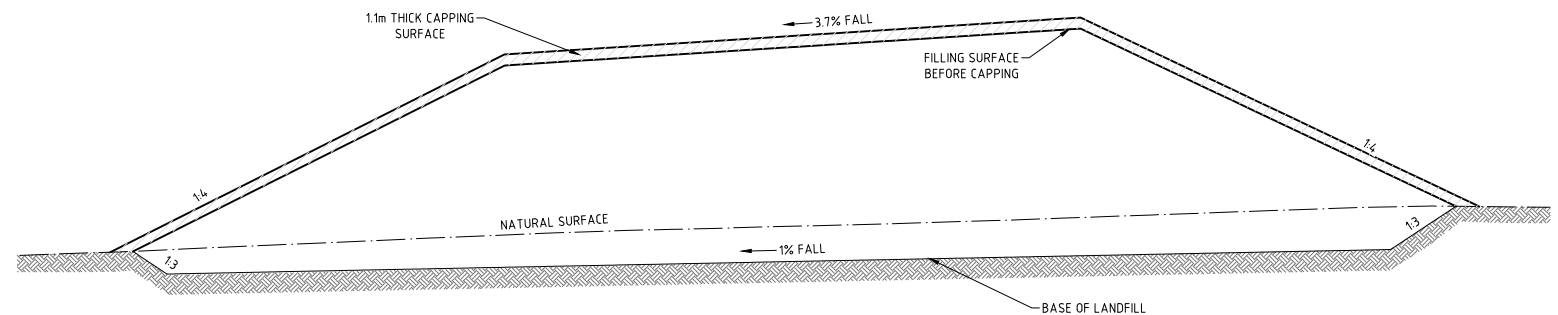


DRAWING		OVERALL FINISHED SURFACE		
PROJECT NUMBER	213141	DRAWING FILE	213141_07F_C001-C013.dwg	ORIGINAL
SURVEY MARK	-	R.L.	-	A1
IMAGE SOURCE		DATUM		SET
STATUS	FOR REVIEW	SHEET	C011 OF C013	07



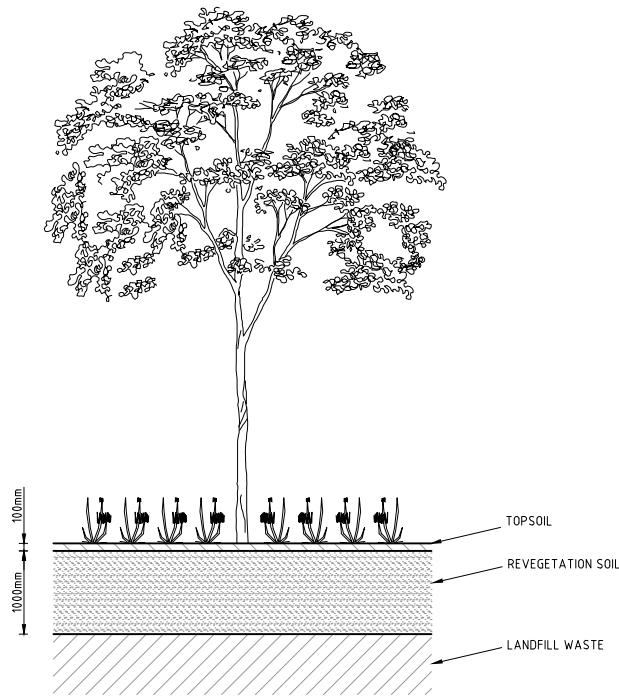
FINISHED SURFACE LONG SECTION
HORIZONTAL SCALE 1:750 (A1) 1:1500 (A3)
VERTICAL SCALE 1:375 (A1) 1:750 (A3)

1
C009



FINISHED SURFACE TYPICAL SECTION
HORIZONTAL SCALE 1:750 (A1) 1:1500 (A3)
VERTICAL SCALE 1:375 (A1) 1:750 (A3)

2
C009



TYPICAL CAPPING DESIGN
SCALE 1:50 (A1)
SCALE 1:100 (A3)

REV.	DATE	DFTD.	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT BOY
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	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL	-	-	-

DRAWING SCALE

REFER TO INDIVIDUAL
DRAWING/SECTION SCALES

DO NOT SCALE FROM THESE DRAWINGS. ALL MEASUREMENTS SHALL BE
CONFIRMED ON SITE AND WITH GEOLYSE PTY. LTD. PRIOR TO CONSTRUCTION

APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

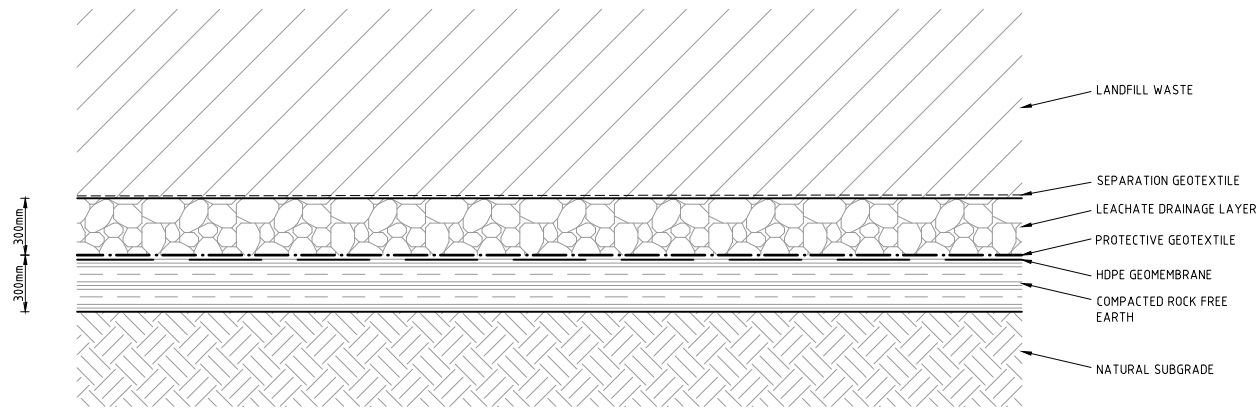
GEOLYSE

ORANGE

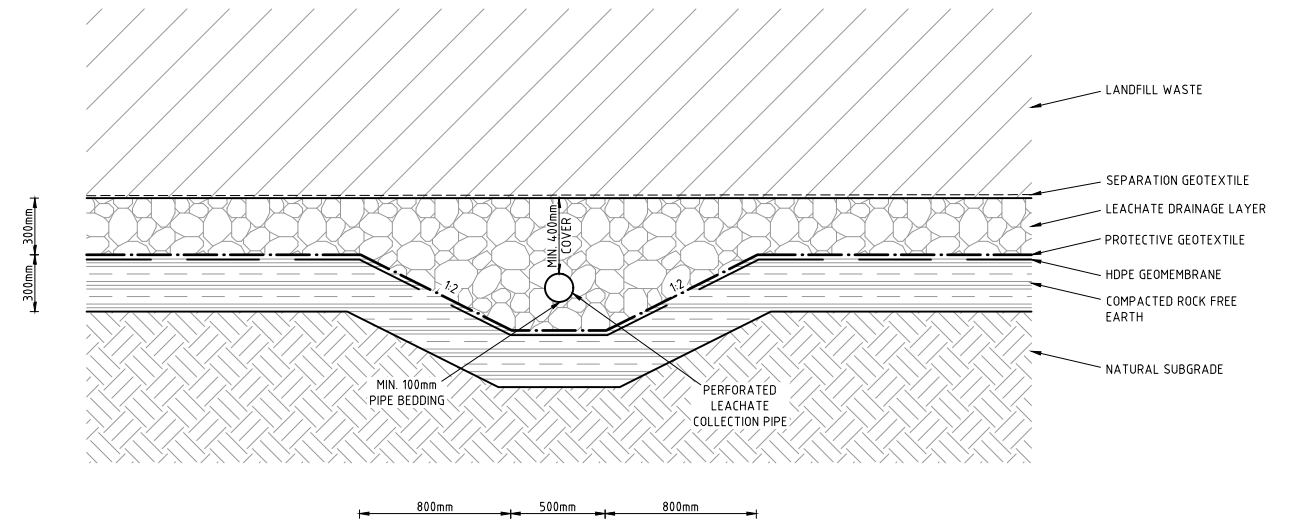
154 PEISLEY STREET
P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6393 5000
Fx. (02) 6393 5050

orange@geolyse.com
www.geolyse.com

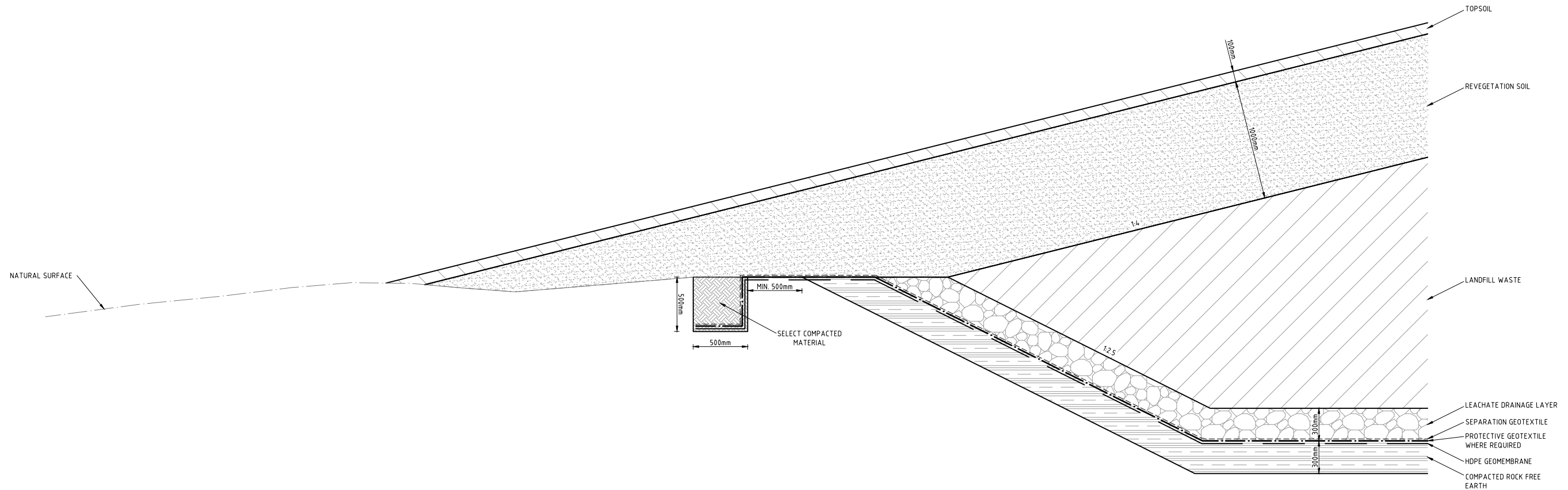
TYPICAL CROSS SECTIONS CAPPING DETAILS			
PROJECT NUMBER 213141	DRAWING FILE 213141_07F_C001-C013.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	SET
IMAGE SOURCE			07
STATUS FOR REVIEW	SHEET C012 OF C013		



TYPICAL LINER DESIGN (IF REQUIRED)
SCALE 1:20 (A1)
SCALE 1:40 (A3)



TYPICAL LEACHATE COLLECTION DRAIN (IF REQUIRED)
SCALE 1:20 (A1)
SCALE 1:40 (A3)



TYPICAL LINER TERMINATION (IF REQUIRED)
SCALE 1:20 (A1)
SCALE 1:40 (A3)


**CONCEPT DESIGN
NOT FOR CONSTRUCTION**

REV.	DATE	DFTD	APPD.	DETAILS
A	27/11/2017	AH	PPO	FOR REVIEW
B	02/05/2018	AP	PPO	AMENDED TO SUIT FINAL LOT BOY
C	23/07/2018	AP	PPO	AMENDED TO AVOID WOODLAND
D	08/08/2018	AP	PPO	TOP GRADE INCREASED AND BATTERS FLATTENED
E	10/08/2018	AP	PPO	STAGE 4A1 AND ACCESS RAMP ADDED
F	13/08/2018	AP	PPO	FILLING STAGE 4E ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018.MJO	GW	13/03/18
DESIGN	213141_02F_TIP_EXTENSION.project	PPO	13/08/18
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL	-	-	-

DRAWING SCALE
REFER TO INDIVIDUAL DRAWING/SECTION SCALES
DO NOT SCALE FROM THESE DRAWINGS. ALL MEASUREMENTS SHALL BE CONFIRMED ON SITE AND WITH GEOLYSE PTY. LTD. PRIOR TO CONSTRUCTION

APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

	GEOLYSE
ORANGE	154 PEISLEY STREET P.O. BOX 1963 ORANGE, NSW 2800 Ph. (02) 6393 5000 Fx. (02) 6393 5050
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TYPICAL LINER DETAILS			
PROJECT NUMBER 213141	DRAWING FILE 213141_07F_C001-C013.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	SET 07
IMAGE SOURCE			
STATUS FOR REVIEW	SHEET C013	OF C013	

Appendix B

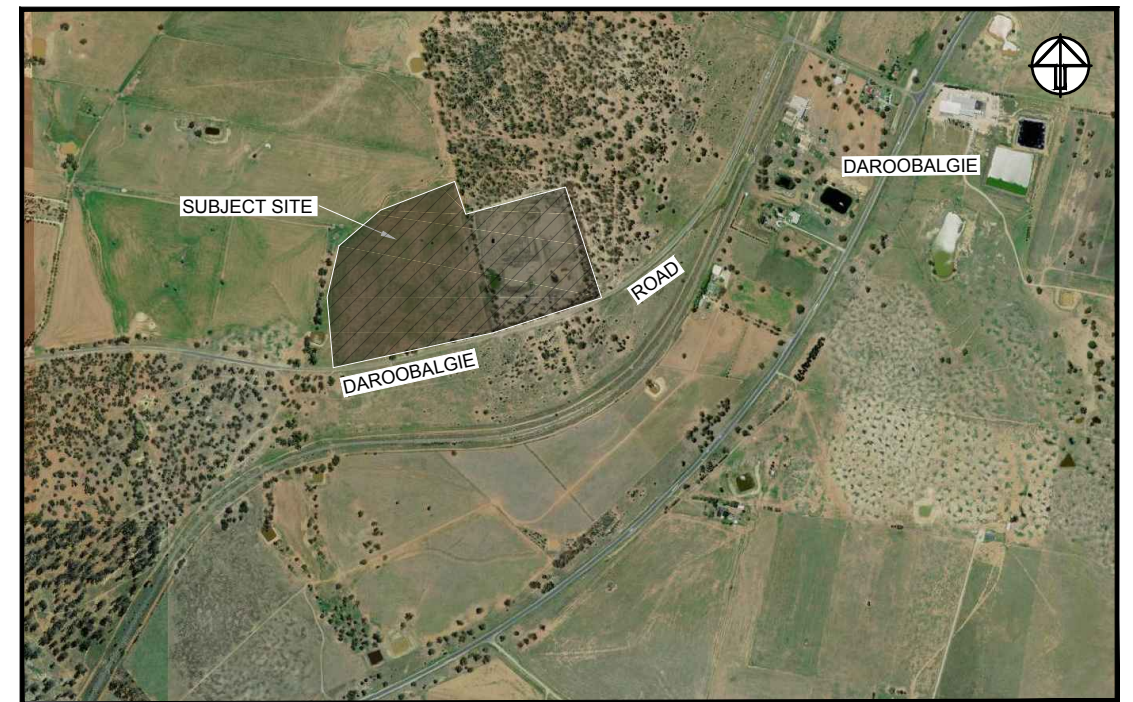
WASTE RECEIVAL AREA PLANS

DAROOBALGIE LANDFILL EXTENSION

FORBES SHIRE COUNCIL

CONCEPT WASTE RECEIVAL AREA PLANS

SCHEDULE OF DRAWINGS	
DRAWING	TITLE
C001	TITLE SHEET
C002	OVERALL LANDFILL EXPANSION CONCEPT LAYOUT PLAN
C003	LANDFILL RECEIVAL AREA CONCEPT LAYOUT PLAN
C004	LANDFILL RECEIVAL AREA CONCEPT LAYOUT TURNING PATHS
C005	OFFICE PLAN AND ELEVATIONS
C006	GENERAL WASTE RECEIVAL SHED PLAN AND ELEVATIONS
C007	CRC SHED PLAN AND ELEVATIONS
C008	RECYCLE CENTER PLAN AND ELEVATIONS




SITE LOCALITY
1:1250

REV.	DATE	DFTD.	APPD.	DETAILS
A	07/03/18	AP	PPO	FOR REVIEW
B	04/04/18	AP	PPO	AMENDMENTS FROM COUNCIL REVIEW
C	18/07/18	AP	PPO	AMENDMENTS ON SEDIMENT BASIN
D	20/08/18	AP	PPO	AMENDMENTS ON LAYOUT
E	24/09/18	AP	PPO	WASTE OIL ADDED
F	04/10/18	AP	PPO	FINAL LANDFILL ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018	GW	12/03/2018
DESIGN	-	-	-
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-

DRAWING SCALE
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APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

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Ph. (02) 6393 5000
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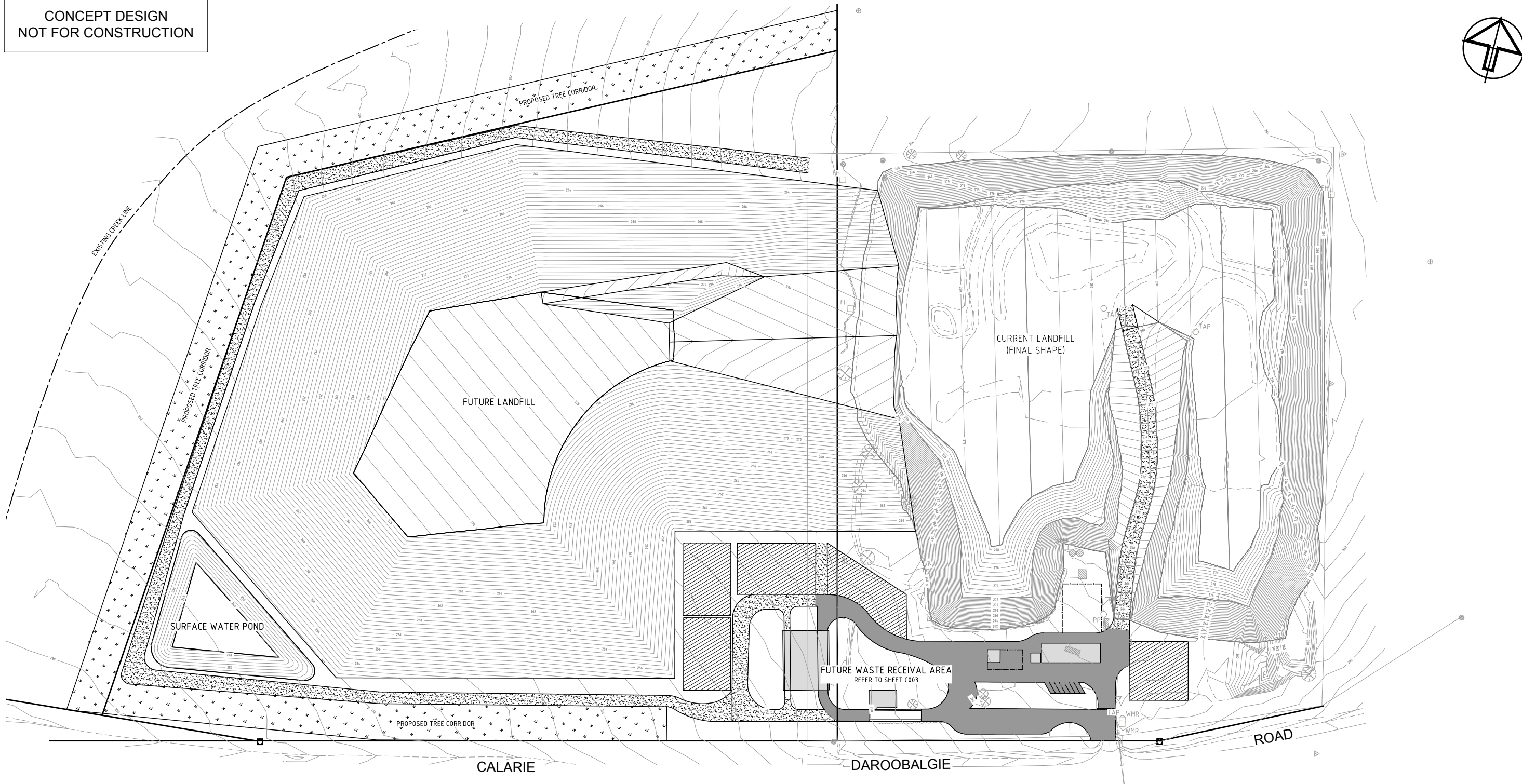
orange@geolyse.com
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TITLE SHEET			
PROJECT NUMBER	213141	DRAWING FILE	213141_08F_C001-C008.dwg
SURVEY MARK	-	R.L.	-
IMAGE SOURCE	-	DATUM	A.H.D.
STATUS	FOR REVIEW	SHEET	C001 OF C008
ORIGINAL	A1	SET	08

- NOTES:**
1. THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
 2. VISIBLE SERVICES HAVE BEEN LOCATED ONLY. PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON THE SITE, THE RELEVANT AUTHORITIES SHOULD BE CONTACTED FOR LOCATION OF FURTHER UNDERGROUND SERVICES AND DETAILED LOCATIONS OF ALL SERVICES.
 3. NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
 4. DATUM IS ASSUMED
 5. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

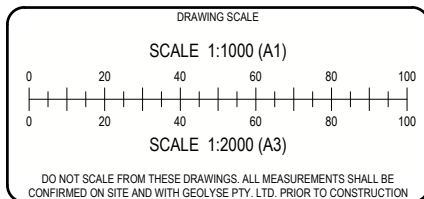
CONCEPT DESIGN
NOT FOR CONSTRUCTION

- LEGEND:**
- 290 — CONTOUR (0.5m INTERVAL)
 - - - EXISTING APPROXIMATE ASBESTOS AREA
 - EXISTING BOTTOM OF BANK
 - - - EXISTING BOUNDARY
 - EXISTING EDGE OF BITUMEN
 - - - EXISTING EXISTING ACCESS TRACK CENTRELINE
 - / - / - EXISTING FENCE LINE
 - E — EXISTING OVERHEAD POWERLINE
 - - - EXISTING STOCK PILES
 - EXISTING TOP OF BANK
 - - - EXISTING OUTLINE OF VEGETATION
 - ⊕ EXISTING BORE HOLE
 - FH EXISTING GATE
 - PP EXISTING HYDRANT
 - PP EXISTING POWER POLE
 - △ EXISTING SIGN POST
 - TAP EXISTING TAP
 - WMR EXISTING WATER METER
 - PROPOSED TREE CORRIDOR
 - BUILDINGS
 - STOCKPILE AREAS
 - SEALED ROADS
 - UNSEALED ROADS



REV.	DATE	DFTD.	APPD.	DETAILS
A	07/03/18	AP	PPO	FOR REVIEW
B	04/04/18	AP	PPO	AMENDMENTS FROM COUNCIL REVIEW
C	18/07/18	AP	PPO	AMENDMENTS ON SEDIMENT BASIN
D	20/08/18	AP	PPO	AMENDMENTS ON LAYOUT
E	24/09/18	AP	PPO	WASTE OIL ADDED
F	04/10/18	AP	PPO	FINAL LANDFILL ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018	GW	12/03/2018
DESIGN	-	-	-
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL	-	-	-



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

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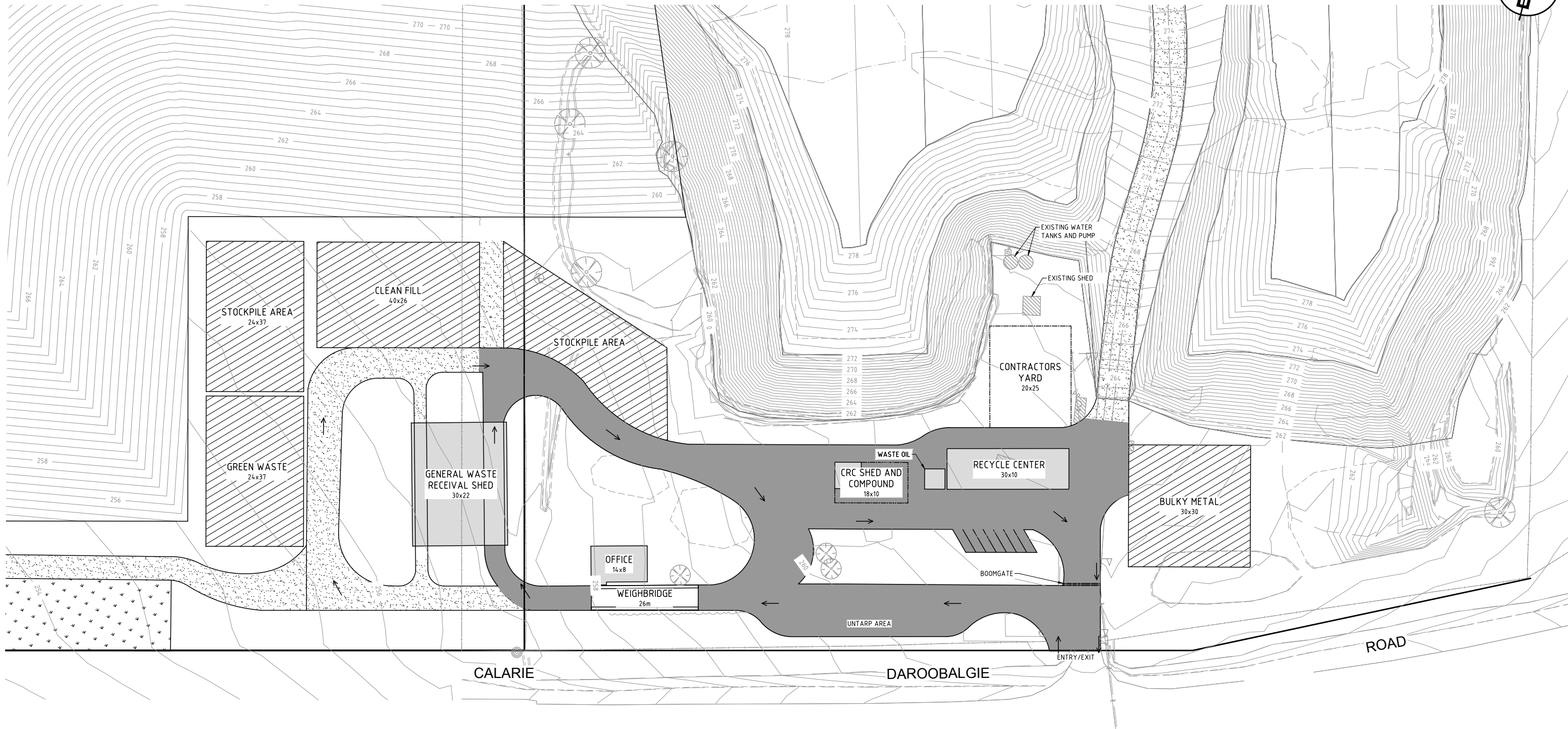
orange@geolyse.com
www.geolyse.com

DRAWING			
OVERALL LANDFILL EXPANSION CONCEPT LAYOUT PLAN			
PROJECT NUMBER 213141	DRAWING FILE 213141_08F_C001-C008.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	SET 08
IMAGE SOURCE	STATUS FOR REVIEW		
SHEET C002	OF C008		

- NOTES:**
- THIS PLAN IS PREPARED FROM A FIELD SURVEY FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS ON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
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 - NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
 - DATUM IS ASSUMED
 - THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

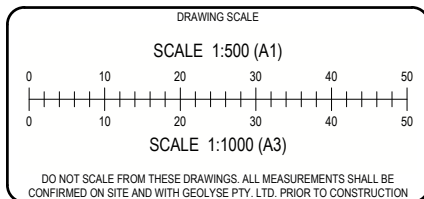
CONCEPT DESIGN
NOT FOR CONSTRUCTION

- LEGEND:**
- | | | | | | |
|---------------|---|-------|--------------------------------|--|------------------------|
| — 290 — | CONTOUR (0.5m INTERVAL) | — — — | EXISTING TOP OF BANK | | PROPOSED TREE CORRIDOR |
| - - - | EXISTING APPROXIMATE ASBESTOS AREA | ~~~~~ | EXISTING OUTLINE OF VEGETATION | | BUILDINGS |
| — — — | EXISTING BOTTOM OF BANK | ⊕ | EXISTING BORE HOLE | | STOCKPILE AREAS |
| - - - | EXISTING BOUNDARY | FH | EXISTING GATE | | SEALED ROADS |
| — — — | EXISTING EDGE OF BITUMEN | PP | EXISTING HYDRANT | | UNSEALED ROADS |
| — — — | EXISTING EXISTING ACCESS TRACK CENTRELINE | TAP | EXISTING POWER POLE | | |
| - / - / - / - | EXISTING FENCE LINE | WMR | EXISTING SIGN POST | | |
| — ε — | EXISTING OVERHEAD POWERLINE | | EXISTING TAP | | |
| — — — | EXISTING STOCK PILES | | EXISTING WATER METER | | |



REV.	DATE	DFTD.	APPD.	DETAILS
A	07/03/18	AP	PPO	FOR REVIEW
B	04/04/18	AP	PPO	AMENDMENTS FROM COUNCIL REVIEW
C	18/07/18	AP	PPO	AMENDMENTS ON SEDIMENT BASIN
D	20/08/18	AP	PPO	AMENDMENTS ON LAYOUT
E	24/09/18	AP	PPO	WASTE OIL ADDED
F	04/10/18	AP	PPO	FINAL LANDFILL ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018	GW	12/03/2018
DESIGN	-	-	-
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL	-	-	-



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DARROOBALGIE LANDFILL EXTENSION

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154 PEISLEY STREET
P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6393 5000
Fx. (02) 6393 5050

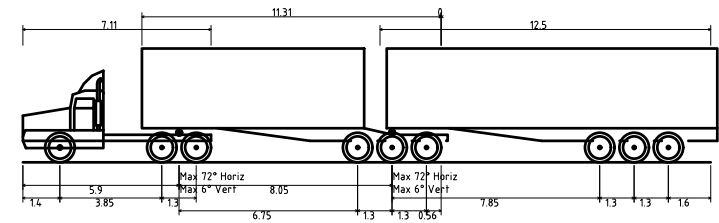
orange@geolyse.com
www.geolyse.com

DRAWING LANDFILL RECEIVAL AREA CONCEPT LAYOUT PLAN			
PROJECT NUMBER 213141	DRAWING FILE 213141_08F_C001-C008.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	SET
IMAGE SOURCE			08
STATUS FOR REVIEW	SHEET C003 OF C008		

- NOTES:**
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 - NATURAL CONTOUR INTERVAL 0.5m.
DESIGN CONTOUR INTERVAL 0.5m
 - DATUM IS ASSUMED
 - THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN.

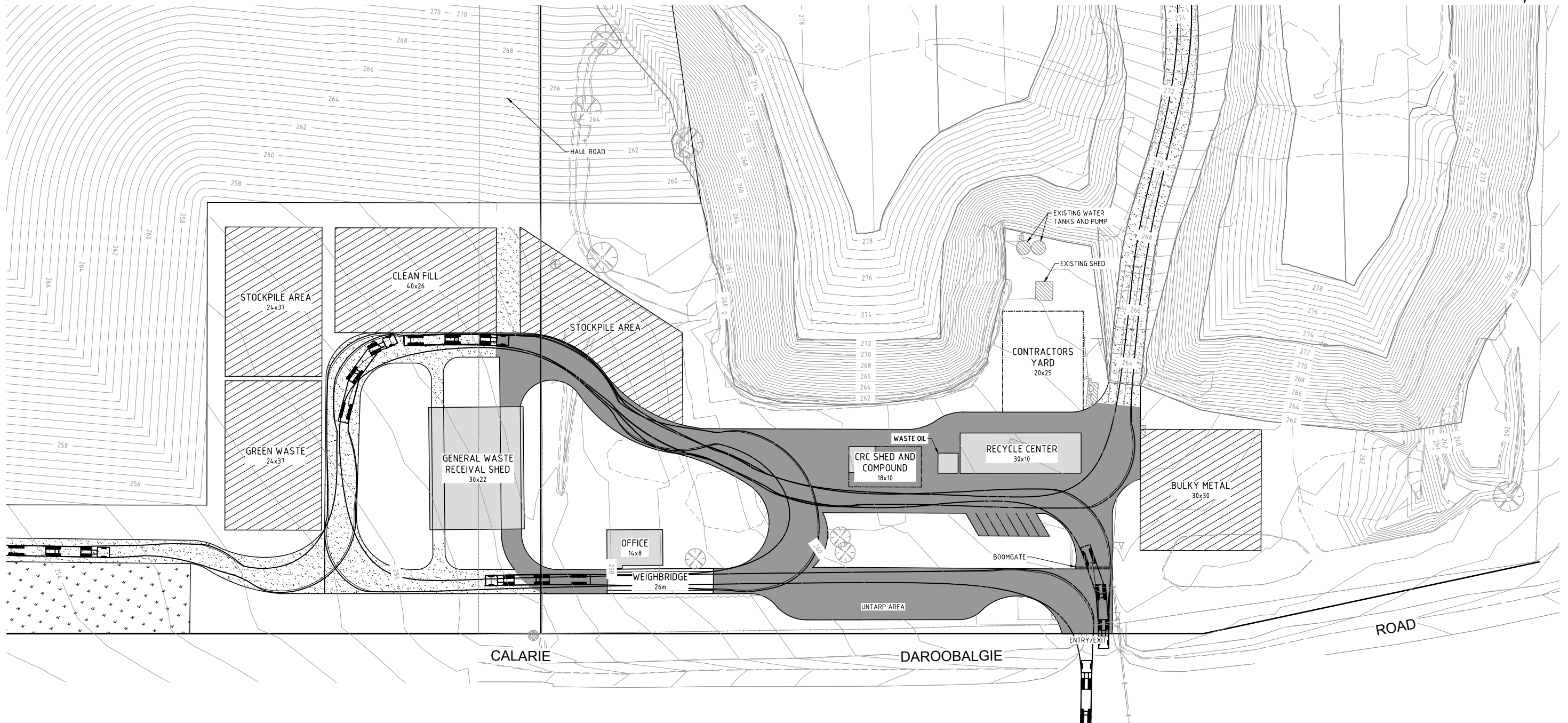
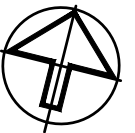
CONCEPT DESIGN
NOT FOR CONSTRUCTION

- LEGEND:**
- | | | | | | |
|-----------|---|-------|--------------------------------|--|------------------------|
| — 290 — | CONTOUR (0.5m INTERVAL) | — — — | EXISTING TOP OF BANK | | PROPOSED TREE CORRIDOR |
| - - - | EXISTING APPROXIMATE ASBESTOS AREA | ~ ~ ~ | EXISTING OUTLINE OF VEGETATION | | BUILDINGS |
| — — — | EXISTING BOTTOM OF BANK | ⊕ | EXISTING BORE HOLE | | STOCKPILE AREAS |
| - - - | EXISTING BOUNDARY | ⊕ | EXISTING GATE | | SEALED ROADS |
| — — — | EXISTING EDGE OF BITUMEN | FH | EXISTING HYDRANT | | UNSEALED ROADS |
| - - - | EXISTING EXISTING ACCESS TRACK CENTRELINE | PP | EXISTING POWER POLE | | |
| - / - / - | EXISTING FENCE LINE | TAP | EXISTING SIGN POST | | |
| — E — | EXISTING OVERHEAD POWERLINE | WMR | EXISTING TAP | | |
| — — — | EXISTING STOCK PILES | | EXISTING WATER METER | | |



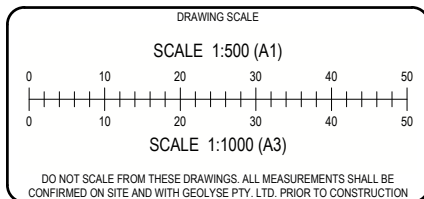
B-Double (26.0m)
Overall Length 26.000m
Overall Width 2.500m
Overall Body Height 4.300m
Min Body Ground Clearance 0.540m
Track Width 2.500m
Lock-to-lock time 6.00s
Curb to Curb Turning Radius 15.000m

AUSTROADS B-DOUBLE (26.0m) TYPICAL DETAIL
NOT TO SCALE



REV.	DATE	DFTD	APPD.	DETAILS
A	07/03/18	AP	PPO	FOR REVIEW
B	04/04/18	AP	PPO	AMENDMENTS FROM COUNCIL REVIEW
C	18/07/18	AP	PPO	AMENDMENTS ON SEDIMENT BASIN
D	20/08/18	AP	PPO	AMENDMENTS ON LAYOUT
E	24/09/18	AP	PPO	WASTE OIL ADDED
F	04/10/18	AP	PPO	FINAL LANDFILL ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018	GW	12/03/2018
DESIGN	-	-	-
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL	-	-	-



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

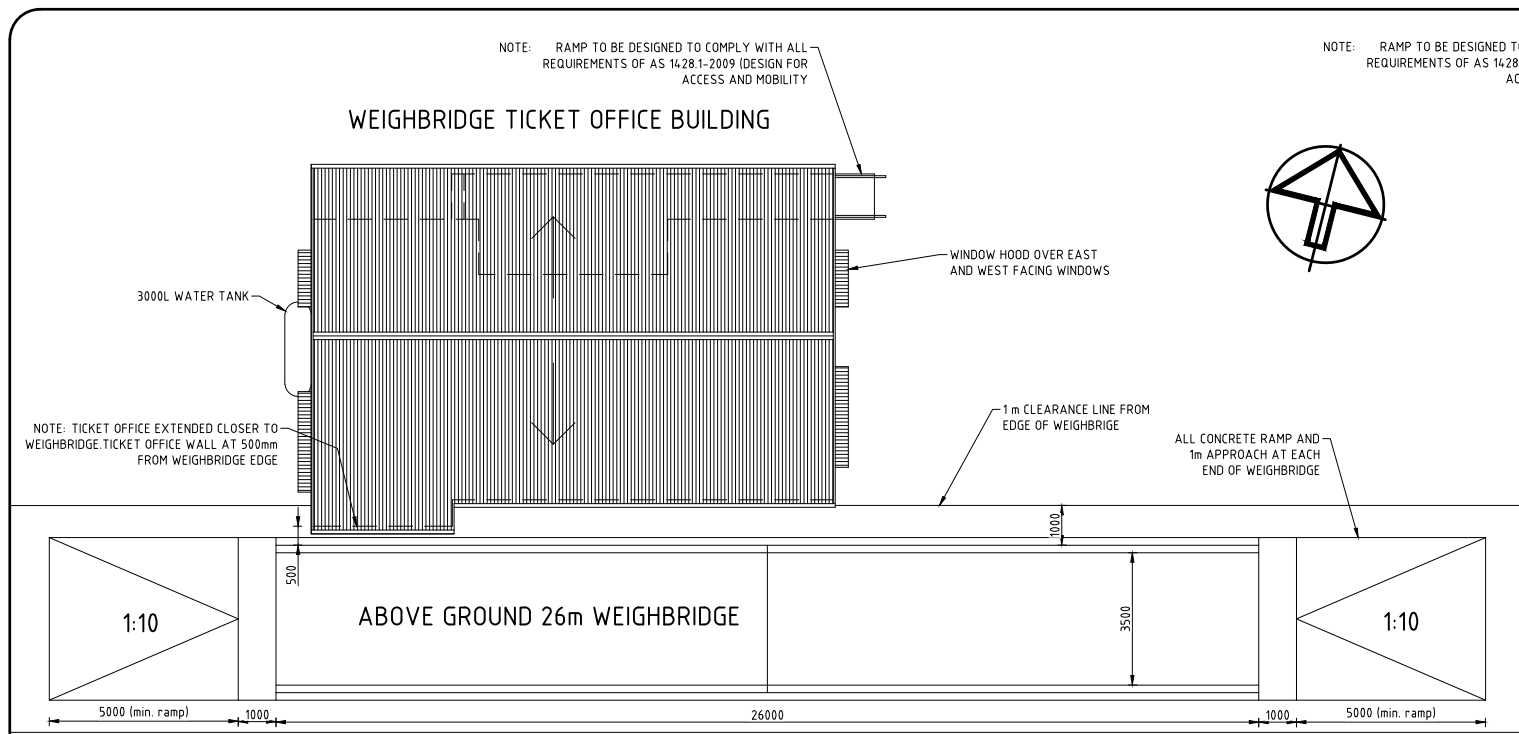
GEOLYSE

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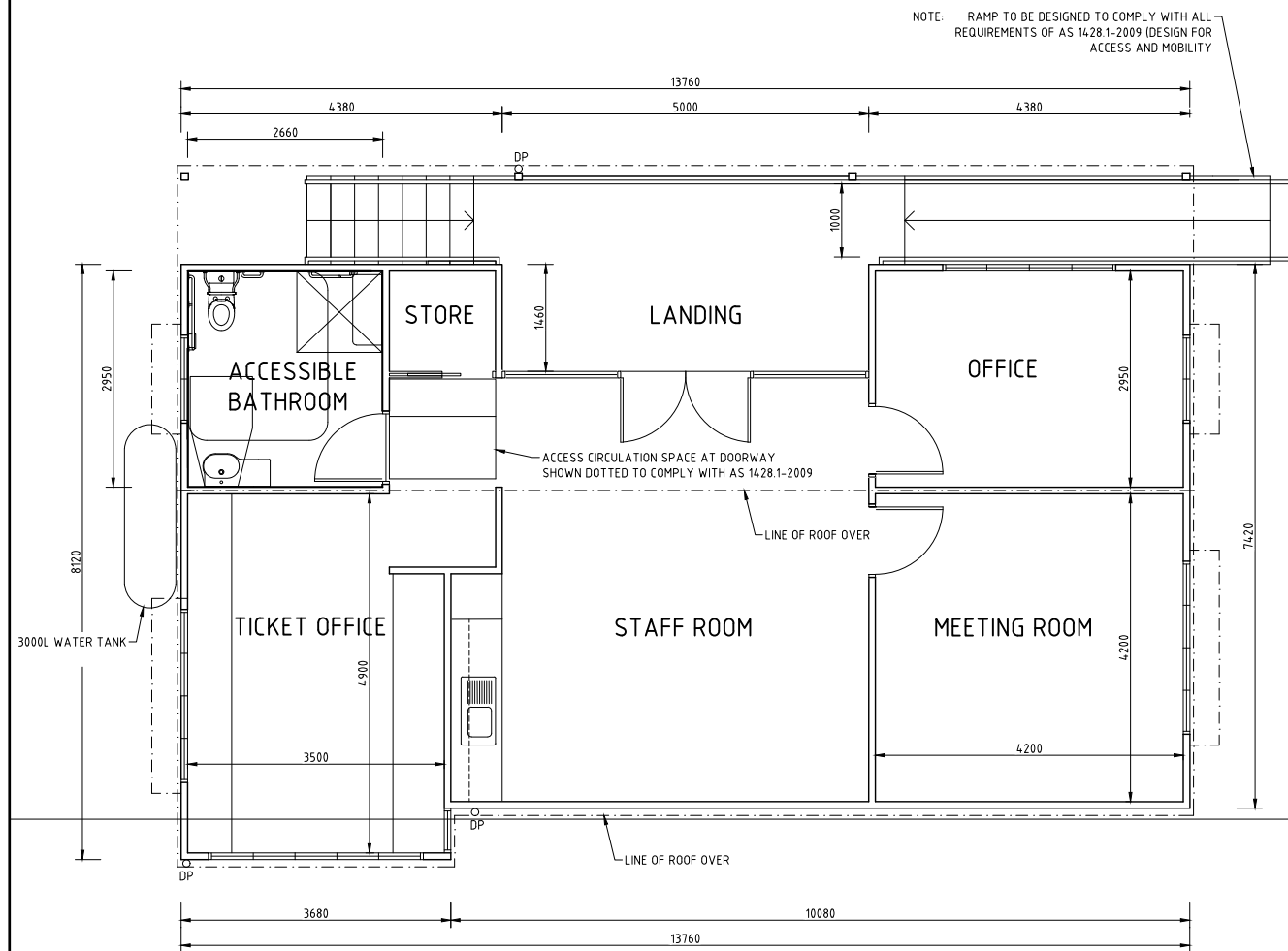
154 PEISLEY STREET
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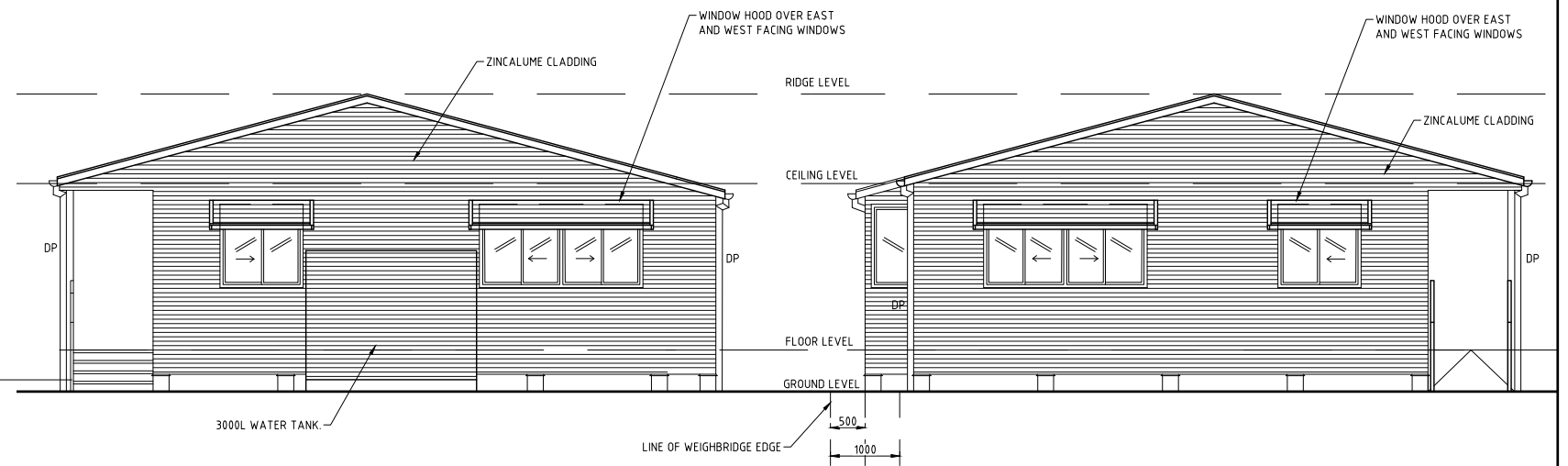
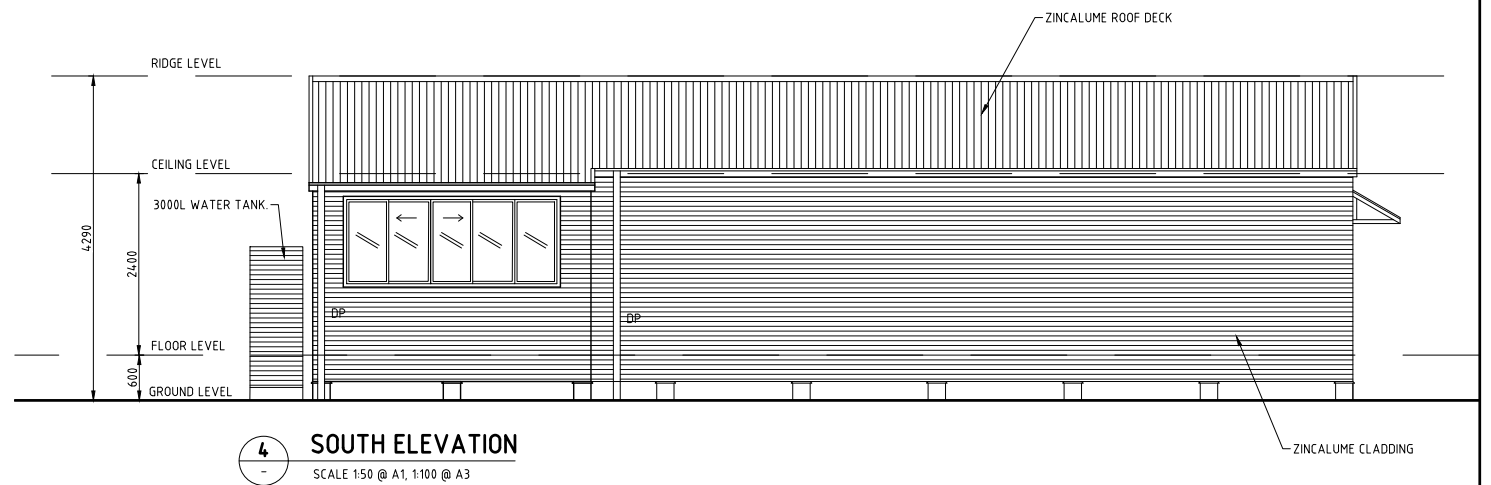
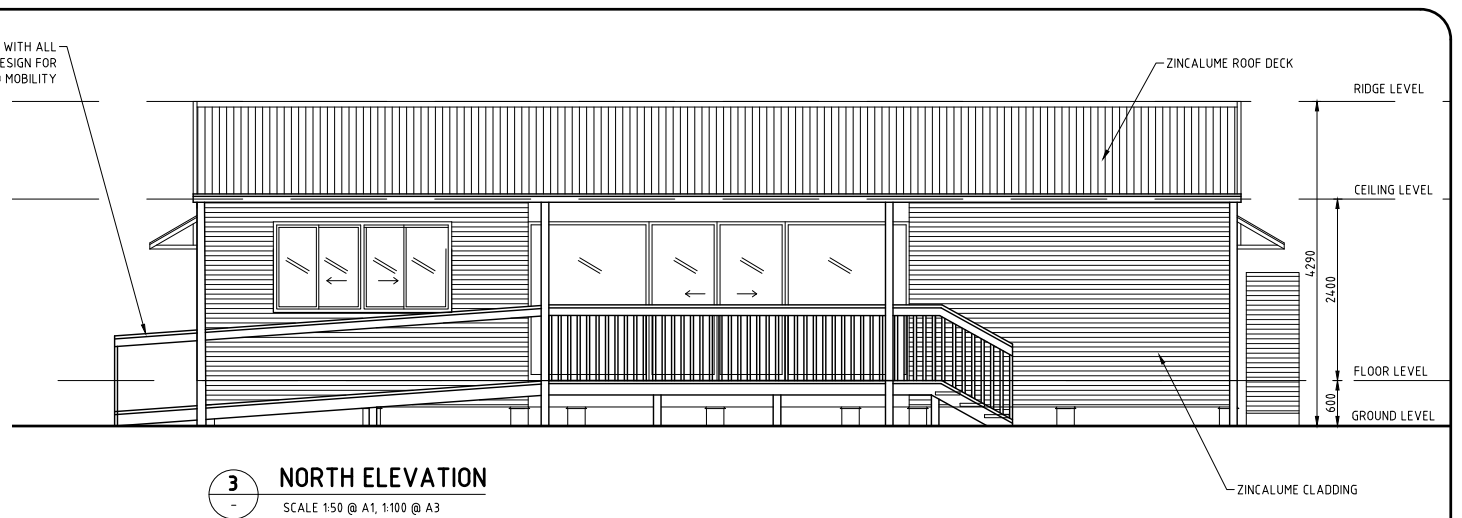
DRAWING			
LANDFILL RECEIVAL AREA CONCEPT LAYOUT TURNING PATHS			
PROJECT NUMBER 213141	DRAWING FILE 213141_08F_C001-C008.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	SET
IMAGE SOURCE			08
STATUS FOR REVIEW	SHEET C004 OF C008		



1 ROOF PLAN
SCALE 1:100 @ A1, 1:50 @ A3



2 FLOOR PLAN
SCALE 1:50 @ A1, 1:100 @ A3




REV.	DATE	DFTD	APPD.	DETAILS
A	07/03/18	AP	PPO	FOR REVIEW
B	04/04/18	AP	PPO	AMENDMENTS FROM COUNCIL REVIEW
C	18/07/18	AP	PPO	AMENDMENTS ON SEDIMENT BASIN
D	20/08/18	AP	PPO	AMENDMENTS ON LAYOUT
E	24/09/18	AP	PPO	WASTE OIL ADDED
F	04/10/18	AP	PPO	FINAL LANDFILL ADDED

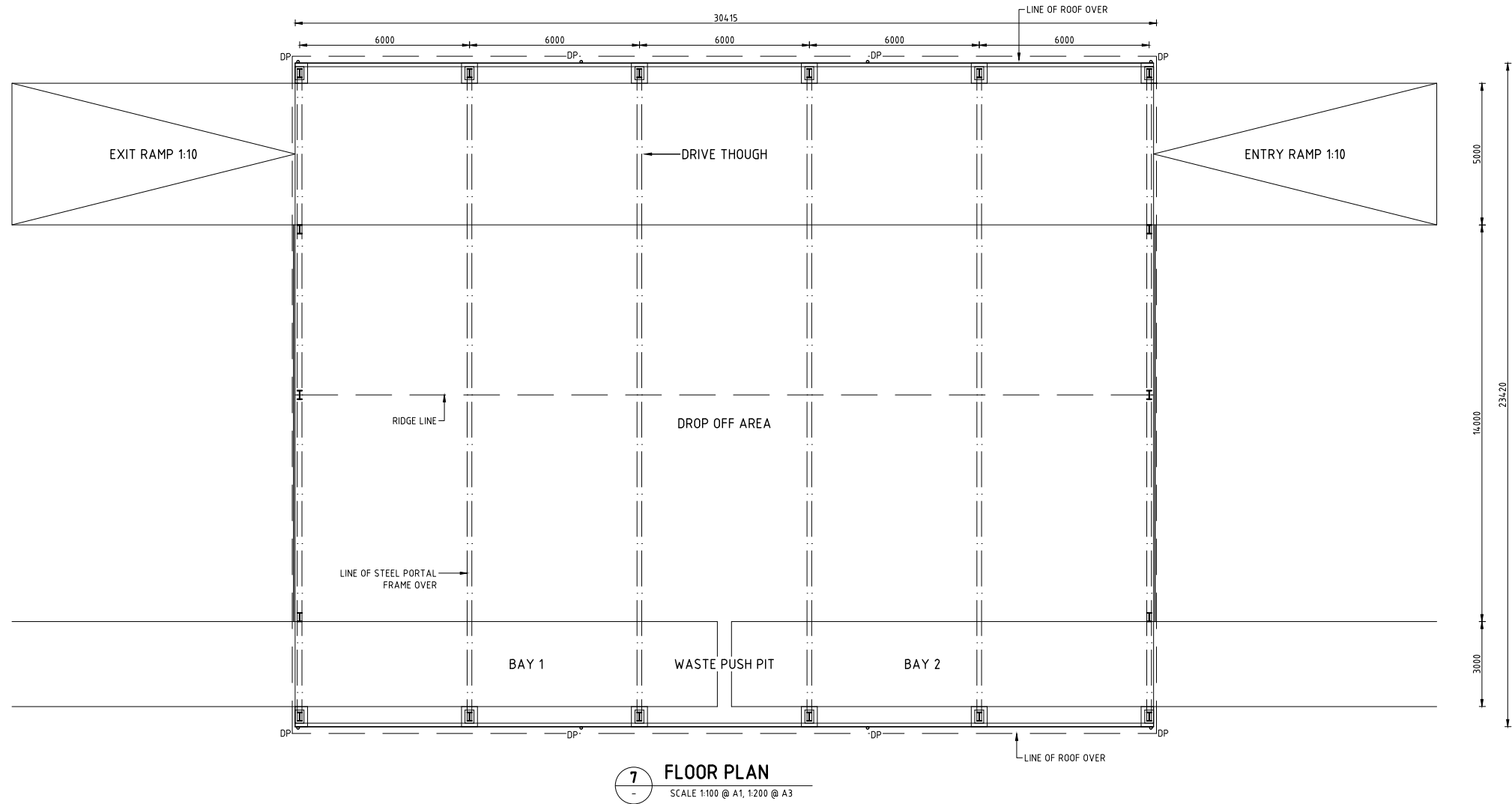
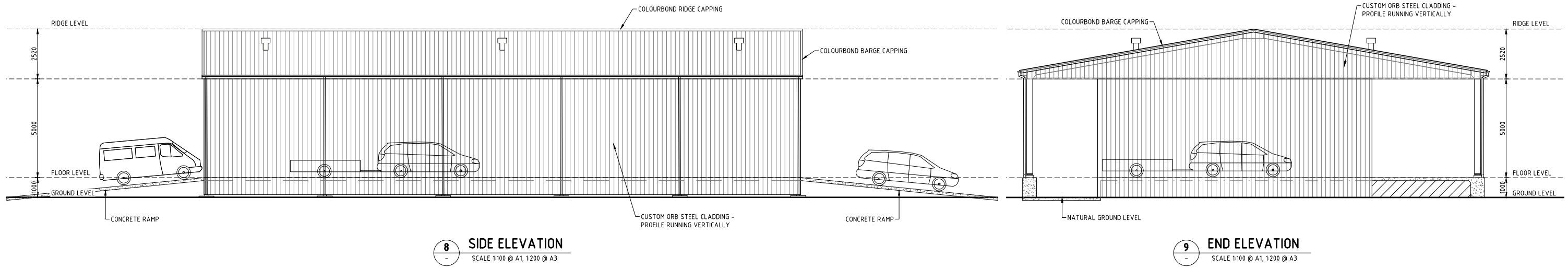
	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018	GW	12/03/2018
DESIGN	-	-	-
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL	-	-	-

DRAWING SCALE
REFER TO INDIVIDUAL DRAWING/SECTION SCALES
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APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

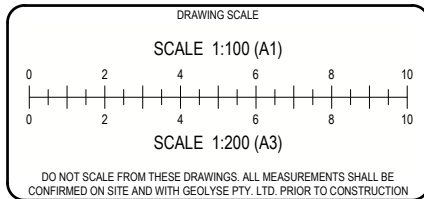
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ORANGE		
orange@geolyse.com www.geolyse.com		

DRAWING			
OFFICE PLAN AND ELEVATIONS			
PROJECT NUMBER 213141	DRAWING FILE 213141_08F_C001-C008.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	
IMAGE SOURCE -	STATUS FOR REVIEW		
SHEET C005 OF C008		08	



REV.	DATE	DFTD.	APPD.	DETAILS
A	07/03/18	AP	PPO	FOR REVIEW
B	04/04/18	AP	PPO	AMENDMENTS FROM COUNCIL REVIEW
C	18/07/18	AP	PPO	AMENDMENTS ON SEDIMENT BASIN
D	20/08/18	AP	PPO	AMENDMENTS ON LAYOUT
E	24/09/18	AP	PPO	WASTE OIL ADDED
F	04/10/18	AP	PPO	FINAL LANDFILL ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018	GW	12/03/2018
DESIGN	-	-	-
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-



APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

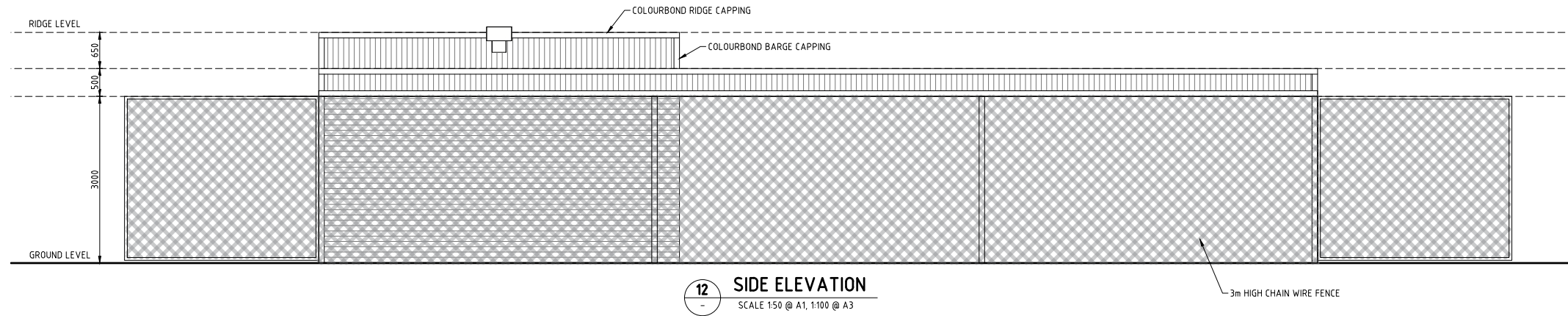
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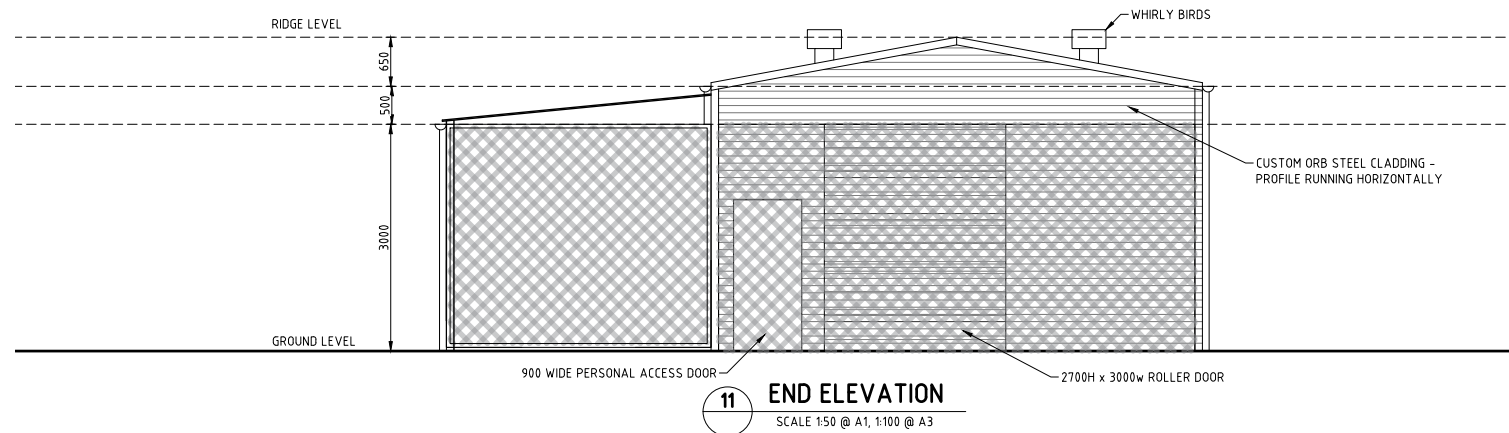
154 PEISLEY STREET
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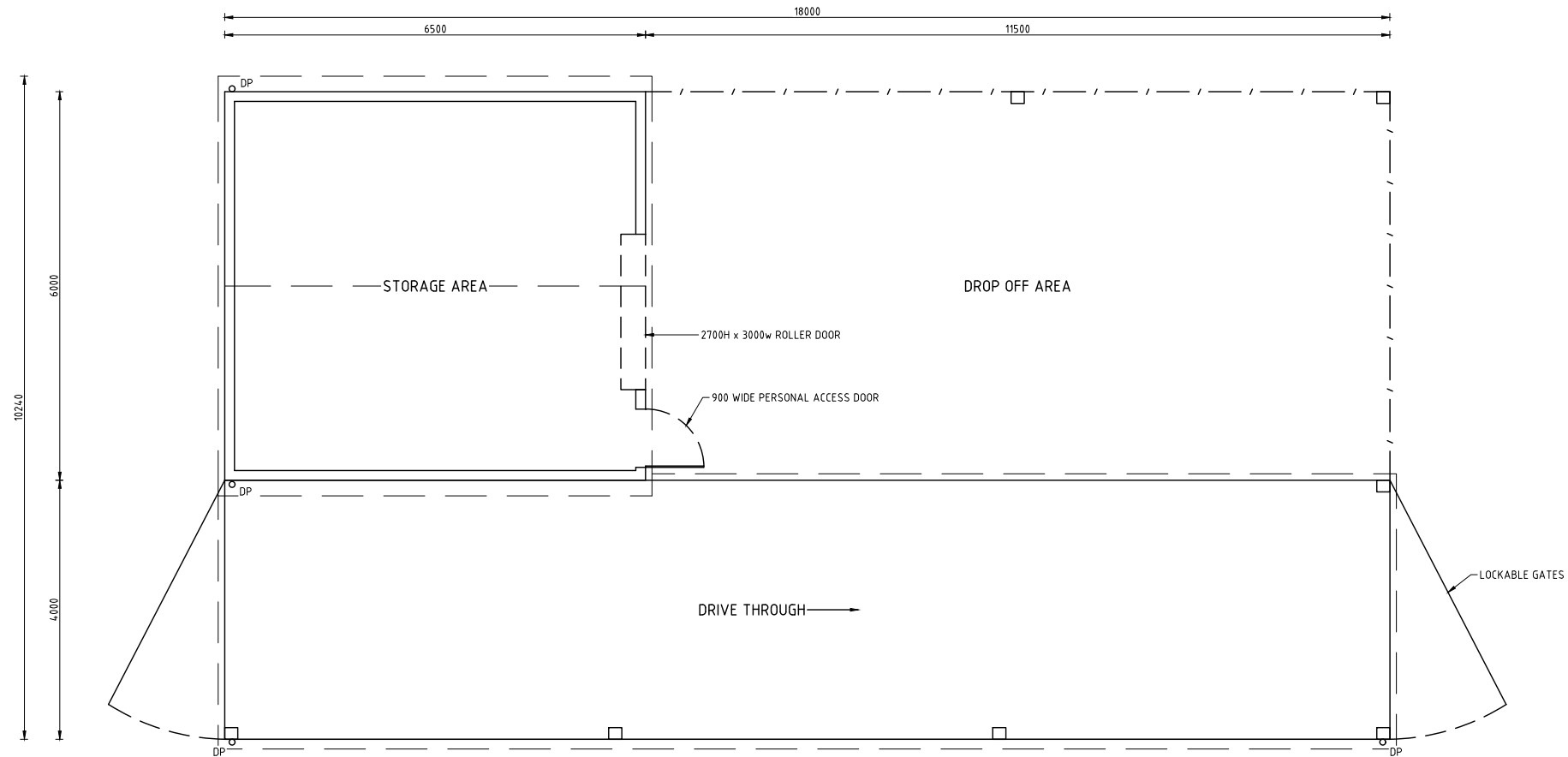
DRAWING			
GENERAL WASTE RECEIVAL SHED			
PROJECT NUMBER	213141	DRAWING FILE	213141_08F_C001-C008.dwg
SURVEY MARK	-	R.L.	-
IMAGE SOURCE	-	DATUM	A.H.D.
STATUS	FOR REVIEW	SHEET	C006 OF C008
SET	08	ORIGINAL	A1



12 SIDE ELEVATION
SCALE 1:50 @ A1, 1:100 @ A3



11 END ELEVATION
SCALE 1:50 @ A1, 1:100 @ A3




10 FLOOR PLAN
SCALE 1:50 @ A1, 1:100 @ A3

REV.	DATE	DFTD.	APPD.	DETAILS
A	07/03/18	AP	PPO	FOR REVIEW
B	04/04/18	AP	PPO	AMENDMENTS FROM COUNCIL REVIEW
C	18/07/18	AP	PPO	AMENDMENTS ON SEDIMENT BASIN
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	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018	GW	12/03/2018
DESIGN	-	-	-
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-

DRAWING SCALE
REFER TO INDIVIDUAL DRAWING/SECTION SCALES
DO NOT SCALE FROM THESE DRAWINGS. ALL MEASUREMENTS SHALL BE CONFIRMED ON SITE AND WITH GEOLYSE PTY. LTD. PRIOR TO CONSTRUCTION

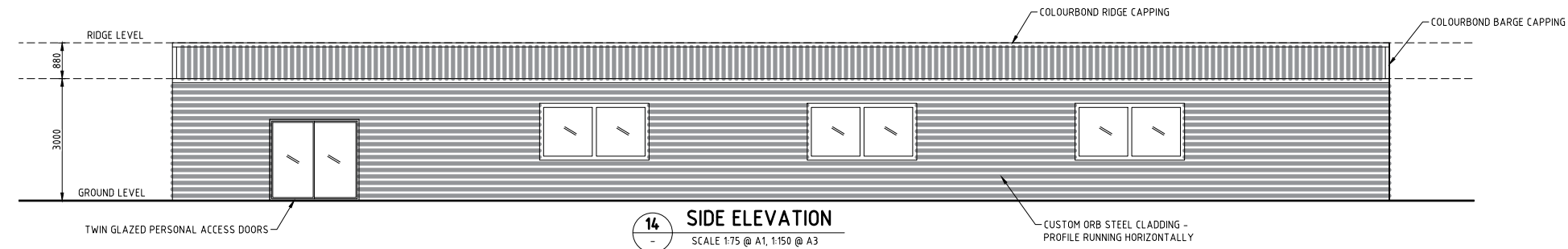
APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

**GEOLYSE**
ORANGE

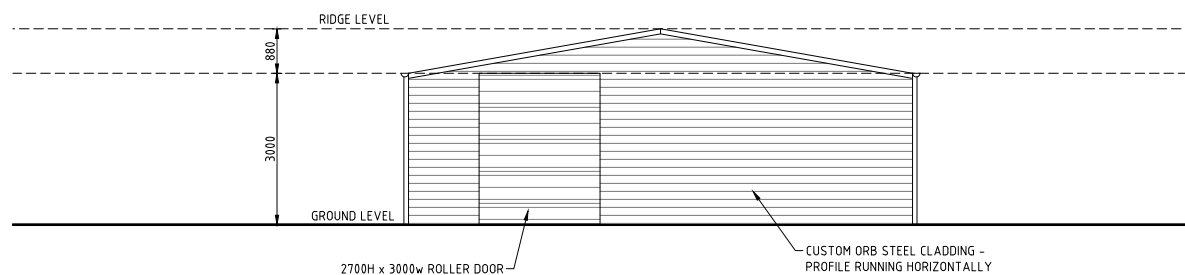
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www.geolyse.com

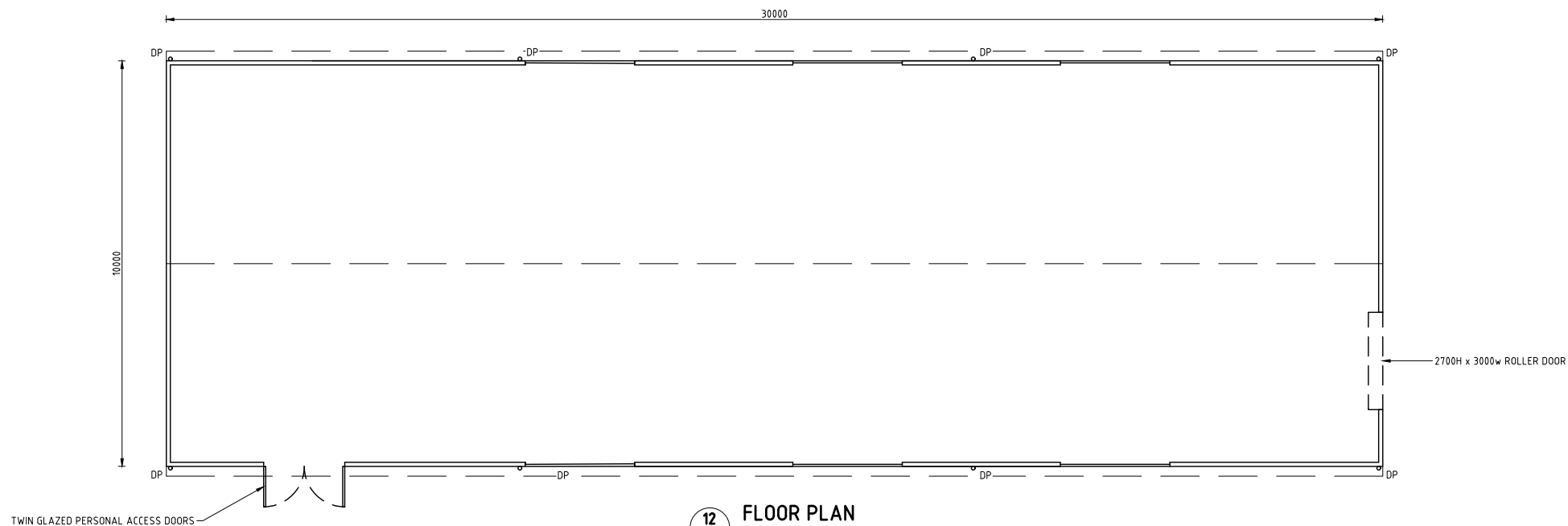
DRAWING			
CRC SHED PLAN AND ELEVATIONS			
PROJECT NUMBER	213141	DRAWING FILE	213141_08F_C001-C008.dwg
SURVEY MARK	-	R.L.	-
IMAGE SOURCE	-	DATUM	A.H.D.
STATUS	FOR REVIEW	SHEET	C007 OF C008
ORIGINAL	A1	SET	08



14 SIDE ELEVATION
SCALE 1:75 @ A1, 1:150 @ A3



13 END ELEVATION
SCALE 1:75 @ A1, 1:150 @ A3



12 FLOOR PLAN
SCALE 1:75 @ A1, 1:150 @ A3

REV.	DATE	DFTD.	APPD.	DETAILS
A	07/03/18	AP	PPO	FOR REVIEW
B	04/04/18	AP	PPO	AMENDMENTS FROM COUNCIL REVIEW
C	18/07/18	AP	PPO	AMENDMENTS ON SEDIMENT BASIN
D	20/08/18	AP	PPO	AMENDMENTS ON LAYOUT
E	24/09/18	AP	PPO	WASTE OIL ADDED
F	04/10/18	AP	PPO	FINAL LANDFILL ADDED

	FILE	INITIALS	DATE
SURVEY	213141 SURVEY MARCH 2018	GW	12/03/2018
DESIGN	-	-	-
DRAINS/ HEC-RAS MODELLING	-	-	-
ENGINEERING/ SURVEYING APPROVAL		-	-

DRAWING SCALE
REFER TO INDIVIDUAL DRAWING/SECTION SCALES
DO NOT SCALE FROM THESE DRAWINGS. ALL MEASUREMENTS SHALL BE CONFIRMED ON SITE AND WITH GEOLYSE PTY. LTD. PRIOR TO CONSTRUCTION

APPROVAL AUTHORITY	FORBES SHIRE COUNCIL
CLIENT	FORBES SHIRE COUNCIL
PROJECT	DAROOBALGIE LANDFILL EXTENSION

**GEOLYSE**
ORANGE

154 PEISLEY STREET
P.O. BOX 1963
ORANGE, NSW 2800
Ph. (02) 6393 5000
Fx. (02) 6393 5050
orange@geolyse.com
www.geolyse.com

DRAWING RECYCLE CENTER PLAN AND ELEVATIONS			
PROJECT NUMBER 213141	DRAWING FILE 213141_08F_C001-C008.dwg	ORIGINAL	A1
SURVEY MARK -	R.L. -	DATUM A.H.D.	
IMAGE SOURCE -	STATUS FOR REVIEW		
SHEET C008 OF C008		SET 08	

Appendix C

BIODIVERSITY ASSESSMENT

Daroobalgie Waste Depot Expansion

Ecological Assessment

Prepared for Geolyse Pty Ltd | 17 August 2018

Suite 6, Level 1, 146 Hunter Street
Newcastle NSW 2300

T +61 (0)2 4907 4800

F +61 (0)2 4926 1312

E info@emmconsulting.com.au

www.emmconsulting.com.au

Daroobalgie Waste Depot Expansion

Draft Report

Report H180112RP3 | Prepared for Geolyse Pty Ltd | 17 August 2018

Prepared by	Erin Lowe	Approved by	Nathan Garvey
Position	Senior Ecologist	Position	Associate Ecologist
Signature		Signature	
Date	17/08/2018	Date	17/08/2018

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at the time and under the conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

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Document Control

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3	17/08/2018	Erin Lowe	Nathan Garvey



T +61 (0)2 4907 4800 | F +61 (0)2 4926 1312

Suite 6, | Level 1, | 146 Hunter Street | Newcastle | New South Wales | 2300 | Australia

www.emmconsulting.com.au

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1 Introduction

1.1 Project background

Forbes Shire Council (Council) currently owns and operates the Daroobalgie Waste Depot (DWD) which is located at Daroobalgie, north east of Forbes (Figure 1.1). The DWD is now at capacity; therefore Council has been looking at options for its expansion and has acquired land to the west of the existing DWD for the proposed expansion (the study area) as shown on Figure 1.2.

Geolyse Pty Ltd (Geolyse) has commissioned EMM Consulting Pty Ltd (EMM) to assess the ecological impacts of the proposed DWD expansion (the project).

1.2 Development proposal

Council holds EPA licence 6118 from the NSW Environmental Protection Agency (EPA), and undertakes scheduled activities Waste Disposal (application to land) and Waste Storage at the existing DWD. The DWD is licensed to accept liquid waste (from Forbes Local Government Area (LGA)), general solid waste, including both putrescible and non-putrescible, and building and demolition wastes.

The DWD has reached capacity and cannot be expanded any further within its boundaries and therefore has triggered the requirement to expand the landfill.

Council has undertaken a lengthy process in considering all available options for the expansion of the DWD, including use of Council and Crown land to the east and north. Consideration of the impacts arising from a northwards and eastwards expansion, particularly impacts to biodiversity, has led Council to a preferred option for the expansion. The preferred option is to expand onto the adjoining site, with the project shown on Figure 1.2. The project adjoins the western boundary of the existing site and can be accessed from Daroobalgie Road. The design of the project has been refined based on environmental constraints identification with the object of avoiding or minimising environmental impacts, as discussed further in Section 5.

1.3 Site description

The project is located approximately 9.5 km north-east of the township of Forbes in the Forbes Shire Council LGA, within the Lachlan catchment (refer to Figure 1.1).

The existing DWD has an area of approximately 5.7 hectares (ha), is zoned RU1 Primary Production under the Forbes Local Environmental Plan 2013 (Forbes LEP) and is located on the northern side of Daroobalgie Road. The DWD has been operating since 1983, receiving municipal waste from Forbes and the surrounding district. The DWD currently consists of extensive fill, internal roads and associated buildings and operates in accordance with the *Daroobalgie Waste Depot Landfill Environmental Management Plan* (EMP) (Geolyse 2016). Operating hours at the current DWD are between 8.30 am and 5.00 pm, seven days a week.

The study area consists of the following lots:

- Part Lot 7008 in Deposited Plan (DP) 1020396 (within the existing DWD); and
- Part Lot 1 in DP120710 and Part Lot 1472 in DP750158 (land west of the existing DWD).

The land directly west of the existing DWD is also zoned RU1 Primary Production under the Forbes LEP and is freehold agricultural land that has been used for grazing and agricultural activities. This area contains a very thin strip of White Cypress Pine (*Callitris glaucophylla*) and Grey Box (*Eucalyptus microcarpa*) with a mid and understorey comprising a mix of native and exotic species, between the existing DWD and the agricultural land to the west, and very widely scattered paddock trees with a completely cleared mid-storey and ground layer to facilitate crop production across the majority of the study area.

1.4 Purpose of this report

This ecological assessment forms part of the development application (DA) and accompanies the Statement of Environmental Effect (SEE) for the project, which will be assessed and determined under Division 4.3 Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) by Council.

This ecological assessment was undertaken by EMM to consider the impacts of the project, specifically to:

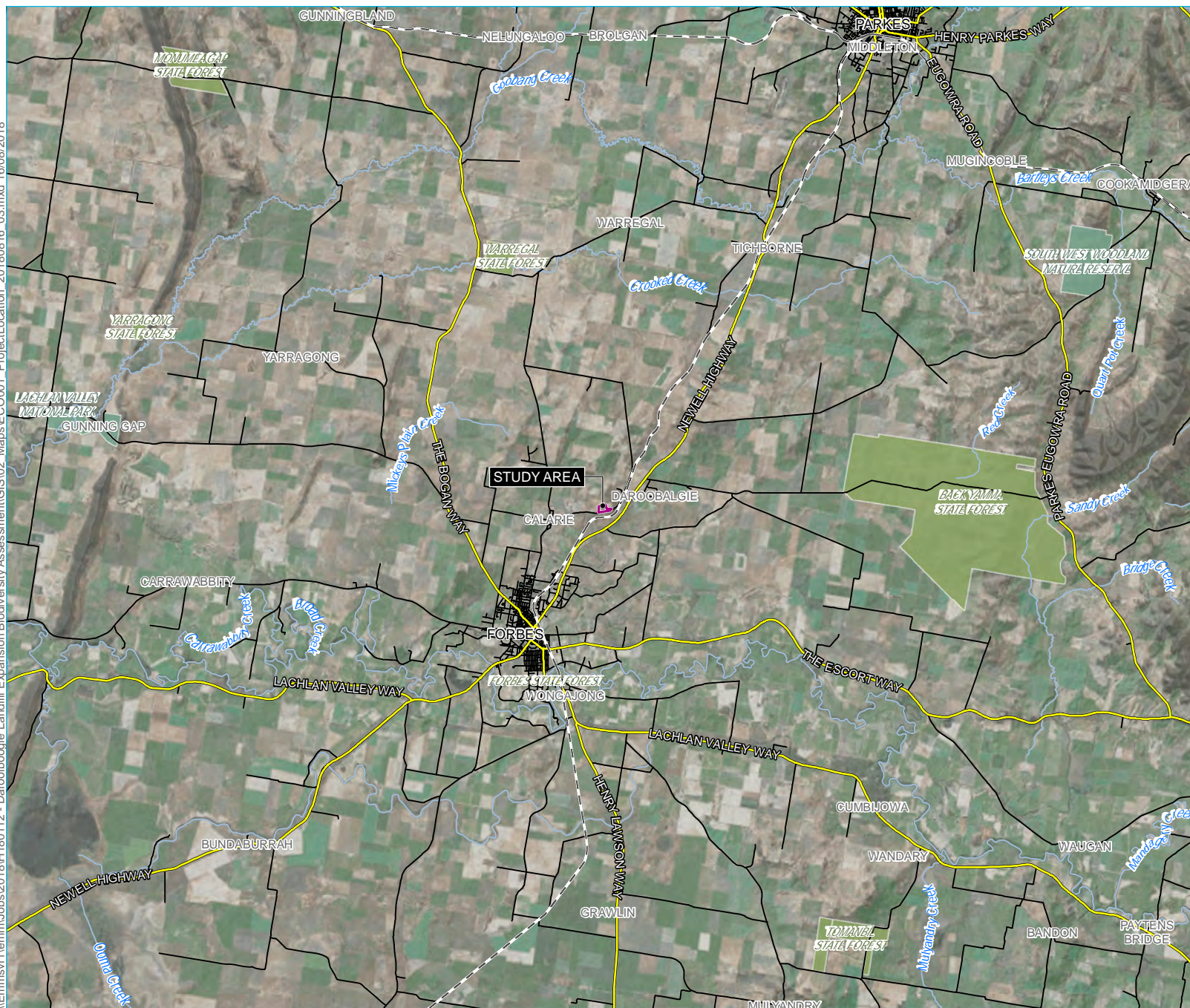
- assess the characteristics and ecological condition of the vegetation communities and habitat within the study area;
- determine occurrence, or likelihood of occurrence, of threatened species, populations and threatened ecological communities (TECs) listed under the *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- describe and quantify impacts on biodiversity resulting from the proposal; and
- provide recommendations to avoid, minimise and mitigate potential impacts of the project on biodiversity.

1.5 Legislative requirements

The project has been assessed against the key biodiversity legislation and government policy, including:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- *Environmental Planning and Assessment Act 1979* (EP&A Act);
- *Biodiversity Conservation Act 2017* (BC Act);
- *Fisheries Management Act 1994* (FM Act), and
- *Biosecurity Act 2015* (BS Act).

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- KEY**
- Study area
 - Rail line
 - Main road
 - Local road
 - Watercourse / drainage line
 - NPWS reserve
 - State forest

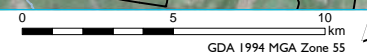
Project location

Daroobalgie Landfill expansion
Ecological assessment

Figure 1.1



Source: EMM (2018); Geolyse (2018); DFSI (2017); GA (2015)



2 Legislative context

This chapter provides a brief outline of the key biodiversity legislation and government policy considered in this assessment.

2.1 Commonwealth

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as Matters of National Environmental Significance (MNES) under the EPBC Act. These are:

- world heritage properties;
- places listed on the National Heritage Register;
- Ramsar wetlands of international significance;
- threatened flora and fauna species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining); and
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that may potentially have a significant impact on a MNES is to be referred to DoEE for determination as to whether or not it is a controlled action. If deemed a controlled action the project is assessed under the EPBC Act for approval.

The project is unlikely to have a significant impact on MNES and is, therefore, not required to be referred to DoEE for approval. Further information is provided in Section 6.1 of this report.

2.2 State

2.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act was enacted to encourage the consideration and management of impacts of proposed development or land-use changes on the environment and the community. The EP&A Act is administered by the NSW Department of Planning and Environment (DPE).

The EP&A Act provides the overarching structure for planning in NSW; however, is supported by other statutory environmental planning instruments. Sections of the EP&A Act of primary relevance to the natural environment and this project are outlined further below.

i State Environmental Planning Policies (Part 3 Division 3.3)

State Environmental Planning Policies (SEPPs) outline policy objectives relevant to state wide issues. The SEPP relevant to the current development is *SEPP No. 44 Koala Habitat Protection*.

SEPP 44 aims to encourage the conservation and management of natural vegetation areas that provide habitat for koalas to ensure permanent free-living populations will be maintained over their present range and to reverse the current trend of koala-population decline. It applies to areas of native vegetation greater than one hectare and in Councils listed in Schedule 1 of SEPP 44. The development site is located in Forbes Shire Council LGA, which is listed in Schedule 1, therefore Koala habitat has been considered within this assessment.

Further consideration of SEPP 44 is provided in Section 6.2.1 of this report.

2.2.2 Biodiversity Conservation Act 2016

In August 2017, the BC Act commenced operation and changed the way impacts to biodiversity are assessed and offset in NSW, with application of the Biodiversity Offsets Scheme (BOS) required for any projects exceeding certain clearing thresholds outlined in the Biodiversity Conservation Regulation 2017 (BC Regulation). The thresholds are:

- the proposed development exceeds the BOS threshold, as set out in clause 7.2 of the BC Regulation;
- the proposed development will clear native vegetation on land included on the Biodiversity Values Map; and
- for proposals that do not trigger the above thresholds, whether the proposed action will have a significant impact upon threatened species or TECs (the 5-part Test).

The project does not trigger the thresholds outlined in the BC Regulation and is therefore not required to be assessed under the BOS. Further details are provided in Section 6.3 of this report.

2.2.3 Fisheries Management Act 2015

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened species, populations and communities, and critical habitats listed under the FM Act must be assessed through the Assessment of Significance process under Section 220ZZ of the FM Act.

Two key objectives of the FM Act are to conserve fish stocks and key fish habitats, and conserve threatened species, populations and ecological communities of fish and marine vegetation. When reviewing applications, the Department of Primary Industries (DPI) will assess the likelihood of impacts to waterways in relation to their sensitivity (TYPE) and waterway class (CLASS).

The entire project is located within the catchment of the Lachlan River. A tributary of Lake Forbes and the Lachlan River, approximately 1.4 km to the south of the study area, is mapped as Key Fish Habitat by DPI. However, no impacts to any drainage lines that drain into this identified waterway will result from the project and no further consideration of the FM Act is required.

2.2.4 Biosecurity Act 2015

The primary objective of the Biosecurity Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

The Biosecurity Act stipulates management arrangements for weed biosecurity risks in NSW, with the aim to prevent, eliminate and minimise risks. Management arrangements include:

- any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about;
- applies to all land within NSW and all waters within the limits of the state; and
- local strategic weed management plans will provide guidance on the outcomes expected to discharge duty for the weeds in that plan.

The Biosecurity Regulation 2017 (BS Regulation) sets out mandatory measures to prevent, eliminate or minimise a biosecurity risk posed or likely to be posed by biosecurity matter.

The *Central West Strategic Weed Management Plan* (CWLLS 2017) outlines how government, industry, and the community will share responsibility and work together to identify, minimise, respond to and manage weeds. The plan also supports regional implementation of the Biosecurity Act and BS Regulation.

Further consideration of weeds within the study area and in relation to the Biosecurity Act and BS Regulation is given in Sections 4.2.2 and 6.4 of this report.

3 Methods

3.1 Desktop review

3.1.1 Database searches

In order to provide context for the study area, information about flora and fauna species, populations, communities and habitats from within 20 km of the study area (the locality) was obtained from the following databases:

- Office of Environment and Heritage (OEH) BioNet Atlas of NSW Wildlife (Bionet) for previous threatened species records (search undertaken 19 April 2018);
- Commonwealth Department of Environment and Energy (DoEE) *Protected Matters Search Tool* (PMST) for MNES, including threatened species likely to occur within the study area (search undertaken 19 April 2018) (refer to Appendix A for the full report); and
- NSW Plant Community Types (PCTs), as held within the Vegetation Information System (VIS) Classification 2.1 database.

A 20 km search radius was used (as opposed to 5 km or 10 km radius) in order to obtain a suitable and representative species list for habitat assessment of the study area, as areas of western NSW tend to be undersampled resulting in fewer species records compared to more coastal areas of the state.

3.1.2 Spatial data

Spatial data encompassing the study area was provided by Geolyse. Base map data was obtained from Department of Finance, Services and Innovation (DFS) NSW databases, with cadastral data obtained from DFSI digital cadastral database. Mapping for stream orders was obtained from DPI (2013).

The following spatial datasets were utilised during the development of this report:

- State Vegetation Type Map: Central West / Lachlan Region Version 1.3. VIS_ID 4468 (OEH 2016a);
- Mitchell Landscapes Version V3.1 (OEH 2016b);
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7 (DoEE 2016); and
- Directory of important wetlands (DoEE 2010).

3.1.3 Previous local studies

One ecological study has been previously completed adjacent to the DWD, being the *Ecological constraints assessment – proposed Daroobalgie Landfill expansion* (DPM 2015). This report considered the potential impacts of a northwards and eastwards expansion of the DWD, but did not assess the current study area.

This assessment included a desktop analysis, undertaken for a 10 km radius of the project area, followed by a survey between the 5 and 8 of December 2015 that included:

- stratification, rapid assessment and comprehensive plot assessment to identify plant community types (PCTs);
- fauna habitat assessment;
- diurnal bird surveys;
- diurnal searches for mammal tracks, scats and other traces;
- deployment of a baited camera trap;
- deployment of an ultrasonic bat detector; and
- opportunistic records of fauna.

3.2 Field survey

The field survey was undertaken by Senior Ecologist Erin Lowe on Wednesday 2 May 2018. Given the highly disturbed nature of the study area, the field surveys were targeted at identifying constraints, including species and communities listed under the BC Act and the EPBC Act in the study area. Field surveys included detailed mapping of vegetation, floristic assessment and a largely habitat based fauna assessment.

3.2.1 Flora and vegetation

Vegetation structure and dominant flora species were recorded within the study area. Notes were taken describing any disturbances (such as weed invasion and human disturbance) to assess the vegetation condition. Dominant species in each vegetation layer (ground, shrub and canopy) were recorded to identify vegetation communities, particularly that representative of TECs, and to identify potential habitat for threatened flora species. Random meander searches were conducted through the native vegetation in the study area to target threatened flora species.

Vegetation mapping undertaken during the site assessment was conducted using a hand-held GPS unit (GDA94), mobile tablet computer and aerial photo interpretation. Mapping has been produced using a Geographic Information System (GIS; ArcGIS 10.5). PCTs were identified and then stratified into vegetation zones based on broad condition state, in accordance with the Biodiversity Assessment Method (BAM, OEH 2017).

Following the mapping of vegetation zones within the study area, native vegetation integrity was assessed using data obtained via plots, as per the methodology outlined in Section 5 of the BAM (OEH 2017). Plot data collection included:

- one 20 x 20 m plot, for assessment of composition and structure; and
- one 20 x 50 m plots for assessment of function, including a series of five 1 x 1 m plots to assess average leaf litter cover.

The assessment of composition and structure, based on a 20 x 20 m plot, recorded species name, stratum, growth form, cover and abundance rating for each species present within the plot. Cover (foliage cover) was estimated for all species rooted in or overhanging the plot, and recorded using decimals (if less than 1%, rounded to whole number (1-5%) or estimated to the nearest 5% (5- 100%).

Abundance was counted (up to 20) and estimated above 20, and recorded using the following intervals: 1, 2, 3, 4, 5, 10, 20, 50, 100, 500 and 1000.

The assessment of function recorded the number of large trees, tree stem size class, tree regeneration, number of trees with hollows and length of fallen logs, as well as leaf litter cover within the 20 x 50 m plot and 1 x 1 m subplots.

3.2.2 Fauna

Due to the degraded nature of the study area, and limited fauna habitat, the fauna survey included a habitat assessment. Any evidence of fauna such as tracks, scats, scratches on and around trees, and any potential fauna habitat features were also noted, including:

- the presence of nesting/sheltering/basking sites such as tree hollows, litter, fallen timber and logs and rocks;
- the cover/abundance of ground, shrub and canopy layers;
- drainage and the presence of freshwater habitats noting their permanency;
- connectivity to adjacent areas of habitat;
- the extent and nature of previous disturbances, including the presence of fire scars and dieback;
- vegetation assemblage and structure;
- soil type and topography; and
- habitat surveys for Koala habitat and feed trees, including opportunistic surveys for individuals and scats (faeces).

Targeted fauna surveys were not undertaken and fauna species were recorded opportunistically as they were encountered during the field survey.

4 Results

4.1 Desktop review

4.1.1 Database searches

The PMST tool identified the following MNES which may occur within, or in the vicinity of the study area (refer to Appendix A):

- four wetlands of international importance;
- three threatened ecological communities;
- 21 listed threatened species; and
- 11 listed migratory species.

The BioNet search identified that one threatened plant species have been recorded within the locality (Figure 4.1). The search also identified a total of 34 threatened fauna species that have been recorded within the locality, consisting of two mammals, one reptile and 31 birds (Figure 4.1). No species have been recorded within the study area, although the Grey-crowned Babbler has been recorded immediately to the east of the existing DWD.

Appendix B provides a likelihood of occurrence assessment of those threatened species recorded within the locality.

4.1.2 Regional vegetation mapping

State Vegetation Type Map: Central West / Lachlan Region Version 1.3. VIS_ID 4468 (OEH 2016) maps the following PCTs within or adjacent to the study area (Figure 4.2):

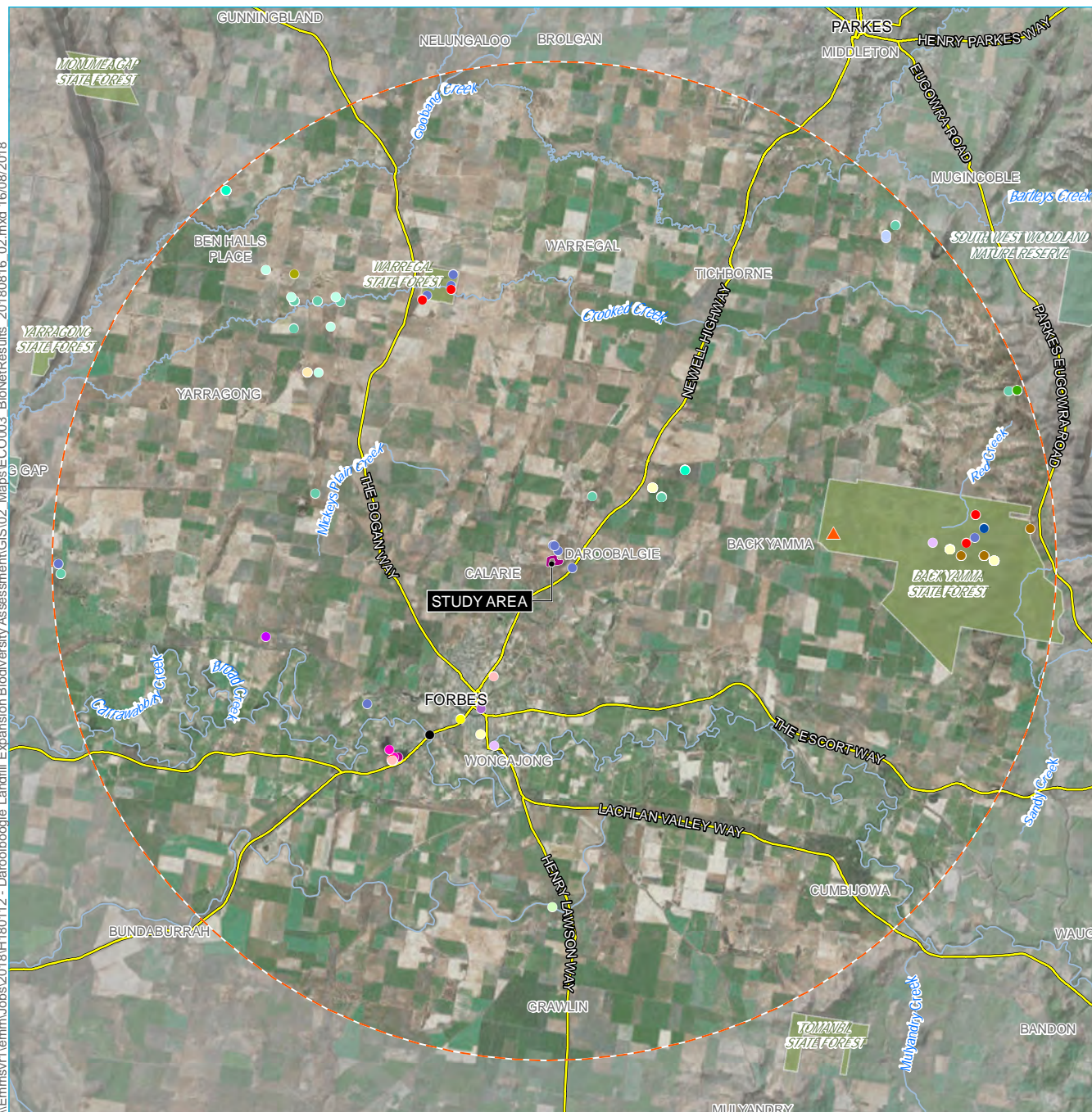
- Not Native;
- PCT 76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions;
- PCT 267 – White Box – White Cypress Pine – Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion;
- PCT 45 - Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion; and
- PCT 250 – Derived tussock grassland of the central western Plains and lower slopes of NSW.

4.1.3 Previous local studies

DPM (2015) identified a number of biodiversity values, in the woodland areas to the north and east of the existing DWD and which has since been ruled out as an option for the project (refer to Section 5.2). These include:

- TECs listed under the BC Act, specifically:
 - Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions; and
 - White Box Yellow Box Blakely's Red Gum Woodland.
- TECs listed under the EPBC Act, specifically:
 - Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Grasslands of South-Eastern Australia; and
 - White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grassland.
- breeding and foraging habitat for the vulnerable (BC Act) Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*); and
- based upon a desktop analysis, 16 threatened or migratory fauna species that are either known to occur, are considered likely to occur, or have the potential to occur within the previous subject site, based on presence of their preferred habitat.

DPM (2015) concluded that alternative options for expansion of the DWD should be considered, including the potential to acquire cleared land to the west of the existing landfill facility. The results of the DPM (2015) survey assisted Geolyse and Council to refine the project design based upon the ecological constraints, as well as provide background to EMM of the biodiversity values adjacent to the current study area.



KEY

- Study area
 - 20 km buffer
 - Main road
 - Watercourse / drainage line
 - NPWS reserve
 - State forest
- Threatened fauna species (BioNet, 2018)
- *Anseranas semipalmata* (Maggie Goose) (3)
 - *Aprasia parapulchella* (Pink-tailed Legless Lizard) (1)
 - *Artamus cyanopterus cyanopterus* (Dusky Woodswallow) (36)
 - *Botaurus poiciloptilus* (Australasian Bittern) (1)
 - *Burhinus grallarius* (Bush Stone-curlew) (10)
 - *Certhionyx variegatus* (Pied Honeyeater) (1)
 - *Chalinolobus picatus* (Little Pied Bat) (2)
 - *Chthonicola sagittata* (Speckled Warbler) (46)
 - *Circus assimilis* (Spotted Harrier) (8)
 - *Climacteris picumnus victoriae* (Brown Treecreeper (eastern subspecies)) (68)
 - *Daphoenositta chrysoptera* (Varied Sittella) (4)
 - *Dasyurus maculatus* (Spotted-tailed Quoll) (1)
 - *Epthianura albifrons* (White-fronted Chat) (4)
 - *Falco hypoleucos* (Grey Falcon) (47)
 - *Falco subniger* (Black Falcon) (9)
 - *Glossopsitta pusilla* (Little Lorikeet) (2)
 - *Grus rubicunda* (Brolga) (1)

- Threatened flora species (BioNet, 2018)
- ▲ *Austrostipa wakoolica* (A spear-grass) (2)

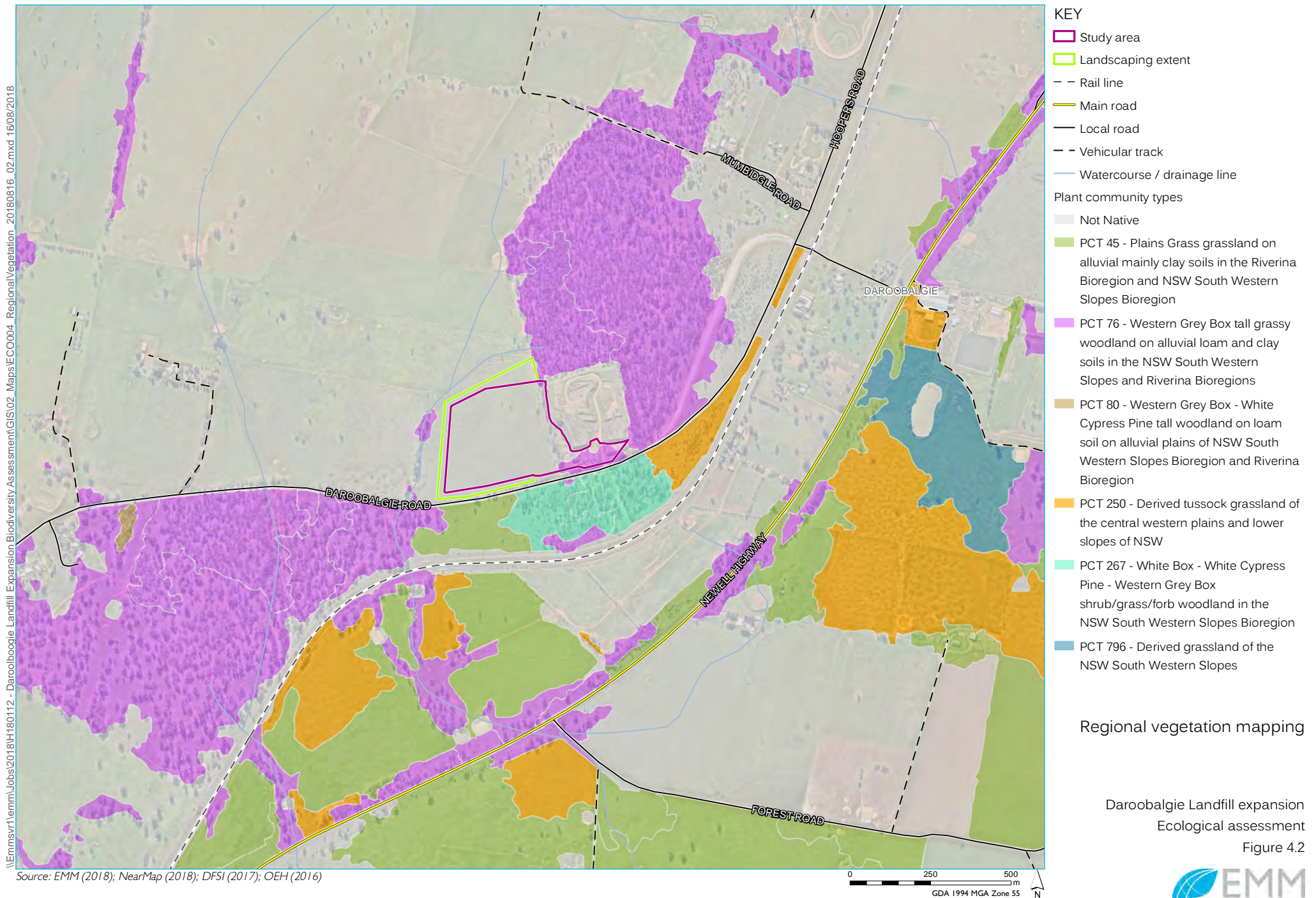
Threatened flora and fauna recorded within the locality

Daroobalgie Landfill expansion
Ecological assessment

Figure 4.1



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4.2 Field survey

4.2.1 Vegetation

The majority of the study area is currently used for cropping and has a long history of disturbance associated with both cattle grazing and cropping. Therefore, native vegetation within this area consists of a small number of isolated paddock trees with a completely cleared (cropped) understorey. The cropped land does not fit in any PCT. Native vegetation within the study area is restricted to a strip of woodland between the cropped land and the existing DWD.

Therefore, only a single PCT was identified within the study area:

- PCT 76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion, with a total area of 0.49 ha.

The remaining land within the study area consists of:

- cropped land, with a total area of 9.06 ha; and
- cleared land, with a total area of 1.25 ha.

The PCTs, cropped land and cleared areas are described in further detail within the following section and shown in Figure 4.3.

i PCT 76 - Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions


A description of PCT 76 in the study area is provided within Table 4.1 and mapped within Figure 4.3.

Table 4.1 PCT 76 description

Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion	
PCT ID	76
Common name	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion
Extent within development site	0.49 ha (Figure 4.3)
Description	Inland Grey Box (<i>Eucalyptus microcarpa</i>) is the dominant canopy species with some White Cypress Pine (<i>Callitris glaucophylla</i>) and Western Rosewood (<i>Alectryon oleifolius</i>) present within this stratum. The shrub layer is moderately sparse and consists of native species Sticky Hopbush (<i>Dodonaea viscosa</i> subsp. <i>cuneata</i>), <i>Senna artemisioides</i> and Green Wattle (<i>Acacia deanei</i>). The ground layer is dominated by native Ruby Saltbush (<i>Enchylaena tomentosa</i>) and native grasses Windmill Grass (<i>Chloris truncata</i>) and Wallaby Grass (<i>Rytidosperma</i> sp.). Other, less dominant native grasses include Bermudagrass (<i>Cynodon dactylon</i>), Plains grass (<i>Austrostipa aristiglumis</i>) and Wattle Mat-rush (<i>Lomandra filiformis</i>). Other, less dominant forb and small shrub species within the ground layer include Buckbush (<i>Salsola australis</i>), Climbing Saltbush (<i>Einadia nutans</i> subsp. <i>nutans</i>), Black Rolypoly (<i>Sclerolaena muricata</i> var. <i>muricata</i>), Speargrass (<i>Austrostipa scabra</i>) and Rigid Panic (<i>Walwhalleya proluta</i>). Exotic species recorded within this community include African boxthorn (<i>Lycium ferocissimum</i>), Apple Cactus (<i>Cereus uruguayanus</i>), Brassica sp., and Saffron Thistle (<i>Carthamus lanatus</i>)..
Survey effort	One plot, undertaken in accordance with the BAM (OEH 2017) and rapid assessment.

Table 4.1 **PCT 76 description**

Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion

Condition description	The community is in moderate condition with some introduced plant species and substantial rubbish observed throughout the community. This is due to the surrounding land use (cropping/grazing and an operating landfill). Associated edge impacts contribute even further to the existing condition of this community. Native overstorey cover totals 37.5%, with total native groundcover of 33.9%. Exotic cover totals 8.2%, while high threat exotic species African Boxthorn (<i>Lycium ferocissimum</i>) and Saffron Thistle (<i>Carthamus lanatus</i>) total 4.9% cover. Litter cover totals 62%.
Characteristic species used for identification of PCT	According to the NSW VIS Classification Version 2.1, the canopy layer species recorded within this community that align with the dominant species listed as characteristic of this PCT include Inland Grey Box and White Cypress Pine. Aligning middle stratum species include Sticky Hopbush Aligning ground stratum species include Windmill Grass, Speargrass, Climbing Saltbush, Plains Grass and Wattle Mat-rush. PCT 80 was ruled out due to the lack of other characteristic canopy species such as Yellow Box (<i>Eucalyptus melliodora</i>) and Blakely's Red Gum (<i>Eucalyptus blakelyi</i>).
Justification of evidence used to identify the PCT	Apart from species composition, the stated distribution is South Western Plains and western section of the South Western Slopes IBRA bioregions. The occurrence of the community on heavy alluvial clay soils as well as the landscape position on undulating alluvial plains is consistent with this PCT. The characteristic species, as listed above, are consistent with the PCT, with Inland Grey Box being the characteristic over storey species. The mid-storey and ground layer contain native shrubs, grasses and forbs characteristic of the PCT.
Status	<p>Commonwealth EPBC Act: Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia.</p> <p>NSW BC Act: Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions.</p> <p>Justification for inclusion:</p> <p>This community meets the NSW Threatened Species Scientific Committee (TSSC) determination (TSSC 2011) for inclusion as the BC Act listed community. This community also meets the thresholds test specified in the commonwealth listing advice (DSEWPac 2012) for the EBPC Act listed community.</p>
<p>Photograph 1: Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion – Plot 4.</p>	

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KEY

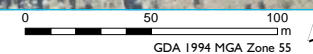
- Study area
- Landscaping extent
- Watercourse / drainage line
- Cadastral boundary
- ▲ *Eucalyptus microcarpa* (Grey Box)
- ▲ *Callitris glaucophylla* (White Cypress Pine)
- Plant community types
- Cropped
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

Vegetation communities recorded within the study area

Daroobalgie Landfill expansion
Ecological assessment

Figure 4.3


Source: EMM (2018); NearMap (2018); DFIG (2017)



ii Cropped land

A description of the cropped land is provided within Table 4.2 and mapped within Figure 4.3

Table 4.2 Cropped land description

Cropped land	
PCT ID	N/A
Common name	Cropped land
Condition class	N/A
Extent within the development site	9.06 ha (Figure 4.3)
Description	This area contains three White Cypress Pine paddock trees and approximately seven small Inland Grey Box trees along the boundary of the cropped land and PCT 76 (Figure 4.3). The area is utilised for cropping and contains no native mid-storey or ground layer (Photograph 2).
Survey effort	Rapid vegetation assessment.
Condition description	The community is in poor condition due to cropping.
Characteristic species used for identification of PCT	N/A
Justification of evidence used to identify the PCT	N/A
Status	Commonwealth EPBC Act: not listed NSW BC Act: not listed
Photograph 2: Cropped land.	

iii Cleared land

The existing DWD landfill operation within the study area (1.25 ha) contains a hardstand area (for the parking and movement of vehicles and plant), stockpiles, internal roads, a building dams, all associated with the current operations. There are approximately seven small scattered Inland Grey Box trees within this area, under which is cleared hardstand (Figure 4.3).

4.2.2 Flora

A total of 39 flora species were recorded within the study area, comprising those recorded within the BAM (OEH 2017) plot and those recorded during rapid assessment of the study area. Twenty-nine of the species recorded are native species and 10 are weed species. No threatened flora species were recorded during the survey. Appendix C provides a list of the flora species recorded within the study area.

i Priority weeds

One state priority weed, the African Boxthorn (*Lycium ferocissimum*), as identified within the *Central West Strategic Weed Management Plan* (CWLLS 2017), was recorded within the study area. Further consideration of this weed in relation to the Biosecurity Act is in Section 6.4 of this report.

One further high threat exotic species, as per the BAM (OEH 2017), was recorded in the study area (Saffron Thistle).

4.2.3 Fauna

i Fauna recorded within the study area

A total of 20 native bird species and one native mammal species were noted during the field survey, all of which can be considered to be common (refer to Table 4.3). The exception was a group of six Grey-crowned Babbler (eastern subspecies) (listed as vulnerable under the BC Act) that were recorded within a White Cypress Pine within the cropped land and then moved into the wooded areas to the north and north-east of the DWD.

One exotic fauna species was recorded in the study area, the Red Fox (*Vulpes vulpes*).

Table 4.3 Fauna recorded incidentally during the field survey

Common name	Scientific name	BC Act	EPBC Act
Birds			
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	-	-
<i>Colluricincla harmonica</i>	Grey Shrikethrush	-	-
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	-	-
<i>Corcorax melanorhamphos</i>	White-winged Chough	-	-
<i>Corvus coronoides</i>	Australian Raven	-	-
<i>Cracticus tibicen</i>	Australian Magpie	-	-
<i>Dacelo novaeguineae</i>	Laughing Kookaburra	-	-
<i>Eolophus roseicapillus</i>	Galah	-	-
<i>Gerygone fusca</i>	Western Gerygone	-	-
<i>Grallina cyanoleuca</i>	Magpie-lark	-	-
<i>Haliastur sphenurus</i>	Whistling Kite	-	-
<i>Manorina melanocephala</i>	Noisy Miner	-	-
<i>Megalurus mathewsi</i>	Rufous Songlark	-	-
<i>Pardalotus striatus</i>	Striated Pardalote	-	-
<i>Platycercus eximius</i>	Eastern Rosella	-	-
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V	-
<i>Rhipidura leucophrys</i>	Willie Wagtail	-	-
<i>Struthidea cinerea</i>	Apostlebird	-	-
<i>Sturnus vulgaris</i>	Common Starling	-	-
<i>Threskiornis molucca</i>	Australian White Ibis	-	-
Mammals			
<i>Macropus giganteus</i>	Eastern Grey Kangaroo	-	-
<i>Vulpes vulpes</i> *	Red Fox	-	-

Notes: 1. BC Act or EPBC Act: V – vulnerable

2. * Exotic species

ii Fauna habitat

a. Woodland areas

Grassy woodland habitat within the study area corresponds with PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion (Figure 4.3). The canopy stratum of this community, when in flower would provide foraging resources for nectivorous bird species. These trees are likely to produce infrequent nectar flows from year to year, as opposed to very large trees which have leafy crowns and would provide more reliable nectar flows. The canopy stratum may also provide suitable structure for nest building birds. There is a lack of dense mid-stratum within these communities and this may present more limited opportunities for nest building birds that utilise this layer. Due to the age of the stand, no hollows were recorded; however, small hollows may be present in upper canopy of some trees. This is likely to be a constraint on the abundance of hollow nesting birds, arboreal mammals and bats which use hollows for shelter and breeding.

The woodland habitat has a relatively diverse flora assemblage with a reasonable number of ground stratum species. However, the mid stratum is limited. This is likely to correspond with a limited ecological function and lower abundance of invertebrates which, in turn, would be expected to support lower diversity of insectivorous fauna species including small woodland birds, such as Thornbills and Fairy Wrens.

Field surveys recorded a relatively low diversity of bird species, with mostly common species observed including Australian Magpie (*Cracticus tibicen*), Laughing Kookaburra (*Dacelo novaeguineae*), Galah (*Eolophus roseicapilla*), Eastern Rosella (*Platycercus eximius*), Willie Wagtail (*Rhipidura leucophrys*) and Australian White Ibis (*Threskiornis molucca*).

Common forest and woodland birds recorded include Striated Pardalote (*Pardalotus striatus*) and Grey Shrikethrush (*Colluricincla harmonica*). Other bird species that are found in open habitat such as open grassy woodland were recorded including the Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*) and Rufous Songlark (*Megalurus mathewsi*).

No primary Koala feed trees, as per SEPP 44 and the Western Slopes and Plains Koala Management Area (KMA) (DECC 2008) occur within the woodland area. Further consideration of Koala habitat in relation to SEPP 44 is provided within Section 6.2.1.

b. Cropped land and cleared areas

Fauna may occur in these areas on a transient basis; however, they will not be dependent on these habitats and they offer little ecological value.

5 Impact assessment

5.1 Impact summary

The project has potential for both direct and indirect impacts. The direct impacts arising from the project include:

- the removal of 0.49 ha of PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion, that occurs as a thin woodland strip;
- the removal of trees within the 0.49 ha area of PCT 76 that may contain hollows in the upper canopy;
- the clearance of three scattered White Cypress Pine trees and approximately seven small Inland Grey Box trees in areas of cropped land; and
- the clearance of seven small scattered Inland Grey Box trees from cleared areas.

Potential indirect impacts arising from the project include:

- temporarily increased noise levels from construction equipment, leading to disturbance of fauna, especially if this occurs during breeding seasons;
- temporary increase of traffic volume (during construction) leading to higher chance of fauna strike and increased noise levels leading to disturbance of fauna; and
- indirect impacts on retained woodland to the north of the proposed impact area, such as erosion and sedimentation and disturbance from machinery during the construction and operation of the project.

The vegetation within the study area already occurs as low quality vegetation that is already heavily impacted by edge effects. The project will not significantly increase edge effects given the high level of existing clearance.

5.2 Avoid and minimise impacts

The principal means to reduce impacts to biodiversity values resulting from the project has been to avoid areas of high quality or supporting significant biodiversity values and minimise the removal of identified native vegetation and fauna habitat.

Geolyse and Council has considered all biodiversity values and sought advice from DPM (2015), Biosis Pty Ltd and EMM in the planning and design stages of the project to avoid, where possible, direct impacts to identified biodiversity values.

Based upon the findings of the constraints assessment (DPM 2015) (refer to previous impact area on Figure 5.1) and further work by EMM, Geolyse and Council have made significant reductions to the extent of the proposed impact area, which was originally based upon a much larger area, as shown in Figure 5.1.

The refinements to the proposed impact area have avoided impacts upon the following significant biodiversity features:

- TECs listed under the BC Act (based upon impact area 1 in Figure 5.1), specifically:
 - 20.1 ha of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions; and
 - 1.4 ha of White Box Yellow Box Blakely's Red Gum Woodland (based upon previous impact area in Figure5.1).
- TECs listed under the EPBC Act (based upon previous impact area in Figure5.1), specifically:
 - 20.1 ha of Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Grasslands of South-Eastern Australia; and
 - 1.4 ha of White Box – Yellow Box – Blakely's Red Gum Grassy Woodlands and Derived Native Grassland.
- 23.4 ha of breeding and foraging habitat for the vulnerable (BC Act) Grey-crowned Babbler (eastern subspecies)(based upon previous impact area in Figure5.1).

Additional recommendations include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered and are explained in Table 5.1.

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KEY

- Proposed impact area
- Landscaping extent
- Previous impact area
- Watercourse / drainage line
- Cadastral boundary

Avoidance measures

Daroobalgie Landfill expansion
Ecological assessment
Figure 5.1

Source: EMM (2018); Geolyse (2018); NearMap (2018); DFSI (2017)



Table 5.1 Recommended mitigation measures for direct impacts and indirect impacts

Impact	Action and outcome	Responsibility	Timing
Direct impact			
Clearing of native vegetation - PCT 76 (TEC)	<p>Avoid and minimise clearing impacts to this PCT/TEC where possible. Clearing limits will be clearly marked to prevent unnecessary clearing beyond the extent of the development site. Tree clearing and disturbance will be limited to the development site.</p> <p>Appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' should be installed.</p> <p>Identify the location of any 'No Go Zones' in site inductions.</p>	Construction site manager	Prior to and during vegetation clearing
Clearing of potential hollow bearing trees/habitat trees, resulting in fauna injury and mortality	<p>Limit removal of trees to that required within the development site in support of the installation of project infrastructure.</p> <p>A clearing procedure will be implemented during the clearing of the development site, as follows:</p> <ul style="list-style-type: none"> • preclearance surveys will be completed to determine if any nesting birds are present; and • a suitably trained fauna handler will be present in case unidentified hollows are encountered during clearing to rescue and relocate displaced fauna if found on-site. <p>Installation of appropriate exclusion fencing around trees and vegetation to be retained in or directly adjacent to, the development site.</p> <p>Appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' should be installed.</p> <p>Identify the location of any 'No Go Zones' in site inductions.</p> <p>All construction staff should be made aware of the potential presence of threatened species (Grey-crowned Babbler) on the site and the manner in which they should be treated, especially during breeding season.</p>	Construction site manager and suitably trained fauna handler	Prior to and during tree clearing
Indirect impact			
Indirect impacts on retained woodland/TEC to the north of the proposed impact area	<p>Clearing limits will be clearly marked to prevent unnecessary clearing beyond the extent of the development site. Tree clearing and disturbance will be limited to the development site.</p> <p>Appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' should be installed.</p> <p>Identify the location of any 'No Go Zones' in site inductions.</p> <p>Use existing tracks to the impact area and machinery to park in dedicated parking zones, and not within the road reserve.</p> <p>Implement an erosion and sediment control plan, in accordance with a Construction Environmental Management Plan (CEMP) to prevent inputs of sediment and contaminated runoff into the woodland to be retained, north of the proposed impact area.</p>	Construction site manager	Prior to and during works

Table 5.1 Recommended mitigation measures for direct impacts and indirect impacts

Impact	Action and outcome	Responsibility	Timing
Weeds	Vehicle hygiene protocols should be included within the CEMP and will assist to control the movement of weeds.	Construction site manager	Prior to and during works
	Update EMP to include mention of Biosecurity Act and additional weeds species.	Council	Prior to operation of the project
Improved connectivity via landscape planting	Landscape planting should include shrub and tree species that are representative of PCT 76 or PCT 80. A recommend combination might be Cooba (<i>Acacia salicina</i>) and Wilga (<i>Geijera parviflora</i>), with spacing of 2-3 metres (to allow screening within 3 years), with Inland Grey Box or White Box inter dispersed, to provide larger trees for more screening, species dispersal and habitat in the long term.	Council	As specified by Council

No hollows were recorded within the study area; however, as there is potential for small hollows to occur in the upper canopy of some trees. Table 5.1 includes a recommendation for an Ecologist to inspect trees prior to clearance for signs of habitat (nest or hollow) or presence of fauna and to be present during clearing in case fauna species are found to be present.

Should any injured fauna be encountered, work in the immediate area should cease. For small native animals (lizards, birds, possums) throw a blanket or towel over it to immobilise it, then capture the animal and put it in a well ventilated box and cover it. Keep it warm, quiet and undisturbed to minimise shock. Large animals may be too dangerous to handle (Kangaroo). Keep an eye on the animal and protect it from further harm until assistance arrives. Injured animals should be immediately taken to the nearest appropriately qualified veterinary clinic or fauna rescue organisation contacted.

6 Assessment of biodiversity legislation

6.1 Environment Protection and Biodiversity Conservation Act 1999

An assessment of the impacts of the project on MNES was prepared to determine whether referral of the project to the Commonwealth Minister for the Environment is required. Matters of MNES relevant to the project are summarised in Table 6.1.

Table 6.1 Assessment of the project against the EPBC Act

MNES	Project specifics	Potential for significant impact
Threatened species	Twenty-one listed threatened species have been recorded or are predicted to occur within the locality. The majority of these species are considered unlikely to occur within the study area and the study area does not provide habitat for an ecologically significant proportion of any of these species. Significant impact criteria assessments have been undertaken and are provided within Appendix D.	Significant impact unlikely to result from the project.
Threatened ecological communities	One threatened ecological community, as listed under the EPBC Act, was recorded within the study area. A significant impact criteria assessment has been undertaken for Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia and is provided within Appendix D.	Significant impact unlikely to result from the project.
Migratory species	Eleven migratory species have been recorded or are predicted to occur within the locality. The study area does not provide important habitat for an ecologically significant proportion of any of these species.	Significant impact unlikely to result from the project.
Wetlands of international importance	The study area does not flow directly into a Ramsar site and the development is not likely to result in a significant impact.	Significant impact unlikely to result from the project.

Based upon the results of the significant impact criteria assessments (Appendix D), referral of the project to the Commonwealth Minister for the Environment is not required.

6.2 Environmental Planning and Assessment Act 1979

6.2.1 SEPP No 44

No Koala feed tree species, as defined within Schedule 2 of the SEPP, were identified within the study area. Therefore, the vegetation within the study area is not considered potential Koala habitat as defined under SEPP 44 and the study area is unlikely to provide habitat for the species.

6.3 Biodiversity Conservation Act 2016

The project will not trigger any thresholds outlined in the BC Regulation as explained in the following sections.

6.3.1 Area threshold

The study area is located on land with a minimum lot size of 200 ha. As shown in Table 6.2, this results in a clearing threshold of 1 ha. Clearance of native vegetation (PCT 76) within the study area is 0.49 ha and therefore the development does not trigger the area threshold for entry into the BOS.

Table 6.2 Area threshold for application of the Biodiversity Offsets Scheme

Minimum lot size of land	Area of clearing
Less than 1 ha	0.25 ha or more
Less than 40 ha but not less than 1 ha	0.5 ha or more
Less than 1000 ha but not less than 40 ha	1 ha or more
1000 ha or more	2 ha or more

6.3.2 Biodiversity Values Map

The development does not occur on land mapped on the biodiversity values map and therefore does not trigger this threshold for entry into the BOS.

6.3.3 Test of significance

Appendix E provides Assessments of Significance (5-part tests) for those species considered as having the potential to occur within the study area, based upon the likelihood of occurrence assessment (Appendix B).

Due to the design iterations and small area of woodland to be impacted, the development will not have a significant impact on any threatened species or TECs listed under the BC Act.

6.4 Biosecurity Act 2015

One state priority weed (asset protection) as identified within the *Central West Strategic Weed Management Plan* (CWLLS 2017), the African Boxthorn, was recorded within the study area.

State priority weeds (asset protection) are weed species that are widely distributed in some areas of the region. Their spread should be minimised to protect priority assets.

BS Act requirements and strategic response in the region, for the African Boxthorn include:

- mandatory measure (division 8, Clause 33, BS Regulation 2017): a person must not import into the State or sell;
- regional strategic response:
 - develop region-wide coordinated campaigns for collaborative management;

- identification of regional containment zones where required;
- identification of key sites/assets in the geographic area; and
- species managed in accordance with published weed management plans.

The *Daroobalgie Waste Depot Landfill Environmental* EMP (Geolyse 2016) contains operational controls that include noxious weed control:

- the procedure for noxious weed control is that noxious weeds are reported to Council for control;
- monitoring for noxious weeds is on an ongoing daily basis with the sanitary landfill contractor being responsible.

It is recommended that the EMP is updated to include controls for African Boxthorn and Saffron Thistle.

7 Conclusion

The site assessment identified that the majority of the study area is heavily disturbed due to past land use for grazing and cropping. A small area of PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregion was mapped between the existing DWD and the proposed expansion area. PCT 76 represents Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions, an EEC listed under BC Act and Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia, an endangered ecological community under the EPBC Act. This community within the study area contains a moderate diversity of native species and is in moderate condition with some introduced plant species and substantial rubbish observed throughout the community. This is due to the surrounding land use and associated edge impacts.

The Grey-crowned Babbler, a vulnerable species listed under the BC Act, was recorded within the study area. The study area also has the potential to provide habitat for a number of threatened species listed under both the BC Act and EPBC Act.

Measures to avoid and minimise impacts to vegetation were considered during the planning and design stages of the project. This has included a significant modification of the proposed expansion area to avoid impacts to TECs and threatened species habitat. This has resulted in avoidance of the majority of significant biodiversity values, and minimisation of impacts on other areas of native vegetation.

Additional recommendations to mitigate any minor residual impacts are provided in Section 5.2. Through an iterative design process, which considered the above biodiversity values, the residual impact of the project will be limited to removal of 0.49 ha of moderate quality native woodland.

Assessments of significance under the BC Act concluded no significant impact, therefore the project does not need any further assessment under the BOS, nor does it require offsets. Significant impact criteria assessments under the EPBC Act concluded no significant impact; therefore referral to the Commonwealth is not required for the project.

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Appendix A

Protected Matters Search Tool



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 19/04/18 11:53:12

[Summary](#)

[Details](#)

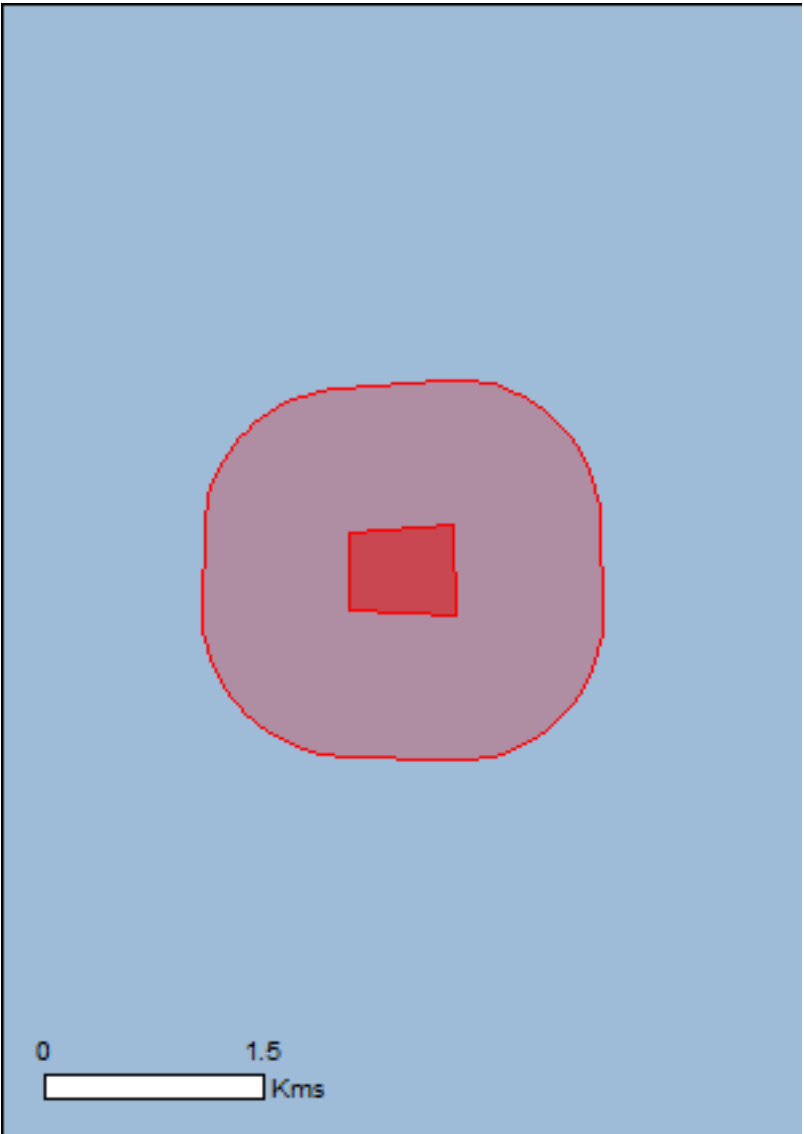
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

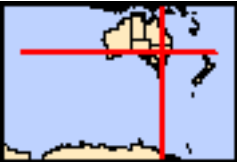
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 1.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	21
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	17
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	22
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)		[Resource Information]
Name	Proximity	
Banrock station wetland complex	700 - 800km upstream	
Hattah-kulkyne lakes	500 - 600km upstream	
Riverland	600 - 700km upstream	
The coorong, and lakes alexandrina and albert wetland	800 - 900km upstream	

Listed Threatened Ecological Communities	[Resource Information]
--	--------------------------

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species	[Resource Information]
---------------------------	--------------------------

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Androcalva procumbens [87153]	Vulnerable	Species or species habitat may occur within area
Austrostipa metatoris [66704]	Vulnerable	Species or species habitat may occur within area
Austrostipa wakoolica [66623]	Endangered	Species or species habitat likely to occur within area
Philothea ericifolia [64942]	Vulnerable	Species or species habitat may occur within area
Tylophora linearis [55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species

Name	Threatened	Type of Presence
Myiagra cyanoleuca Satin Flycatcher [612]		habitat may occur within area Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[<u>Resource Information</u>]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Critically Endangered	habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor Swift Parrot [744]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]	Critically Endangered	Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]		Species or species habitat may occur within area
	Endangered*	Species or species habitat likely to occur within area

Extra Information

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Alauda arvensis Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass		Species or species

Name	Status	Type of Presence
Tussock, Nassella Tussock (NZ) [18884]		habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Solanum elaeagnifolium Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-33.327884 148.043459,-33.332474 148.043631,-33.332223 148.036979,-33.328315 148.037065,-33.327884 148.043459

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
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- [-University of New England](#)
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- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

Appendix B

Threatened species likelihood of occurrence assessment

Table B.1 **Likelihood of occurrence assessment**

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
TECs							
<i>Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia</i> (EPBC Act listing)		E	E		y	<i>Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands</i> mostly occurs from central NSW, through northern/central Victoria into eastern South Australia. The grassy woodland form of this community has a tree canopy that is dominated or co-dominated by Inland Grey Box (<i>E. microcarpa</i>). The shrub or mid layer is variable, ranging from absent, where it has been removed, to moderately dense cover. Shrub composition also can be variable. The ground layer also varies in composition, with mostly grasses or a combination of grasses and grass-like plants, herbaceous flowering plants and the smaller chenopods (salt bushes). Derived native grassland can occur where tree canopy and mid layer has been almost entirely removed but the native ground layer remains largely intact. Patches of derived native grassland should also comprise similar ground layer species to be consistent with the ground layer for the grassy woodland (DSEWPaC 2012).	Recorded
<i>Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions</i> (BC Act listing)						<i>Inland Grey Box Woodland</i> includes those woodlands in which the most characteristic tree species, Inland Grey Box, is often found in association with Bimble or Poplar Box (<i>E. populnea subsp. bimbil</i>), White Cypress Pine (<i>Callitris glaucophylla</i>), Kurrajong (<i>Brachychiton populneus</i>), Bull Oak (<i>Allocasuarina luehmannii</i>) or Yellow Box (<i>E. melliodora</i>), and sometimes with White Box (<i>E. albens</i>). Shrubs are typically sparse or absent, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent. The community generally occurs as an open woodland 15–25 m tall but in some locations the overstorey may be absent as a result of past clearing or thinning, leaving only an understorey (OEH 2017).	
						<i>Inland Grey Box Woodland</i> (BC Act listing) occurs within the study area, with the community also meeting the condition criteria of <i>Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands</i> (EPBC Act listing).	
<i>Weeping Myall Woodlands</i> (EPBC Act listing)		E	E		y	The core distribution of <i>Weeping Myall Woodlands</i> in NSW is thought to have been the Riverina bioregion. This community occurs in a range of forms from open woodlands to woodlands, in which Weeping Myall (<i>Acacia pendula</i>) trees are the sole or dominant overstorey species. The understorey of the community often includes an open layer of shrubs above an open ground layer of grasses and herbs, though the ecological community can exist naturally as either shrubby or grassy woodland (DoEWhA 2009).	Not present
<i>Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penepplain, Murray-Darling Depression, Riverina and NSW</i> (BC Act listing)						The tree canopy within the study area is dominated by Inland Grey Box with no Weeping Myall recorded. This TEC does not occur within or adjacent to the study area.	

Table B.1 **Likelihood of occurrence assessment**

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
<i>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</i> (EPBC Act listing)		E	CE		y	<p>Within NSW this ecological community occurs in the tablelands and western slopes of NSW. This ecological community can occur as either woodland or derived grassland. It has a ground layer of native tussock grasses and herbs, and a sparse, scattered shrub layer. White Box (<i>E. albens</i>), Yellow Box or Blakely's Red Gum (<i>E. blakelyi</i>) dominate the ecological community, where a tree layer still occurs (DoEH 2006).</p> <p>White Box, Yellow Box and Blakely's Red Gum do not occur within the study area therefore the threatened ecological community is not present.</p>	Not present
<i>White Box Yellow Box Blakely's Red Gum Woodland</i> (BC Act listing)							
Reptiles							
<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	V	V	y	y	<p>The Pink-tailed Legless Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. The species inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>). The species occurs in woodland with sandstone outcrops preferring ridges, buffs and slopes with a north west aspect. Thermally suitable microhabitat may be a limiting resource for the species (DoEE 2018). Sites are typically well-drained, with rocky sandstone outcrops or scattered, partially-buried rocks. The species is commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites (OEH 2018). The species has not been recorded within the locality.</p> <p>No suitable rocky habitat is present in the study area. Searches under numerous rocks and logs within the woodland to the north and east of the study area by DPM Envirosciences (DPM) during December 2015 failed to detect burrows of this species. Suitable habitat is not present.</p>	Unlikely
Birds							
<i>Anseranas semipalmata</i>	Magpie Goose	V		y		<p>There are an increasing number of records of the Magpie Goose in central and northern NSW. The species is mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. It is equally at home in aquatic or terrestrial habitats. Activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off; breeding can occur in both summer and winter dominated rainfall areas and is strongly influenced by water level; most breeding now occurs in monsoonal areas; nests are formed in trees over deep water; breeding is unlikely in south-eastern NSW. Some individuals, mostly younger birds, may be seen at quite long distances inland (OEH 2018). No suitable wetland habitat exists within or nearby to the study area and the species is unlikely to occur.</p>	Unlikely

Table B.1 **Likelihood of occurrence assessment**

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	CE	y	y	<p>The Regent Honeyeater has a patchy distribution and is highly mobile, occurring only irregularly in most sites, and in variable numbers, often with long periods with few observation anywhere. Within the current distribution there are four known key breeding areas where the species is regularly recorded. These are the Bundarra-Barraba, Capertee Valley and Hunter Valley districts in New South Wales, and the Chiltern area in north-east Victoria (DoE 2016).</p> <p>Key eucalypt species identified in the National Recovery Plan for the Regent Honeyeater (DoE 2016) comprise Mugga Ironbark (<i>E. sideroxylon</i>), Yellow Box, White Box, Yellow Gum (<i>E. leucoxylon</i>), Spotted Gum (<i>Corymbia maculata</i>), Swamp Mahogany (<i>E. robusta</i>), Needle-leaf Mistletoe (<i>Amyema cambagei</i>) which grows on River Oak (<i>Casuarina cunninghamiana</i>), Box Mistletoe (<i>A. miquellii</i>) and Long-flower Mistletoe (<i>Dendrophoe vitellina</i>). Two Bionet (2018) records exist within the locality (50km), approximately 40 km north-east of the study area dated from 1992 and 1995.</p> <p>The species has the potential to fly over the study area, but is unlikely to forage within the study area due to a lack of key feed species. The study area is not located within, or in proximity to, a key breeding area.</p>	Unlikely
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	V		y		<p>The species occurs throughout most of NSW, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. The most common habitat for this species is in woodlands and dry open sclerophyll forests, usually dominated by eucalyptus, including mallee associations. The species has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. Understorey is typically open with sparse Eucalyptus saplings, Acacia and other shrubs, including heath. The ground cover may consist of grasses, sedges or open ground, often with coarse woody debris (OEH 2018).</p> <p>This species has been recorded within the locality and potential sub-optimal foraging and breeding habitat occurs within the study area.</p>	Potential foraging and breeding
<i>Botaurus poeciloptilus</i>	Australasian Bittern	E	E	y	y	<p>The Australasian Bittern is widespread and found over most of NSW except for far north-west. Preferred habitat is comprised of wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds or cutting grass (<i>Gahnia</i> sp.) growing over a muddy or peaty substrate (OEH 2018).</p> <p>This species has been recorded within the locality however no suitable wetland habitat exists within the study area and the species is unlikely to occur.</p>	Unlikely
<i>Burhinus grallarius</i>	Bush Stone-curlew	E		y		<p>The Bush Stone-curlew has previously been recorded in all but the most arid parts of mainland Australia. Today the species is scarce or largely absent in many parts of its former range south and east of the Great Dividing Range. It inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. The curlew likes to roost and nest in grassy woodlands of Bull Oak, gum or box with low, sparse grassy or herb understorey. Nests are usually beside a</p>	Potential foraging and breeding

Table B.1 **Likelihood of occurrence assessment**

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
						<p>fallen log, which probably makes it harder for foxes to find. Curlews prefer a sparse understorey so they can see predators while foraging for insects (OEH 2018).</p> <p>This species has been recorded within the locality and potential sub-optimal foraging and breeding habitat occurs within the study area.</p>	
<i>Certhionyx variegatus</i>	Pied Honeyeater	V		y		<p>The Pied Honeyeater has a widespread distribution throughout <i>Acacia</i>, mallee and spinifex scrubs of arid and semi-arid Australia, occasionally occurring further east, on the slopes and plains. The species inhabits wattle shrub, primarily Mulga (<i>Acacia aneura</i>), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering. The species feeds on nectar, predominantly from various species of emu-bushes (<i>Eremophila</i> spp.); also from mistletoes and various other shrubs (e.g. <i>Grevillea</i> spp.); also eats saltbush fruit, berries, seed, flowers and insects (OEH 2018).</p> <p>This species has been recorded within the locality however suitable habitat is not present, due to the lack of dense mistletoe and <i>Eremophila</i> spp.</p>	Unlikely
<i>Chthonicola sagittata</i>	Speckled Warbler	V		y		<p>The Speckled Warbler has a patchy distribution, occurring within the eastern half of NSW and most frequently reported from the hills and tablelands of the Great Dividing Range. The species lives in a wide range of <i>Eucalyptus</i> dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Nests are located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter (OEH 2018).</p> <p>This species has been recorded within the locality and potential foraging and breeding habitat occurs within the study area.</p>	Potential foraging and breeding
<i>Circus assimilis</i>	Spotted Harrier	V		y		<p>The Spotted Harrier occurs widely in NSW, mainly within grassy open woodland including <i>Acacia</i> and mallee remnants, inland riparian woodland, grassland and shrub steppe. The species also occurs in agricultural land, foraging over open woodlands (OEH 2018).</p> <p>This species has been recorded within the locality and potential foraging habitat occurs within the study area.</p>	Potential foraging
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	V		y		<p>The Brown Treecreeper is found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabiting woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. The species is usually not found in woodlands with a dense shrub layer. Fallen timber is an important habitat component for foraging. Hollows in standing dead or live trees and tree stumps are essential for nesting (OEH 2018).</p> <p>This species has been recorded within the locality and potential foraging and sub-optimal breeding habitat occurs within the study area.</p>	Potential foraging and breeding
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		y		<p>The Varied Sittella's distribution in NSW is nearly continuous from the coast to the far west. The species inhabits eucalypt</p>	Potential foraging

Table B.1 **Likelihood of occurrence assessment**

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
						forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and <i>Acacia</i> woodland. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy (OEH 2018). This species has been recorded within the locality and potential foraging and breeding habitat occurs within the study area.	and breeding
<i>Epthianura albifrons</i>	White-fronted V Chat			y		The White-fronted Chat is found across the southern half of Australia, from southernmost Queensland to southern Tasmania, and across to Western Australia as far north as Carnarvon. The species is found mostly in temperate to arid climates and very rarely sub-tropical areas. In the western part of NSW occurs near waterways. The species forages insects on bare grassy ground in wetland areas. It builds 'open-cup' nests in low vegetation or low isolated mangroves. (OEH 2018). This species has been recorded within the locality however the study area does not contain suitable habitat due to the lack of wetland within or surrounding the study area.	Unlikely
<i>Falco hypoleucos</i>	Grey Falcon	E		y		The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The species is usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey (OEH 2018). This species has been recorded within the locality however the study area does not contain suitable habitat due to its distance from any substantial watercourse or wetland.	Unlikely
<i>Falco subniger</i>	Black Falcon	V		y		The Black Falcon is widely, but sparsely, distributed in NSW, mostly occurring in inland regions. The species is found along tree-lined watercourses and in isolated woodlands, mainly in arid and semi-arid areas. It roosts in trees at night and often on power poles by day. Common prey items are birds, small mammals, insects and reptiles and sometimes carrion (OEH 2018, Birdlife 2018a). This species has been recorded within the locality and potential foraging habitat exists within the study area.	Potential foraging
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		y		The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. This species forages primarily in the canopy of open <i>Eucalyptus</i> forest and woodland, yet also finds food in <i>Angophora</i> , <i>Melaleuca</i> and other tree species. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Riparian habitats are particularly used. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). Nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like <i>Allocasuarina</i> (OEH 2018).	Potential foraging

Table B.1 **Likelihood of occurrence assessment**

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
						This species has been recorded within the locality and potential foraging habitat exists within the study area.	
<i>Grantiella picta</i>	Painted Honeyeater	V	V	y	y	<p>The species is sparsely distributed from south-eastern Australia to north-western Queensland, with its greatest concentrations and breeding locations occurring on the inland slopes of the Great Dividing Range in NSW. It inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of Black Box (<i>E. largiflorens</i>) and River Red Gum (<i>E. camaldulensis</i>), Box-Ironbark-Yellow Gum woodlands, <i>Acacia</i>-dominated woodlands, Paperbarks, <i>Casuarina</i>, <i>Callitris</i>, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes. It is more common in wider blocks of remnant woodland than in narrower strips although it breeds in quite narrow roadside strips if ample mistletoe fruit is available (OEH 2018).</p> <p>This species has been recorded within the locality however no mistletoe was observed within the study area and the species is unlikely to forage there.</p>	Unlikely
<i>Grus rubicunda</i>	Brolga	V		y		<p>The Brolga is found across tropical northern Australia, southwards through north-east and east central areas, as well as central New South Wales. The Brolga inhabits large open wetlands, grassy plains, coastal mudflats and irrigated croplands and, less frequently, mangrove-studded creeks and estuaries. It is less common in arid and semi-arid regions, but will occur close to water. Though Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps (OEH 2018, Birdlife 2018b).</p> <p>This species has been recorded within the locality however no suitable wetland habitat exists within or near the study area and the species is unlikely to occur.</p>	Unlikely
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V		y		<p>The White-bellied Sea-eagle is distributed along the east coast and well inland along all major inland rivers and waterways of NSW. The species is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate region. Habitats are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Breeding territories are located close to water, and mainly in tall open forest or woodland (OEH 2018).</p> <p>This species has been recorded within the locality however there are no large areas of open water in proximity to the study area and therefore the species is unlikely to forage there.</p>	Unlikely
<i>Hieraaetus morphnoides</i>	Little Eagle	V		y		<p>The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. Habitat includes open eucalypt forest, woodland or open woodland, She-oak, <i>Acacia</i> and riparian woodlands of NSW. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion (OEH 2018).</p> <p>This species has been recorded within the locality and potential sub-optimal foraging habitat exists within the study area.</p>	Potential foraging

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Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
<i>Lathamus discolor</i>	Swift Parrot	E	CE	y	y	<p>This species migrates in the autumn and winter months to south-eastern Australia. In NSW, it mostly occurs on the coast and south-west slopes in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations (OEH 2018). Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood (<i>C. gummifera</i>), Mugga Ironbark and White Box. Commonly used lerp infested trees include Inland Grey Box, Grey Box (<i>E. moluccana</i>) and Blackbutt (<i>E. pilularis</i>).</p> <p>The species has been recorded within the locality and the species has the potential to forage on the Inland Grey Box within the study area during Winter.</p>	Potential foraging
<i>Leipoa ocellata</i>	Malleefowl	E	V		y	<p>Malleefowl predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 – 450 mm mean annual rainfall) areas. The species utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. The species is less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers (OEH 2018).</p> <p>This species has been recorded within the locality however habitat within the study area is unsuitable.</p>	Unlikely
<i>Lophoictinia isura</i>	Square-tailed Kite	V		y		<p>Within NSW the Square-tailed Kite is a regular resident in the north, north-east and along major flowing river systems and migrates to the south-east for breeding. The species is found in a variety of timbered habitats including dry woodlands and open forests, showing a particular preference for timbered watercourses. The species is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. The species appears to occupy large hunting ranges of more than 100km². Nest sites are generally located along or near watercourses, in a fork or on large horizontal limbs (OEH 2018).</p> <p>This species has been recorded within the locality and potential sub-optimal foraging habitat exists within the study area.</p>	Potential foraging
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		y		<p>The Hooded Robin is widespread across Australia and found throughout much of inland NSW. The species prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. This species requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Dead stumps and fallen timber or low-hanging branches will often be used to perch on for hunting. The species nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than 1 m to 5 m above the ground (OEH 2018).</p> <p>This species has been recorded within the locality and potential sub-optimal foraging and breeding habitat exists within the study area.</p>	Potential foraging and breeding

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Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	V		y		<p>The Black-chinned Honeyeater is widespread within NSW ranging from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. The species is found in the upper levels of open eucalypt forests and woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark, White Box, Inland Grey Box, Yellow Box, Blakely's Red Gum and Forest Red Gum (<i>E. tereticornis</i>). It is also commonly found along waterways, especially in arid and semi-arid areas; as well as occasionally seen in gardens and street trees. The species moves quickly from tree to tree, foraging rapidly along outer twigs, underside of branches and trunks, probing for insects. Nectar is taken from flowers, and honeydew is gleaned from foliage (OEH 2018).</p> <p>This species has been recorded within the locality and potential sub-optimal foraging and breeding habitat exists within the study area.</p>	Potential foraging and breeding
<i>Neophema pulchella</i>	Turquoise Parrot	V		y		<p>The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. The species lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. It prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. The species nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust (OEH 2018).</p> <p>This species has been recorded within the locality and potential foraging habitat exists within the study area. There is no breeding habitat within the study area due to the lack of hollows.</p>	Potential foraging
<i>Oxyura australis</i>	Blue-billed Duck	V		y		<p>The Blue-billed Duck is widespread in NSW, but most common in the southern Murray-Darling Basin area. This species prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover (OEH 2018).</p> <p>The species has been recorded within the locality however no suitable wetland habitat exists within the study area and the species is unlikely to occur.</p>	Unlikely
<i>Pachycephala inornata</i>	Gilbert's Whistler	V		y		<p>The Gilbert's Whistler is sparsely distributed over much of the arid and semi-arid zone of inland southern Australia, extending to the western slopes of NSW. The species usually inhabits semi-arid Mallee or Box-ironbark Eucalypt, <i>Acacia</i>, Cypress-pine or Belah shrublands and woodlands (or mixed assemblages of these), usually with a dense, continuous or patchy understorey of shrubs. They also inhabit thickets of paperbarks and sometimes occur in taller eucalypt woodlands or forests. The species forages on or near the ground in shrub thickets and in tops of small trees (OEH 2018, Birdlife 2018d).</p> <p>The species has been recorded within the locality however no suitable habitat (a dense understorey) exists within the study area and the species is unlikely to occur.</p>	Unlikely

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Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
<i>Petroica boodang</i>	Scarlet Robin	V		y		<p>The Scarlet Robin occurs from the coast to the inland slopes of NSW. Habitat includes dry eucalypt forest and woodlands with an open and grassy understorey with few scattered shrubs that usually contains abundant logs and fallen timber: these are important components of its habitat. The species breeds on ridges of the western slopes, the Great Diving Range and eastern coastal regions and can be found up to 1000 m in altitude (OEH 2018).</p> <p>This species has been recorded within the locality and potential foraging habitat exists within the study area. There is no breeding habitat within the study area due to the lack of ridges.</p>	Potential foraging
<i>Petroica phoenicea</i>	Flame Robin	V		y		<p>Within NSW the Flame Robin breeds in upland areas and during winter many birds move to the inland slopes and plains. The species breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains). Here, the species lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees (OEH 2018).</p> <p>This species has been recorded within the locality and potential foraging habitat exists within the study area. There is no breeding habitat within the study area.</p>	Potential foraging
<i>Polytelis swainsonii</i>	Superb Parrot	V	V	y	y	<p>The Superb Parrot is found throughout eastern inland NSW. This species inhabits forests and woodlands dominated by eucalypts, especially River Red Gums and box eucalypts such as Yellow Box or Inland Grey Box. Superb Parrots breed in either River Red Gum forests and woodlands or box woodlands (DoEE 2018).</p> <p>This species has been recorded within the locality and potential foraging habitat exists within the study area. There is no breeding habitat within the study area due to the lack of hollows.</p>	Potential foraging
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern subspecies)	V		y		<p>In NSW, the eastern subspecies occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. This species inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains, as well as woodlands on fertile soils in coastal regions. The species favours inland plains with an open shrub layer, little ground cover and plenty of fallen timber and leaf litter. The species may also be seen along roadsides and around farms (OEH 2018 & Birdlife 2018).</p> <p>This species has been recorded within the locality and a small group (approximately 6 individuals) were recorded within the study area during the survey.</p>	Recorded
<i>Rostratula australis</i>	Australian Painted Snipe	E		y		<p>The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. The species also uses inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (OEH 2018).</p> <p>The species has been recorded within the locality; however, no suitable wetland habitat exists within the study area and the species is unlikely to occur.</p>	Unlikely

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Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
<i>Stagonopleura guttata</i>	Diamond Firetail	V		y		<p>The Diamond Firetail is endemic to south-eastern Australia and widely distributed in NSW. This species is found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (<i>Eucalyptus pauciflora</i>) Woodlands. Also occurring in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. The species are often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. The species feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests (OEH 2018).</p> <p>This species has been recorded within the locality and potential foraging and breeding habitat exists within the study area.</p>	Potential foraging and breeding
<i>Stictonetta naevosa</i>	Freckled Duck	V		y		<p>The Freckled Duck is found primarily in south-eastern and south-western Australia, and breeds in large temporary swamps created by floods in the Murray Darling System. The species prefers permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Generally rest in dense cover during the day, usually in deep water. Nests are usually located in dense vegetation at or near water level (OEH 2018).</p> <p>The species has been recorded within the locality; however, no suitable wetland habitat exists within the study area and the species is unlikely to occur.</p>	Unlikely
Mammals							
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V		y	<p>Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. The species is generally rare with a very patchy distribution in NSW. The species roosts in caves (near their entrances), crevices in cliffs, old mine workings, frequenting low to mid-elevation dry open forest and woodland close to these features. They are found in well-timbered areas containing gullies (OEH 2018).</p> <p>This species has not been recorded within the locality. There are no suitable roosting sites within the locality and foraging habitat within the study area is sub optimal (and too far removed from suitable roosting habitat).</p>	Unlikely
<i>Chalinolobus picatus</i>	Little-Pied Bat	V		y		<p>The Little-Pied Bat is found in inland NSW (including Western Plains and slopes). This species occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands. Roosting occurs within caves, rocky outcrops, mine shafts, tunnels, tree hollows and buildings (OEH 2018).</p> <p>This species has been recorded within the locality and the species has the potential to forage within the study area. There is no breeding or roosting habitat within the study area due to the lack of hollows.</p>	Potential foraging
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	V	E	y		<p>This species has been recorded from a wide range of habitats, including: coastal heathlands, open and closed eucalypt woodlands, wet sclerophyll and lowland forests (OEH 2018). Unlogged forest or forest that has been less disturbed by</p>	Unlikely

Table B.1 **Likelihood of occurrence assessment**

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
						<p>timber harvesting is preferable. Habitat requirements include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves. Individuals require an abundance of food, such as birds and small mammals, and large areas of relatively intact vegetation through which to forage. Home ranges are estimated to be 620–2,560 ha for males and 90–650 ha for females (DoEE 2018).</p> <p>There are records of this species within the locality however this species is unlikely to occur considering the fragmented and partially cleared nature of the study area which is considered to be of little value to the species with very little shelter and a lack of potential den sites.</p>	
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V	y	y	<p>Inhabits a variety of vegetation types, including mallee, Bull Oak and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Roosts in tree hollows, crevices, and under loose bark. A slow flying agile bat, utilising the understorey to hunt non-flying prey - especially caterpillars and beetles - and will even hunt on the ground (OEH 2018). The species is more abundant in extensive stands of vegetation in comparison to smaller woodland patches (Turbill and Ellis 2006 in TSSC 2015), suggesting its home range is probably large (Lumsden et al., 2008 in TSSC 2015). The species has also been found to be much more abundant in habitats that have a distinct tree canopy and a dense, cluttered understorey layer (Turbill and Ellis 2006 in TSSC 2015).</p> <p>This species has not been recorded within the locality and the species is unlikely to occur within the study area, due to the fragmented nature and lack of dense mid storey that is important for this species.</p>	Unlikely
<i>Petaurus norfolcensis</i>	Squirrel Glider	V		y		<p>The Squirrel Glider can be found along the Great Dividing Range from central Cape York, Queensland south to central Victoria. It inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Preferred habitat consists of mixed species stands with a shrub or Acacia midstorey. This species requires abundant tree hollows for refuge and nest sites (OEH 2018).</p> <p>There are records of the Squirrel Glider within the locality however the habitat within the study area is not suitable for this species given the lack of suitable tree hollows.</p>	Unlikely
<i>Phascolarctos cinereus</i>	Koala	V	V	y	y	<p>The Koala inhabits eucalypt woodlands and forests and feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species (OEH 2018). Large populations of koalas occur on the western slopes and plains, in particular the Pilliga region (Kavanagh and Barrott 2001) and in Gunnedah (Smith 1992) and Walgett LGAs (J. Callaghan, Australian Koala Foundation, pers. comm.). Primary feed trees within the Western Slopes and Plains Koala Management Area (KMA) are River Red Gum (<i>E. camaldensis</i>) and Coolabah (<i>E. coolabah</i>). These do not occur within the study area. White box (<i>E. albens</i>) which occurs within the woodland to the</p>	Unlikely

Table B.1 **Likelihood of occurrence assessment**

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
						<p>north and north-east of the existing DWD is listed as secondary feed tree within the Western Slopes and Plains KMA. No koalas, koala scratches or scats were detected within this area, despite targeted searches by DPM Envirosiences in 2015. White Box does not occur within the study area. There are no Koala records within 20 km of the study area, and three records within a 50 km radius.</p> <p>No Koala feed tree species, as defined within Schedule 2 of the SEPP, were identified within the study area. Therefore, the vegetation within the study area is not considered potential Koala habitat as defined under SEPP 44 and the study area is unlikely to provide habitat for the species.</p>	
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	V		y	<p>Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia. The species occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy (OEH 2018).</p> <p>There are no records within the locality and the species is unlikely to forage within the study area, considering its distance from the coast (>200 km), where most records of the species occur. There is a distinct lack of records for this species this far west (apart from outliers).</p>	Unlikely
Flora							
<i>Androcalva procumbens</i>		V	V		y	<p>This species is endemic to NSW and mainly confined to the Dubbo-Mendooran-Gilgandra region, but also in the Pilliga and Nymagee areas. The species grows in sandy sites, often along roadsides. It has been recorded in <i>Eucalyptus dealbata</i> and <i>Eucalyptus sideroxylon</i> communities, Broombush (<i>Melaleuca uncinata</i>) scrub, under mallee eucalypts with a <i>Calytrix tetragona</i> understorey, and in a recently burnt Ironbark and <i>Callitris</i> area. Other associated species include <i>Acacia triptera</i>, <i>Callitris endlicheri</i>, Yellow Box, <i>Allocasuarina diminuta</i>, <i>Philotheca salsolifolia</i>, <i>Xanthorrhoea species</i>, <i>Exocarpos cupressiformis</i>, <i>Leptospermum parvifolium</i> and <i>Kunzea parvifolia</i> (OEH 2018).</p> <p>This species has not been recorded within the locality and suitable habitat does not occur within the study area.</p>	Unlikely
<i>Austrostipa metatoris</i>	A Spear-grass		V		y	<p>Most records for this species occur in the Murray Valley with sites including Cunninyeuk Station, Stony Crossing, Kyalite State Forest (now part of Murrumbidgee Valley Regional Park) and Lake Benanee. Grows in sandy areas of the Murray Valley; habitats include sandhills, sandridges, undulating plains and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils. Associated species include Poplar Box, Gum Coolibah (<i>Eucalyptus intertexta</i>), <i>Callitris glaucophylla</i>, <i>Casuarina cristata</i>, <i>Santalum acuminatum</i> and <i>Dodonaea viscosa</i>.</p> <p>This species has not been recorded within the locality and suitable habitat does not occur within the study area.</p>	Unlikely

Table B.1 **Likelihood of occurrence assessment**

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
<i>Austrostipa wakoolica</i>	A Spear-grass	E	E		y	<p>This species is confined to the floodplains of the Murray River tributaries of central-western and south-western NSW. This species grows in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. Flowering occurs between October to December (OEH 2018).</p> <p>There are no records of this species within the locality and this species has was not recorded within the study area during surveys and is unlikely to occur within the woodland vegetation within the study area as it is not within a floodplain.</p>	Unlikely
<i>Philothea ericifolia</i>			V	y	y	<p>This species is known only from the upper Hunter Valley and Pilliga to Peak Hill districts of NSW. It grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies. It has been collected from a variety of habitats including heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops. Associated species include Broombush, Narrow-leaved Ironbark, <i>Eucalyptus rossii</i>, Grey Gum, <i>Corymbia trachyphloia</i>, <i>Acacia triptera</i>, <i>A. burrowii</i>, <i>Beyeria viscosa</i>, <i>Philothea australis</i>, <i>Leucopogon muticus</i> and <i>Calytrix tetragona</i> (OEH 2018). Noted as being a “moisture-loving plant”, with plants common on the sides of a particular spur of the Hervey Ranges where soakage from the high background provides sufficient moisture for the plants.</p> <p>This species has been recorded within the locality however suitable habitat does not occur within the study area.</p>	Unlikely
<i>Tylophora linearis</i>		V	E	y	y	<p>The majority of records of this species occur in the central western region. Records are from Goonoo, Pillaga West, Pillaga East, Bibblewindi, Cumbil and Eura State Forests, Coolbaggie NR, Goobang NP and Beni SCA. The species grows in dry scrub and open forest. It has been recorded from low-altitude sedimentary flats in dry woodlands of Red Ironbark (<i>Eucalyptus fibrosa</i>), Mugga Ironbark, White Box, Black Cypress Pine (<i>Callitris endlicheri</i>), White Cypress Pine and Bull Oak.</p> <p>This species has not been recorded within the locality and but habitat within the study area may be suitable. The species was not recorded during the site inspection, however searches during Spring would need to be undertaken to determine its presence.</p>	Potential
Terrestrial Migratory Birds							
<i>Hirundapus caudacutus</i>	White-throated Needletail		Mi, Ma		y	<p>The White-throated Needletail is widespread in eastern and south-eastern Australia. In NSW this species extends inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland (DoEE 2018).</p> <p>No records of this species exist within the locality; however the species may fly over/forage over the study area. The species will not occur within study area.</p>	Unlikely

Table B.1 **Likelihood of occurrence assessment**

Scientific Name	Common Name	Listing		Source		Habitat preferences and distribution	Likelihood of occurrence
		BC Act	EPBC Act	Bionet	PMST		
<i>Motacilla flava</i>	Yellow Wagtail		Mi, Ma		y	<p>This species occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra (Birdlife International 2017). No records of this species exist within the locality.</p> <p>This species is rarely recorded within NSW and is not anticipated to occur close to the study area, given the majority of records are clustered around Newcastle and Sydney coastal regions and due to the lack of suitable habitat the species is unlikely to occur within the study area.</p>	Unlikely
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		Mi, Ma		y	<p>The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. The species is often near wetlands or watercourses (Birdlife 2018e).</p> <p>No records of this species exist within the locality and due to the lack of any forest the species is unlikely to occur within the study area.</p>	Unlikely

Notes: 1. BC Act and EPBC Act status: V – Vulnerable, E – Endangered, CE – Critically Endangered, Mi – Migratory

2. Migratory wetland birds recorded in the PMST and Bionet searches were excluded from the assessment as no wetland habitat exists within or adjacent to the study area.

Appendix C

Flora species recorded

Table C.1 Flora species recorded within the entire study area

Family name	Species name	Common name	Weed Species
Fabaceae	<i>Acacia deanei</i>	Green wattle	
Fabaceae	<i>Acacia oswaldii</i>	Umbrella wattle	
Sapindaceae	<i>Alectryon oleifolius</i>	Western Rosewood	
Poaceae	<i>Austrostipa aristiglumis</i>	Plains grass	
Poaceae	<i>Austrostipa scabra</i>	Speargrass	
Poaceae	<i>Avena barbata</i>	Bearded Oats	*
Poaceae	<i>Bothriochloa macra</i>	Red grass	
Brassicaceae	<i>Brassica sp.</i>	-	*
Cupressaceae	<i>Callitris glaucophylla</i>	White Cypress Pine	
Asteraceae	<i>Carthamus lanatus</i>	Saffron Thistle ¹	*
Asteraceae	<i>Centaurea solstitialis</i>	St Barnabys Thistle	*
Cactaceae	<i>Cereus uruguayanus</i>	Apple Cactus	*
Poaceae	<i>Chloris truncata</i>	Windmill grass	
Convolvulaceae	<i>Convolvulus erubescens</i>	Blushing Bindweed	
Poaceae	<i>Cynodon dactylon</i>	Bermudagrass	
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed	
Sapindaceae	<i>Dodonaea viscosa subsp. Cuneata</i>	Sticky hopbush	
Boraginaceae	<i>Echium plantagineum</i>	Paterson's curse	*
Chenopodiaceae	<i>Einadia nutans subsp nutans</i>	Climbing Saltbush	
Chenopodiaceae	<i>Enchylaena tomentosa</i>	Ruby Saltbush	
Poaceae	<i>Eragrostis cilianensis</i>	Stinkgrass	*
Myrtaceae	<i>Eucalyptus microcarpa</i>	Inland Grey box	
Euphorbiaceae	<i>Euphorbia drummondii</i>	Caustic Weed	
Boraginaceae	<i>Heliotropium europaeum</i>	Potato weed	*
Juncaceae	<i>Juncus sp.</i>	-	
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Mat-rush	
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn ²	*
Chenopodiaceae	<i>Maireana microphylla</i>	Small-lead bluebush	
Poaceae	<i>Paspalidium constrictum</i>	Knobbybutt grass	
Polygonaceae	<i>Polygonum aviculare</i>	Wireweed	*
Poaceae	<i>Rytidosperma sp.</i>	-	*
Chenopodiaceae	<i>Salsola australis</i>	Buckbush	
Chenopodiaceae	<i>Sclerolaena muricata var. Muricata</i>	Black Rolypoly	
Malvaceae	<i>Sida corrugata</i>	Corrugated Side	
Solanaceae	<i>Solanum esuriale</i>	Quena	
Asteraceae	<i>Sonchus oleraceus</i>	Common Sowthistle	*
Zygophyllaceae	<i>Tribulus minutus</i>	Caltrop	
Campanulaceae	<i>Wahlenbergia gracilis</i>	Australian Bluebell	
Poaceae	<i>Walwhalleya proluta</i>	Rigid Panic	

Notes: 1. High threat exotic, as per the BAM (OEH 2017)

2. State priority weed, as identified within the Central West Strategic Weed Management Plan (CWLLS 2017)

Table C.2 Flora species recorded within the BAM (OEH 2017) plot

Family name	Species name	Common name	Weed Species
Fabaceae	<i>Acacia deanei</i>	Green wattle	
Sapindaceae	<i>Alectryon oleifolius</i>	Western Rosewood	
Poaceae	<i>Austrostipa aristiglumis</i>	Plains grass	
Poaceae	<i>Austrostipa scabra</i>	Speargrass	
Brassicaceae	<i>Brassica sp.</i>	-	*
Cupressaceae	<i>Callitris glaucophylla</i>	White Cypress Pine	
Asteraceae	<i>Carthamus lanatus</i>	Saffron Thistle	*
Cactaceae	<i>Cereus uruguayanus</i>	Apple Cactus	*
Poaceae	<i>Chloris truncata</i>	Windmill grass	
Poaceae	<i>Cynodon dactylon</i>	Bermudagrass	
Sapindaceae	<i>Dodonaea viscosa subsp. Cuneata</i>	Sticky hopbush	
Chenopodiaceae	<i>Einadia nutans subsp nutans</i>	Climbing Saltbush	
Chenopodiaceae	<i>Enchylaena tomentosa</i>	Ruby Saltbush	
Myrtaceae	<i>Eucalyptus microcarpa</i>	Grey box	
Boraginaceae	<i>Heliotropium europaeum</i>	Potato weed	*
Lomandraceae	<i>Lomandra filiformis</i>	Wattle Mat-rush	
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn ¹	*
Chenopodiaceae	<i>Maireana sp.</i>		
Poaceae	<i>Rytidosperma sp.</i>	-	*
Chenopodiaceae	<i>Salsola australis</i>	Buckbush	
Chenopodiaceae	<i>Sclerolaena muricata var. Muricata</i>	Black Rolypoly	
Poaceae	<i>Walwhalleya proluta</i>	Rigid Panic	

Notes: 1. High threat exotic, as per the BAM (OEH 2017)

2. State priority weed, as identified within the Central West Strategic Weed Management Plan (CWLLS 2017)

Appendix D

Significant impact assessment - EPBC Act

This section includes an assessment of the potential direct and indirect impacts of the project on MNES. The impact assessment for this project assumes complete disturbance/removal of:

- 0.49 ha of Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia;
- 0.49 ha of vegetation (containing Inland Grey Box trees) which represents potential foraging habitat for the Swift Parrot and Superb Parrot; and
- 0.49 ha of potential *Tylophora linearis* habitat.

The following section provides the criteria that must be considered in the assessment of all threatened species listed under the EPBC Act.

D.1 Significance impact guidelines

In determining the significance of impact associated with the project, the relevant criteria listed in the *Matters of National Environmental Significance – Significance Impact Guidelines 1.1* (DoE 2013) was applied. This assessment has been undertaken for the following MNES values:

- Critically endangered species: Swift Parrot;
- Endangered species: *Tylophora linearis*;
- Vulnerable species: Superb Parrot; and
- Critically endangered and Endangered ecological communities: Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia.

D.2 Assessments of significance

Significant impact assessments have been prepared for species listed under the EPBC Act, in accordance with the criteria above.

D.2.1 Swift Parrot (*Lathamus discolor*) – critically endangered

Inland Grey Box is a commonly used lerp infested tree by the Swift Parrot and occurs within the study area. The Swift Parrot has been recorded within the locality and has the potential to forage on the Inland Grey Box within the study area during Winter.

The Swift Parrot is not considered to be dependent on habitat in the study area and optimal habitat is likely to include areas with a higher density of larger preferred winter flowering feed trees (eg White Box). However the species has been assessed as having the potential to occur given the presence of a commonly used lerp infested tree species (Inland Grey Box) identified in the species recovery plan (Birds Australia 2011).

A total of 0.49 ha of woodland habitat that includes Inland Grey Box will be removed as part of the project. Table D.1 provides an assessment of significance for the removal of this potential foraging habitat, in accordance with the relevant assessment criteria for critically endangered species.

Table D.1 Assessment of significance for the Swift Parrot

Criteria	Discussion
1: Long-term decrease in population size	Potential foraging within the study area may be limited due to lack of key flowering species on which the Swift Parrot forages. White Box is a key species, and although occurring within the locality, does not occur within the study area. Inland Grey Box is a commonly used lerp infested tree by the Swift Parrot and occurs within the study area, and this may provide a potential resource. Potential foraging may be limited for the species due to lack of key flowering feed trees and it is unlikely that the species is reliant on foraging resources within the study area, nor are any substantial numbers of the species likely to occur within the study area. Further, the species does not breed on mainland Australia, and hence there is no potential for breeding habitat to be impacted. As such, there is not likely to be any population level impacts.
2: Reduce area of occupancy	A total area of 0.49 ha of potential foraging habitat, plus an additional 14 scattered trees, will be removed as a result of the project. This species is wide ranging, typically occurring in areas where profuse flowering of feed trees is occurring. The study area does not contain any key nectar species. It is unlikely that the loss a small area of sub-optimal foraging habitat will significantly reduce the occupancy of the species.
3: Fragment a population	This species is highly mobile and is able to cross open areas. The loss of a small area of potential foraging habitat, that occurs on the edge of the existing DWD operation (located to the north east of the study area), and bound by cropped land to the south west, will not cause any fragmentation effects.
4: Adversely affect critical habitat	<p>Habitats of particular importance to the Swift Parrot are outlined in the recovery plan for the species (Birds Australia 2011); including:</p> <ul style="list-style-type: none"> • for nesting; • by large proportions of the Swift Parrot population; • repeatedly between seasons (site fidelity), or • for prolonged periods of time (site persistence). <p>As the study area is within mainland Australia, there is no potential for nesting to occur. The species has not been recorded within the study area and the closest record is approximately 16 km to the north east, in the Back Yamma State Forest. There is no evidence of prolonged occurrence, repeat use or large number of the species occurring in proximity to the study area. Therefore, the project will not affect any habitat critical to the survival of the Swift Parrot.</p>
5: Disrupt the breeding cycle of a population	The Swift Parrot breeds within Tasmania and has no potential to breed within the study area.
6: Decrease availability or quality of habitat	The species has not been recorded within the study area and if it does occur is likely to be on a transient basis only, passing through to more optimal areas of foraging habitat. The Swift Parrot is not considered to be dependent on habitat in the study area and the clearance of a small area of sub-optimal foraging habitat is not likely to cause any discernible impact to the Swift Parrot, and the species will remain largely unaffected by the project.
7: Result in invasive species	Weed invasion impacting on habitat regeneration and health, and aggressive exclusion from forest and woodland habitat by over abundant Noisy Miners are two key threats that invasive species pose on the Swift Parrot. Noisy Miners were not recorded in significant numbers in the proposed extension area during the survey. Without management, vegetation clearing and topsoil stripping may lead to weed invasion in surrounding remaining woodland habitat to the north of the study area). Weed control protocols will be undertaken, in accordance with the proponent's relevant processes and procedures, to ensure plant entering the proposed extension area is weed free. Therefore the project will not result in invasive species that are harmful to the species becoming established in the habitat to the north of the study area.
8: Introduce disease	This species is vulnerable to Psittacine Beak and Feather Disease however the project does not play a role in the introduction of this threat.
9: Interfere with recovery	The key action within the recovery plan for the Swift Parrot (Birds Australia 2011), which is relevant to the project, is the management and protection of Swift Parrot habitat at the landscape scale. The habitat within the study area is unlikely to be important for this species and there is expected to be no impact on its recovery as the result of the project.
Conclusion	It is unlikely that the species is reliant on foraging resources within the study area. Therefore, the habitat to be removed is unlikely to be important for the species and the project is not anticipated to have a significant impact on the Swift Parrot.

D.2.2 *Tylophora linearis* - endangered

This species grows in dry scrub and open forest. It has been recorded from low-altitude sedimentary flats in dry woodlands of Red Ironbark (*Eucalyptus fibrosa*), Mugga Ironbark, White Box, Black Cypress Pine (*Callitris endlicheri*), White Cypress Pine and Bull Oak.

This species has been recorded within the locality and habitat within the study area may be suitable. The species was not recorded during the site inspection, however searches during Spring would need to be undertaken to determine its presence.

A total of 0.49 ha of woodland habitat that includes potential habitat will be removed as part of the project. Table D.2 provides an assessment of significance for the removal of potential habitat, in accordance with the relevant assessment criteria for endangered species.

Table D.2 **Assessment of significance for *Tylophora linearis***

Criteria	Discussion
1: Long-term decrease in population size	The species was not recorded during the site inspection, however searches during Spring would need to be undertaken to determine its presence. Despite this, it is considered unlikely that the removal of 0.49 ha of potential habitat would lead to the long term decrease in population size of this species, particularly given the degraded nature of the habitat present. As such, there is not likely to be any population level impacts.
2: Reduce area of occupancy	A total area of 0.49 ha of potential habitat will be removed as a result of the project. It is unlikely that the loss of a small area of potential habitat will significantly reduce the occupancy of the species, given the much larger areas of potential and better quality habitat to the north and north east of the existing DWD that will be avoided by the project.
3: Fragment a population	The loss of 0.49 ha of potential habitat on the edge of the existing DWD operation (to the north east), and bound by cropped land to the south west, is unlikely to further fragment a population, if it were to occur.
4: Adversely affect critical habitat	No critical habitat is identified for this species. The 0.49 ha area of potential habitat within the study area is not a good example of this species' habitat given that it is isolated and is impacted by surrounding land uses and only contains one associated species, White Cypress Pine. Much larger areas of potential and better quality habitat to the north and north east of the existing DWD will be retained. Therefore the removal of 0.49 ha of potential habitat within the study area will not adversely affect any habitat critical to the survival of the species.
5: Disrupt the breeding cycle of a population	<p>It is unlikely that potential habitat within the study area would support a robust population of <i>Tylophora linearis</i> as the species was not detected during surveys.</p> <p>The potential habitat within the study area occurs directly adjacent to the existing DWD and cropped land. Abiotic factors appear to have adversely affected the habitat with weed species evident on the boundaries of the habitat as well as tracks and rubbish occurring throughout the habitat. No significant abiotic impacts are anticipated to the remaining potential habitat adjacent to the study area more than already exists within the site. Weed control protocols will be undertaken in accordance with the proponent's relevant processes and procedures, to ensure plant entering the project area is weed free, so as to not impact upon the remaining potential habitat adjacent to the study area.</p>
6: Decrease availability or quality of habitat	The species has not been recorded within the study area. The clearance of 0.49 ha of sub-optimal potential habitat is not likely to cause any discernible impact to the species, and the species will remain unaffected by the project.
7: Result in invasive species	Without management, vegetation clearing and topsoil stripping may lead to weed invasion in surrounding remaining habitat to the north of the impact area. Weed control protocols will be undertaken in accordance with the proponent's relevant processes and procedures, to ensure plant entering the project area is weed free. Therefore the project will not result in invasive species that are harmful to the species' potential habitat to the north of the study area.
8: Introduce disease	This species is not known to be particularly susceptible to disease and the project will not introduce any disease relevant to the species.

Table D.2 **Assessment of significance for *Tylophora linearis***

Criteria	Discussion
9: Interfere with recovery	<p>There is currently no adopted national recovery plan for <i>Tylophora linearis</i>.</p> <p>The clearance of 0.49 ha of potential habitat will slightly reduce (less than 1%) the extent of the available woodland habitat directly adjacent to the DWD. However, note that the habitat to impacted is already impacted by the surrounding land uses (cropping and the existing operating DWD) and associated edge effects. To minimise adverse environmental impacts, particularly on potential habitat for this species, the proposed impact area has been refined (Figure 5.1). This has reduced the impact on potential habitat from an original area of 20.1 ha down to 0.49 ha of clearance of the potential habitat.</p> <p>Therefore the project will not interfere with the recovery of the species.</p>
Conclusion	Potential habitat for <i>Tylophora linearis</i> in the locality will not be adversely impacted by the removal of a small area (0.49 ha) of potential habitat for this species

D.2.3 Superb Parrot (*Polytelis swainsonii*) – vulnerable

The Superb Parrot has been recorded within the locality and has the potential to forage within the study area. There is no breeding habitat within the study area due to the lack of suitable hollows and distance from extensive tracts of box-gum woodland that are required for foraging from nesting sites.

The Superb Parrot is not considered to be dependent on habitat in the study area and optimal habitat is likely to include larger areas of better quality woodland. However the species has been assessed as having the potential to occur given the presence of the box gum community. There is no breeding habitat within the study area due to the lack of hollows.

A total of 0.49 ha of woodland habitat that includes Inland Grey Box will be removed as part of the project. Table D.2 provides an assessment of significance for the removal of this potential foraging habitat, in accordance with the relevant assessment criteria for vulnerable species.

Table D.3 **Assessment of significance for Superb Parrot**

Criteria	Discussion
1. Long term decrease in population size	<p>The Superb Parrot has been recorded within the locality and has the potential to forage within the study area. The project will result in the clearance of 0.49 ha and it is unlikely that the species is reliant on foraging resources within the study area, nor are any substantial numbers of the species likely to occur within the study area.</p> <p>Further, the species is not expected to breed within the study area due to the lack of suitable trees with hollows, lack of diversity of tree species within the study area, as well as the distance of the study area from substantial tracts of box gum woodland. The majority of Superb Parrot nests are in large, living trees with many hollow branches (Webster 1998 in Baker-Gabb 2011), of which the study area does not support. Forests and woodlands used for nesting on the inland slopes comprise at least six species of Eucalyptus including River Red Gum, Blakely's Red Gum, Apple Box (<i>E. bridgesiana</i>), Inland Grey Box, White Box and Red Box (<i>E. polyanthemos</i>) (Webster 1998 in Baker-Gabb 2011). The study area contains only Inland Grey Box. Nest sites are almost always located within 10 km of extensive tracts of suitable foraging habitat (Webster 1988 in Baker-Gabb 2011), and may occur within foraging habitat (box-gum woodland). The study area is not located within 10 km of a large tract of woodland and there are no concentrations of records within 10 km of the study area. Hence there is very little potential for breeding habitat to be impacted by the project.</p> <p>As such, there is not likely to be any population level impacts.</p>

Table D.3 Assessment of significance for Superb Parrot

Criteria	Discussion
2. Reduce area of occupancy	A total area of 0.49 ha of potential foraging habitat will be removed as a result of the project. This species is wide ranging and it is unlikely that the loss of 0.49 ha of sub-optimal and fragmented foraging habitat will significantly reduce the occupancy of the species.
3. Fragment a population	The Superb Parrot requires vegetated corridors to move between breeding and foraging habitat (Baker-Gabb 2011). However, the loss of 0.49 ha of potential foraging habitat, that occurs on the edge of the existing DWD operation (located to the north east of the study area), and bound by cropped land to the south west, is unlikely to cause any fragmentation effects.
4. Adversely affect critical habitat	Habitat critical to the survival of the Superb Parrot can be divided into breeding and foraging habitat, as described in the national recovery plan for the species (Baker-Gabb 2011). As outlined, there is no potential for breeding habitat to be impacted by the project. The species has not been recorded within the study area and there are scattered records within the locality, the closest being approximately 3 km to the north east. There is no evidence of prolonged occurrence, repeat use or large number of the species occurring in proximity to the study area and the removal of 0.49 will not affect any habitat critical to the survival of the Swift Parrot.
5. Disrupt the breeding cycle of a population	As outlined, there is no potential for breeding habitat to be impacted by the project.
6. Decrease availability or quality of habitat	The species has not been recorded within the study area and if it does occur is likely to be on a transient basis only, passing through to more optimal areas of foraging habitat. The Superb Parrot is not considered to be dependent on habitat in the study area and the clearance of 0.49 ha of sub-optimal foraging habitat is not likely to cause any discernible impact to the Superb Parrot, and the species will remain largely unaffected by the project.
7. Result in invasive species	Without management, vegetation clearing and topsoil stripping may lead to weed invasion in surrounding remaining habitat to the north of the impact area. Weed control protocols will be undertaken in accordance with the proponent's relevant processes and procedures, to ensure plant entering the project area is weed free. Therefore the project will not result in invasive species that are harmful to the potential habitat to the north of the study area.
8. Introduce disease	This species is not known to be particularly susceptible to disease and the project will not introduce any disease relevant to the Superb Parrot.
9. Interfere with recovery	The key action within the recovery plan for the Superb Parrot (Baker-Gabb 2011), which is relevant to the project, is the management and protection of Superb Parrot habitat. The habitat within the study area is unlikely to be important for this species and there is expected to be no impact on its recovery as the result of the project.
Conclusion	It is unlikely that the species is reliant on foraging resources within the study area. Therefore, the habitat to be removed is unlikely to be important for the species and the project is not anticipated to have a significant impact on the Superb Parrot.

D.2.4 Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Table D.3 provides an assessment of significance for the removal of 0.49 ha of the listed community, in accordance with the relevant assessment criteria for endangered communities.

Table D.3 Assessment of significance for Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Criteria	Discussion
1. Reduce the extent of an ecological community	<p>A total of 0.49 ha of the listed community will be removed as a result of the project. Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia has also been mapped within the immediate vicinity of the proposed extension area (DPM 2015) in the woodland areas to the north and north east of the existing DWD. The area of the listed community within this area is 20.1 ha, as mapped by DPM (2015). This 20.1 ha will not be cleared for the project (Figure 5.1). Therefore, the project will only result in a small reduction of the listed community (less than 1%) in the immediate vicinity of the study area.</p> <p>Therefore, it is considered unlikely that the proposed action will result in a significant reduction of the community extent.</p>
2. Fragment or increase fragmentation	<p>The listed community may provide some habitat linkage around the western periphery of the existing DWD. This link is not continuous however, with gaps of between canopies and a mid and ground layer that is disturbed by the current DWD operations (tracks and rubbish) and to the south of the impact area is Darroobalgie Road. This road also separates the link. This link is therefore only likely to be favourable for species which are able to cross open areas.</p> <p>A similar woodland habitat link exists to the east of the DWD which is both wider in average width and is more continuous in nature than that around the western periphery.</p> <p>There will be no isolation of habitat as a result of the proposal, as alternative woodland linkages exist. Therefore no significant isolation or fragmentation impacts are anticipated.</p>
3. Adversely affect critical habitat	<p>The community identified within the study area meets the minimum condition criteria outlined in the EPBC Act Policy statement for the community (DSEWPac 2012). However, the 0.49 ha area of the community within the study area is not a good example of the community given that it is isolated and is impacted by surrounding land uses. Therefore overall, critical habitat in the locality will not be adversely impacted by the removal 0.49 ha of this vegetation.</p>
4. Modify or destroy abiotic factors necessary for survival	<p>The current community occurs directly adjacent to the existing DWD and cropped land. Abiotic factors appear to have adversely affected the community with weed species evident on the boundaries of the community as well as tracks and rubbish occurring throughout the community. No significant abiotic impacts are anticipated to the community adjacent to the study area more than already exists within the site. Weed control protocols will be undertaken in accordance with the proponent's relevant processes and procedures, to ensure plant entering the project area is weed free, so as to not impact upon the remaining community adjacent to the study area.</p>
5. Cause a substantial change in species composition	<p>The project will remove all habitat within the study area, consequently, there will be no residual functionality of the community within the 0.49 ha. Any areas of the community outside of the disturbance footprint are unlikely to be significantly impacted by indirect means, given the weed control protocols and their functionality is likely to continue unchanged.</p>

Table D.3 Assessment of significance for Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia

Criteria	Discussion
6. Cause a substantial reduction in quality or integrity	<p>The project will remove all habitats within the study area; consequently, there will be no residual risk within the project footprint. Areas outside of the study area have been subjected to the indirect impacts of vehicle movements for a long period of time, e.g the potential importation of invasive species or increased dust levels. The majority of weeds species recorded adjacent to the community are common exotic pasture species associated with surrounding agricultural land use. Weed control protocols will be undertaken in accordance with the proponent's relevant processes and procedures, to ensure plant entering the project area is weed free, so as to not impact upon the remaining community adjacent to the study area. Therefore, it is unlikely that the project will cause a substantial reduction in quality or integrity of the remaining community to the north of study area.</p>
7. Interfere with recovery	<p>There is currently no adopted national recovery plan for this community.</p> <p>The clearance of 0.49 ha of the community will slightly reduce (less than 1%) the extent of the listed community directly adjacent to the DWD. However, note that the community to be impacted is not an exemplary example of the community. To minimise adverse environmental impacts, particularly on the community, the proposed impact area has been refined (Figure 5.1). This has reduced the impact on the community from an original area of 20.1 ha down to 0.49 ha of clearance of the community.</p> <p>Therefore the project will not interfere with the recovery of the species.</p>
Conclusion	<p>Although the Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia identified within the study area meets the condition criteria for inclusion as the TEC under the EPBC Act, the vegetation is not an exemplary example of the community, given its small size, fragmentation and known disturbance history. Therefore overall, critical habitat in the locality will not be adversely impacted by the removal of this vegetation because impact from the project is only on a small area (0.49 ha) and is considered insignificant.</p>

Appendix E

Assessments of significance - BC Act

E.1 Assessment of significance

Section 7.3 of the BC Act provides the criteria that must be considered in the assessment of the significance of potential impacts on threatened species listed under the BC Act (the '5-part test').

E.1.1 Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction:*

Not applicable.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
 - b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

The local occurrence of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions has been mapped within the immediate vicinity of the proposed extension area (DPM 2015) in the woodland areas to the north and east of the existing DWD. The area of the listed community within this area is 20.1 ha and will not be cleared for the project (Figure 5.1). Therefore, the project will only result in a small reduction of the listed community (approximately 1%) in the immediate vicinity of the study area. This is a very small proportion of the community and will have a negligible impact on the extent of the community and the community will not be placed at risk of extinction.

3. *In relation to the habitat of a threatened species or ecological community:*
 - a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or action;*
 - b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or action;*
 - c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality;*

Only small areas of the community within the immediate vicinity of the project (approximately 1%) will be removed. The existing vegetation currently occurs in a highly fragmented landscape and the removal of small areas of the community is unlikely to significantly change this.

The 0.49 ha of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions to be removed is not considered important for the long-term survival of the community in the locality. The 0.49 ha is not considered a good example of the community as it occurs directly adjacent to the existing DWD and cropped land. Abiotic factors appear to have adversely affected the community with weed species evident on the boundaries of the community as well as tracks and rubbish occurring throughout the community.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (whether directly or indirectly);*

Not applicable.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of, a key threatening process.*

A key threatening process relevant to project is “the clearing of native vegetation”. The removal of 0.49 ha of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions classifies as the clearing of native vegetation, as the project will remove parts of one or more strata layers of vegetation in these areas.

Conclusion

The removal of 0.49 ha of Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions within the study area will not have a significant impact on the community in the locality as the proposed clearing is of low magnitude, and represents a small proportion of the community within the locality.

E.1.2 Little-Pied Bat (*Chalinolobus picatus*) (vulnerable)

The Little-Pied Bat is found in inland NSW (including Western Plains and slopes). This species occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimil box woodlands. Roosting occurs within caves, rocky outcrops, mine shafts, tunnels, tree hollows and buildings (OEH 2018).

This species has been recorded within the locality and the species has the potential to forage within the study area. There is no breeding or roosting habitat within the study area due to the lack of hollows.

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction:*

The project will not remove any potential breeding habitat for the Little-Pied Bat due to the absence of suitable structures and therefore is unlikely to impact on the lifecycle of this species. The proposal will remove 0.49 ha of potential foraging habitat for the species. This species is highly mobile and there are much larger higher quality areas of foraging habitat adjacent to the study area. The lifecycle of this species is unlikely to be threatened by the proposal.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*

- b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable.

3. *In relation to the habitat of a threatened species or ecological community:*

- a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or action;*
- b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or action;*
- c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality;*

The project will remove 0.49 ha of potential foraging habitat for the Little-Pied Bat. No breeding habitat will be removed as suitable features are absent from the study area.

The vegetated foraging habitat within the study area is of sub-optimal quality and the removal of 0.49 ha of potential habitat will not cause any significant increase in fragmentation in the landscape, considering the foraging range of the species.

The vegetated habitat within the study area consists of moderate quality woodland with a lack of tree hollows or accumulations of exfoliating bark, which could be used as roosting sites for microbats. The community present is disturbed due to surrounding land uses, which is likely to reduce the amount and diversity of invertebrate prey available to the Little-Pied Bat. The habitat to be removed has no significant importance to this species, as larger and more optimal foraging and roosting habitat is present in the locality.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (whether directly or indirectly);*

The study area does not occur within or nearby any declared area of outstanding biodiversity value.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of, a key threatening process.*

The KTP 'clearing of native vegetation' is most relevant to this species. Vegetation clearance within the study area is restricted to a disturbed vegetation community. The total amount of native vegetation clearance is limited to 0.49 ha which is likely to have a negligible impact on the Little-Pied Bat.

Conclusion:

The project will not have a significant impact on the Little-Pied Bat, as:

- no important roost sites will be impacted;
- a small area of potential foraging habitat will be removed, however there are larger areas of higher quality foraging habitat close to the study area which will not be impacted; and
- no breeding habitat will be removed.

E.1.3 Threatened woodland bird species

The following woodland birds, as listed under the BC Act, have the potential to occur within the study area:

- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) – potential foraging and breeding - V;
- Bush Stone-curlew (*Burhinus grallarius*) - potential foraging and breeding - E;
- Speckled Warbler (*Chthonicola sagittata*) - potential foraging and breeding - V;
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*) – potential foraging and breeding - V;
- Varied Sittella (*Daphoenositta chrysoptera*) - potential foraging and breeding - V;
- Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*) - potential foraging and breeding - V;
- Scarlet Robin (*Petroica boodang*) - potential foraging – V;
- Flame Robin (*Petroica phoenicea*) - potential foraging – V;
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) - recorded – V; and
- Diamond Firetail (*Stagonopleura guttata*) - potential foraging and breeding - V.

These species has been recorded within the locality and have the potential to forage and/or breed within the study area. However, due to the small area of impact (0.49 ha) it is considered that the habitat is not of importance to any of these species.

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction:*

The proposal will remove 0.49 ha of potential foraging and/or breeding habitat for the woodland bird species. However, these species are highly mobile and there are much larger higher quality areas of foraging habitat and/or breeding adjacent to the study area. The lifecycle of these species is unlikely to be threatened by the proposal.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
 - b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable.

3. *In relation to the habitat of a threatened species or ecological community:*
- a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or action;*
 - b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or action;*
 - c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality;*

The vegetated foraging and/or breeding habitat within the study area is of sub-optimal quality and the removal of 0.49 ha of potential habitat will not cause any significant increase in fragmentation in the landscape, considering that Daroobalgie road intersects any linkage to the south and the highly mobile nature of these species.

The community present is disturbed due to surrounding land uses, which is likely to reduce the amount and diversity of invertebrate prey available to the woodland birds. The habitat to be removed has no significant importance to these species, as larger and more optimal foraging, roosting and nesting habitat is present in the locality.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (whether directly or indirectly);*

The study area does not occur within or nearby any declared area of outstanding biodiversity value.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of, a key threatening process.*

The KTP 'clearing of native vegetation' that is most relevant to these woodland bird species. Vegetation clearance within the study area is restricted to a disturbed vegetation community. The total amount of native vegetation clearance is limited to 0.49 ha which is likely to have a negligible impact on these species.

E.1.4 Threatened raptor species

The following raptor species, as listed under the BC Act, have the potential to forage within the study area:

- Spotted Harrier (*Circus assimilis*) - potential foraging – V;
- Black Falcon (*Falco subniger*) - - potential foraging – V;
- Little Eagle (*Hieraaetus morphnoides*) - potential foraging – V; and
- Square-tailed Kite (*Lophoictinia isura*) - potential foraging – V.

These species has been recorded within the locality and have the potential to forage within the study area. However, due to the small area of impact (0.49 ha) it is considered that the habitat is not of importance to any of these species.

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction:*

The proposal will remove 0.49 ha of potential foraging habitat for the raptor species. However, these species are highly mobile and there are much larger higher quality areas of foraging habitat adjacent to the study area. The lifecycle of these species is unlikely to be threatened by the proposal.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
 - b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable.

3. *In relation to the habitat of a threatened species or ecological community:*
 - a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or action;*
 - b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or action;*
 - c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality;*

The vegetated foraging habitat within the study area is of sub-optimal quality and the removal of 0.49 ha of potential habitat will not cause any significant increase in fragmentation in the landscape, considering that Darroobalgie road intersects any linkage to the south and the highly mobile and large ranging nature of these species.

The vegetation community present is disturbed due to surrounding land uses, which is likely to reduce the amount and diversity of small mammal prey available to the raptor species. The habitat to be removed has no significant importance to these species, as larger and more optimal foraging habitat is present in the locality.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (whether directly or indirectly);*

The study area does not occur within or nearby any declared area of outstanding biodiversity value.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of, a key threatening process.*

The KTP 'clearing of native vegetation' that is most relevant to these woodland bird species. Vegetation clearance within the study area is restricted to a disturbed vegetation community. The total amount of native vegetation clearance is limited to 0.49 ha which is likely to have a negligible impact on these species.

E.1.5 Threatened parrot species

The following parrot species, as listed under the BC Act, have the potential to forage within the study area:

- Little Lorikeet (*Glossopsitta pusilla*) - potential foraging – V;
- Swift Parrot (*Lathamus discolor*) - potential foraging – E;
- Turquoise Parrot (*Neophema pulchella*) - potential foraging – V; and
- Superb Parrot (*Polytelis swainsonii*) - potential foraging – V.

These species have been recorded within the locality and have the potential to forage within the study area. However, due to the small area of impact (0.49 ha) it is considered that the habitat is not of importance to any of these species.

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction:*

The proposal will remove 0.49 ha of potential foraging habitat for the threatened parrot species. These species are likely to move through the study area on a transient basis only, passing through to more optimal areas of foraging habitat. The parrot species are not considered to be dependent on habitat in the study area and the clearance of 0.49 ha of sub-optimal foraging habitat is not likely to cause any discernible impact and these species will remain largely unaffected by the project. The lifecycle of these species is unlikely to be threatened by the proposal.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
 - b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable.

3. *In relation to the habitat of a threatened species or ecological community:*
 - a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or action;*
 - b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or action;*
 - c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality;*

The vegetated foraging habitat within the study area is of sub-optimal quality and the removal of 0.49 ha of potential habitat will not cause any significant increase in fragmentation in the landscape, considering that Darroobalgie road intersects any linkage to the south and the highly mobile nature of these species.

The community present is disturbed due to surrounding land uses and the habitat to be removed has no significant importance to these species, as larger and more optimal foraging habitat (with mature trees and more canopy species diversity, including White Box) is present in the locality. These species are highly mobile and are able to cross open areas. The loss of 0.49 ha of potential foraging habitat, that occurs on the edge of the existing DWD operation (located to the north east of the study area), and bound by cropped land to the south west, will not cause any fragmentation effects.

There is no evidence of prolonged occurrence, repeat use or large number of these species occurring in proximity to the study area and it is considered that the 0.49 ha of potential habitat to be removed is unlikely to be important to these species.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (whether directly or indirectly);*

The study area does not occur within or nearby any declared area of outstanding biodiversity value.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of, a key threatening process.*

The KTP 'clearing of native vegetation' that is most relevant to these parrot species. Vegetation clearance within the study area is restricted to a disturbed vegetation community. The total amount of native vegetation clearance is limited to 0.49 ha which is likely to have a negligible impact on these species.

E.1.6 *Tylophora linearis* (vulnerable)

Tylophora linearis has been recorded within the locality and habitat within the study area may be suitable. The species was not recorded during the site inspection, however searches during Spring would need to be undertaken to determine its presence.

A total of 0.49 ha of potential woodland habitat that includes potential habitat will be removed as part of the project.

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction:*

The potential habitat for *Tylophora linearis* within the study area occurs directly adjacent to the existing DWD and cropped land. Abiotic factors appear to have adversely affected the habitat with weed species evident on the boundaries of the habitat as well as tracks and rubbish occurring throughout the habitat. No significant abiotic impacts are anticipated to the remaining potential habitat adjacent to the study area more than already exists within the site. Weed control protocols will be undertaken in accordance with the proponent's relevant processes and procedures, to ensure plant entering the project area is weed free, so as to not impact upon the remaining potential habitat adjacent to the study area. Therefore, the lifecycle of these species is unlikely to be threatened by the proposal.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*

- b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable.

3. *In relation to the habitat of a threatened species or ecological community:*

- a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or action;*
- b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or action;*
- c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality;*

The potential habitat within the study area is of sub-optimal quality and the removal of 0.49 ha of potential habitat will not cause any significant increase in fragmentation in the landscape, considering that Daroobalgie road intersects any linkage to the south and the highly mobile nature of these species.

The potential habitat present is disturbed due to surrounding land uses and the habitat to be removed has no significant importance to this species, as larger and more optimal habitat (of better quality) is present in the locality. The loss of 0.49 ha of potential habitat, that occurs on the edge of the existing DWD operation (located to the north east of the study area), and bound by cropped land to the south west, will not cause any fragmentation effects.

The species has not been recorded within the study area. The clearance of 0.49 ha of sub-optimal potential habitat is not likely to cause any discernible impact to the species, and the species will remain unaffected by the project. Therefore it is considered that the 0.49 ha of potential habitat to be removed is unlikely to be important to these species.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (whether directly or indirectly);*

The study area does not occur within or nearby any declared area of outstanding biodiversity value.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of, a key threatening process.*

The KTP 'clearing of native vegetation' that is most relevant to this species. Vegetation clearance within the study area is restricted to a disturbed vegetation community. The total amount of native vegetation clearance is limited to 0.49 ha which is likely to have a negligible impact on this species.

E.1.7 Bush Stone-curlew (*Burhinus grallarius*) (endangered)

The Bush Stone-curlew has been recorded within the locality and has the potential to forage and breed within the study area. However, due to the small area of impact (0.49 ha) it is considered that the habitat is not of importance to any of these species.

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction:*

The proposal will remove 0.49 ha of potential foraging and breeding habitat for the Bush Stone-curlew. However there are much larger higher quality areas of foraging habitat and breeding to the north and east of the study area. The lifecycle of this species is unlikely to be threatened by the proposal.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
 - b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable.

3. *In relation to the habitat of a threatened species or ecological community:*
 - a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or action;*
 - b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or action;*
 - c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality;*

The vegetated foraging and breeding habitat within the study area is of sub-optimal quality and the removal of 0.49 ha of potential habitat will not cause any significant increase in fragmentation in the landscape, considering that Daroobalgie road intersects any linkage to the south.

The habitat present is disturbed due to surrounding land uses. The operating DWD, including vehicular movement along the adjacent trail to the habitat, is likely to cause disturbance to this ground nesting, ground foraging and mainly nocturnal bird. Further, the prevalence of foxes in this woodland patch (a deceased fox was observed within a large hollow log) is also likely to impede breeding of ground-nesting birds such as the bush stone-curlew.

Therefore, the habitat to be removed has no significant importance to these species, as larger and more optimal foraging and nesting habitat is present in the locality.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (whether directly or indirectly);*

The study area does not occur within or nearby any declared area of outstanding biodiversity value.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of, a key threatening process.*

The KTP 'clearing of native vegetation' that is most relevant to this species. Vegetation clearance within the study area is restricted to a disturbed vegetation community. The total amount of native vegetation clearance is limited to 0.49 ha which is likely to have a negligible impact on the Bush Stone-curlew.

E.1.8 Black-chinned Honeyeater (*Melithreptus gularis gularis*) (vulnerable)

This species has been recorded within the locality and potential sub-optimal foraging and breeding habitat exists within the study area. However, due to the small area of impact (0.49 ha) it is considered that the habitat is not of importance to any of these species.

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction:*

The proposal will remove 0.49 ha of potential foraging and breeding habitat for the Black-chinned Honeyeater. This species is not considered to be dependent on habitat and better quality habitat occurs to the north and east of the DWD. The clearance of 0.49 ha of sub-optimal foraging and nesting habitat is not likely to cause any discernible impact and this species, if present, will remain largely unaffected by the project. The lifecycle of these species is unlikely to be threatened by the proposal.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*
 - a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
 - b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable.

3. *In relation to the habitat of a threatened species or ecological community:*
 - a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or action;*
 - b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or action;*
 - c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality;*

The vegetated foraging and nesting habitat within the study area is of sub-optimal quality and the removal of 0.49 ha of potential habitat will not cause any significant increase in fragmentation in the landscape, considering that Darroobalgie road intersects any linkage to the south and the highly mobile nature of these species.

The community present is disturbed due to surrounding land uses and the habitat to be removed has no significant importance to these species, as larger and more optimal foraging habitat (with mature trees and more canopy species diversity) is present in the locality. This species is highly mobile and is able to cross relatively open areas. The loss of 0.49 ha of potential foraging habitat, that occurs on the edge of the existing DWD operation (located to the north east of the study area), and bound by cropped land to the south west, will not cause any fragmentation effects.

There is no evidence of prolonged occurrence, repeat use or large number of this species occurring in proximity to the study area and it is considered that the 0.49 ha of potential habitat to be removed is unlikely to be important to this species.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (whether directly or indirectly);*

The study area does not occur within or nearby any declared area of outstanding biodiversity value.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of, a key threatening process.*

The KTP 'clearing of native vegetation' that is most relevant to the Black-chinned Honeyeater. Vegetation clearance within the study area is restricted to a disturbed vegetation community. The total amount of native vegetation clearance is limited to 0.49 ha which is likely to have a negligible impact on this species.

Appendix D

ABORIGINAL HERITAGE ASSESSMENT



View of Proposal area from southeast corner facing northwest.

ABORIGINAL DUE DILIGENCE ARCHAEOLOGICAL ASSESSMENT

**Daroobalgie Landfill Expansion
Forbes LGA
May 2018**

Report Prepared by
OzArk Environmental & Heritage Management Pty Ltd
for Geolyse on behalf of Forbes Shire Council



**Environmental and
Heritage Management P/L**

OzArk EHM

145 Wingewarra St
(PO Box 2069)
Dubbo NSW 2830

Phone: (02) 6882 0118
Fax: (02) 6882 0630
enquiry@ozarkehm.com.au
www.ozarkehm.com.au

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Prepared For	Prepared By		
Andrew Brownlow Manager – Environmental / Director Geolyse Pty Ltd 154 Peisley Street PO Box 1963 Orange NSW 2800 P: 02 6393 5000 M: 0417 210 253 abrown@geolyse.com	Alyce Cameron Archaeologist OzArk Environmental & Heritage Management Pty. Limited 145 Wingewarra Street (PO Box 2069) Dubbo NSW 2830 P: 02 6882 0118 F: 02 6882 6030 alyce@ozarkehm.com.au		
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Acknowledgement

OzArk acknowledge Traditional Owners of the area on which this assessment took place and pay respect to their beliefs, cultural heritage and continuing connection with the land. We also acknowledge and pay respect to the post-contact experiences of Aboriginal people with attachment to the area and to the elders, past and present, as the next generation of role models and vessels for memories, traditions, culture and hopes of local Aboriginal people.

EXECUTIVE SUMMARY

OzArk Environmental & Heritage Management (OzArk) has been engaged by Geolyse (the client), on behalf of Forbes Shire Council (the proponent) to complete an Aboriginal Due Diligence archaeological assessment of the Darroobalgie Landfill Expansion. This report examines proposed works associated with the proposed landfill expansion (the proposal). The Proposal Area is situated within the Forbes Local Government Area.

The visual inspection of the Proposal Area was undertaken by OzArk Project Archaeologist, Dr Alyce Cameron, on Friday 27 April 2018. No Aboriginal sites or sensitive landforms were recorded as a result of the inspection.

The undertaking of the due diligence process resulted in the conclusion that the proposed works will have an impact on the ground surface, however, no Aboriginal objects or intact archaeological deposits will be harmed by the proposal. This moves the proposal to the following outcome:

AHIP (Aboriginal Heritage Impact Permit) application not necessary. Proceed with caution. If any Aboriginal objects are found, stop work and notify OEH (Office of Environment and Heritage). If human remains are found, stop work, secure the site and notify NSW Police and OEH.

To ensure the greatest possible protection to the area's Aboriginal cultural heritage values, the following recommendations are made:

- 1) The proposed work may proceed within the Proposal Area without further archaeological investigation under the following conditions:
 - a) All land and ground disturbance activities must be confined to within the Proposal Area. Should the parameters of the proposal extend beyond the assessed areas, then further archaeological assessment may be required.
 - b) All staff and contractors involved in the proposed work should be made aware of the legislative protection requirements for all Aboriginal sites and objects.
- 2) This assessment has concluded that there is a low likelihood that the proposed work will adversely harm Aboriginal cultural heritage items or sites. However, during the course of works, if Aboriginal artefacts or skeletal material are noted, all work should cease and the procedures in the *Unanticipated Finds Protocol* (**Appendix 2**) should be followed;
- 3) Work crews should undergo cultural heritage induction to ensure they recognise Aboriginal artefacts (see **Appendix 3**) and are aware of the legislative protection of Aboriginal objects under the NPW Act and the contents of the *Unanticipated Finds Protocol*.
- 4) The information presented here meets the requirements of the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. It should be retained

as shelf documentation for five years as it may be used to support a defence against prosecution in the event of unanticipated harm to Aboriginal objects.

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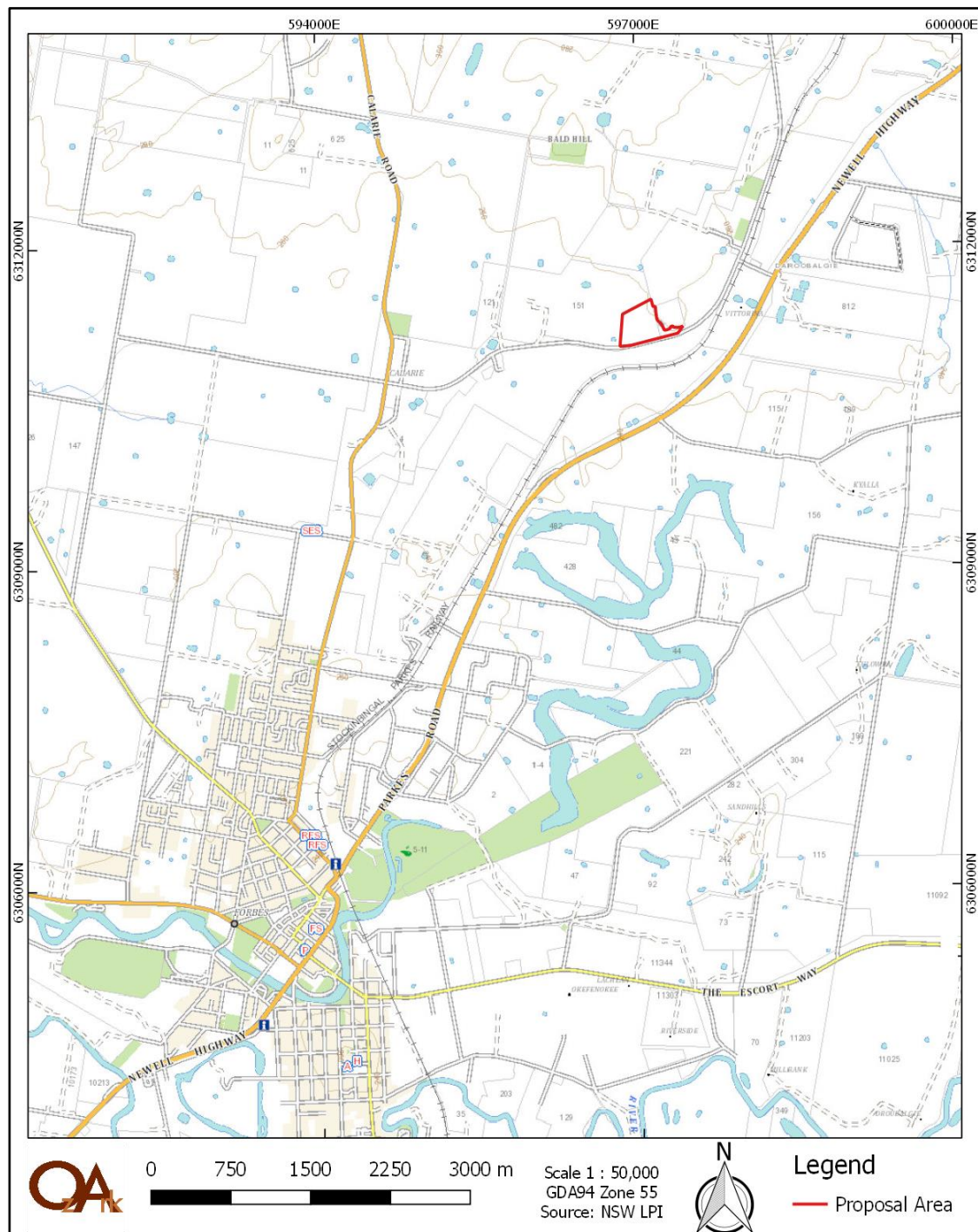
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1 INTRODUCTION

1.1 BRIEF DESCRIPTION OF THE PROPOSAL

OzArk Environmental & Heritage Management (OzArk) has been engaged by Geolyse (the client), on behalf of Forbes Shire Council (the proponent) to complete a Due Diligence archaeological assessment for the Daroobalgie Landfill Expansion. This report examines proposed works associated with the Daroobalgie Landfill Expansion (the proposal). The Proposal is situated within the Forbes Local Government Area (LGA) (**Figure 1-1**).

Figure 1-1. Location of the Proposal Area.



1.2 BACKGROUND

This Due Diligence consisted of a desktop assessment and a visual inspection. The visual inspection was undertaken at the request of the client. Satellite imagery shows that the majority of the Proposal Area has been ploughed or is part of the current Daroobalgie Waste Depot (DWD) (**Figure 1-2**). A search of the Aboriginal Heritage Information System (AHIMS) database showed that no previously recorded Aboriginal sites are located on the land being assessed.

1.3 PROPOSAL AREA

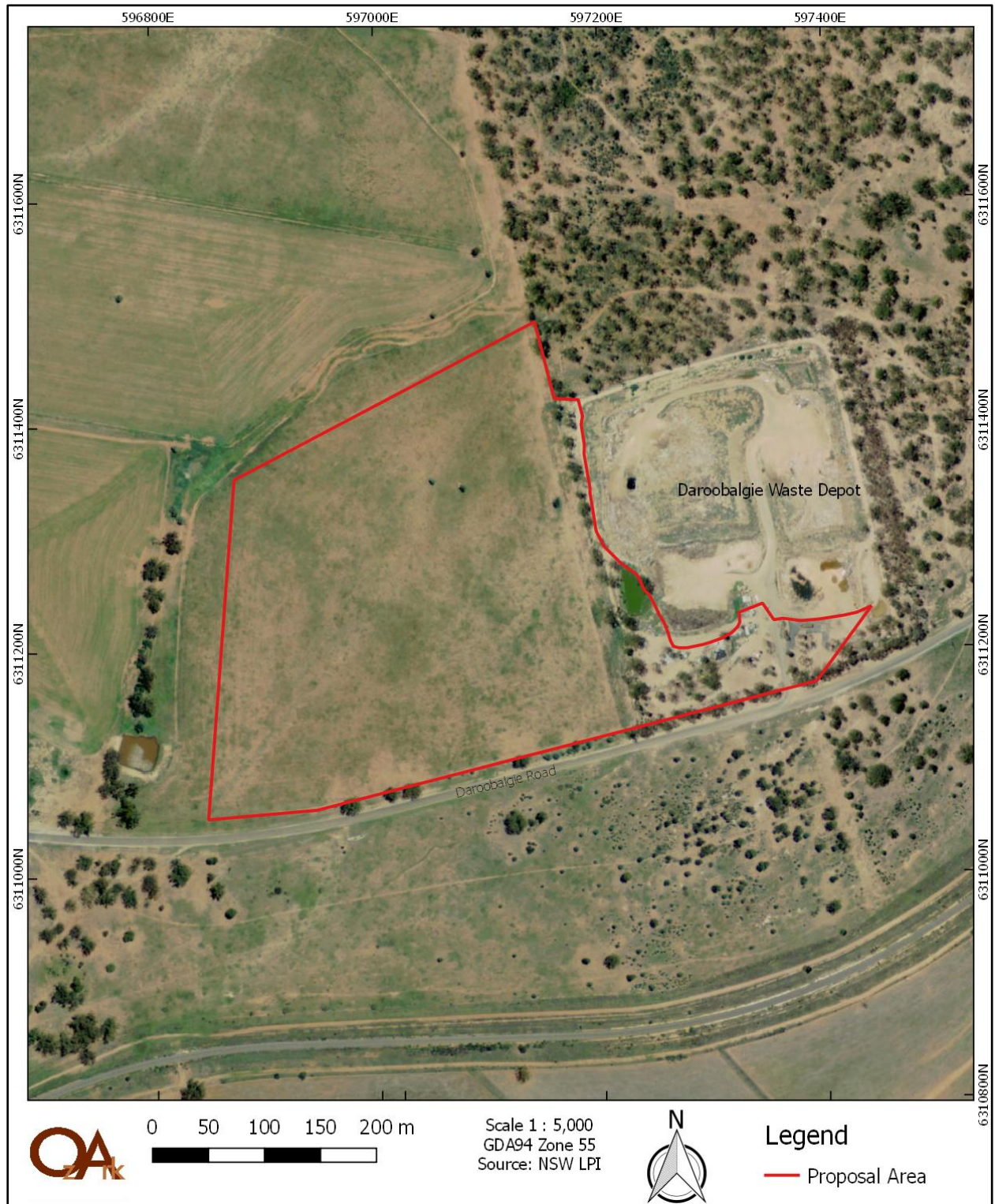
The Proposal Area is situated adjacent to the western boundary of the DWD. The proposed expansion will extend the current DWD area to the west, south and southwest and will cover an area approximately 18.9ha in total. The Proposal Area is bordered by the Daroobalgie Road along the south and an unnamed watercourse to the west and north.

The majority of the Proposal Area has previously been used for grazing and extensive agricultural land uses or is part of the current DWD.

ASSESSMENT APPROACH

The desktop and visual inspection component for the Proposal Area follows the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (Due Diligence; DECCW 2010). The field inspection followed the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011).

Figure 1-2: Aerial showing the proposal.



2 DUE DILIGENCE ASSESSMENT

2.1 INTRODUCTION

The National Parks and Wildlife Regulation 2009 (NPW Regulation) made under the *National Parks and Wildlife Act 1974* (NPW Act) advocates a Due Diligence process to determining likely impacts on Aboriginal objects. Carrying out Due Diligence provides a defence to the offence of harming Aboriginal objects and is an important step in satisfying Aboriginal heritage obligations in NSW.

2.2 DEFENCES UNDER THE NPW REGULATION 2009

2.2.1 Low impact activities

The first step before application of the Due Diligence process itself is to determine whether the proposed activity is a “low impact activity” for which there is a defence in the NPW Regulation. The exemptions are listed in Section 80B (1) of the NPW Regulation (DECCW 2010: 6).

The activities associated with the expansion of the Darroobalgie Waste Depot are not considered a ‘low impact activity’. Also, as the proposed work is located in landforms with a heightened potential to reveal Aboriginal cultural material (within 200m of a watercourse), the Due Diligence process must be applied.

2.2.2 Disturbed lands

Relevant to this process is the assessed levels of previous land-use disturbance.

The NPW Regulation Section 80B (4) (DECCW 2010a: 18) define disturbed land as follows:

Land is disturbed if it has been the subject of a human activity that has changed the land’s surface, being changes that remain clear and observable.

Examples include ploughing, construction of rural infrastructure (such as dams and fences), construction of roads, trails and tracks (including fire trails and tracks and walking tracks), clearing vegetation, construction of buildings and the erection of other structures, construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage and other similar infrastructure) and construction of earthworks.

Sections of the proposed work are located in previously cleared landforms which contain the current DWD and areas used for crop cultivation and cattle grazing (see **Plate 1** and **Plate 2** for photos of Proposal Area). Due to this, it could be considered that the proposed work is occurring in ‘disturbed land’. However, sections of the proposed work are within 200m of a watercourse and there are tree-lines within the area where the land’s surface

has not been changed in a clear and observable manner and the Due Diligence process must be applied.

2.3 APPLICATION OF THE DUE DILIGENCE CODE OF PRACTICE TO THE PROPOSAL

To follow the generic Due Diligence process, a series of steps in a question/answer flowchart format (DECCW 2010: 10) are applied to the proposed impacts and the Proposal Area, and the responses documented.

2.3.1 Step 1

Will the activity disturb the ground surface or any culturally modified trees?

Yes the activity will disturb the ground surface. There are no culturally modified trees recorded within the Proposal Area.

The proposed works will include:

- The excavation of a new landfill site within the Proposal Area. This includes excavating and filling the new landfill site in progressive stages;
- Planting a tree corridor around the west, north and south area of the Proposal Area;
- Building a new waste receiving area, within the current DWD and south of the current landfill; and
- Building a surface water pond in the south-west corner of the Proposal Area.

2.3.2 Step 2a)

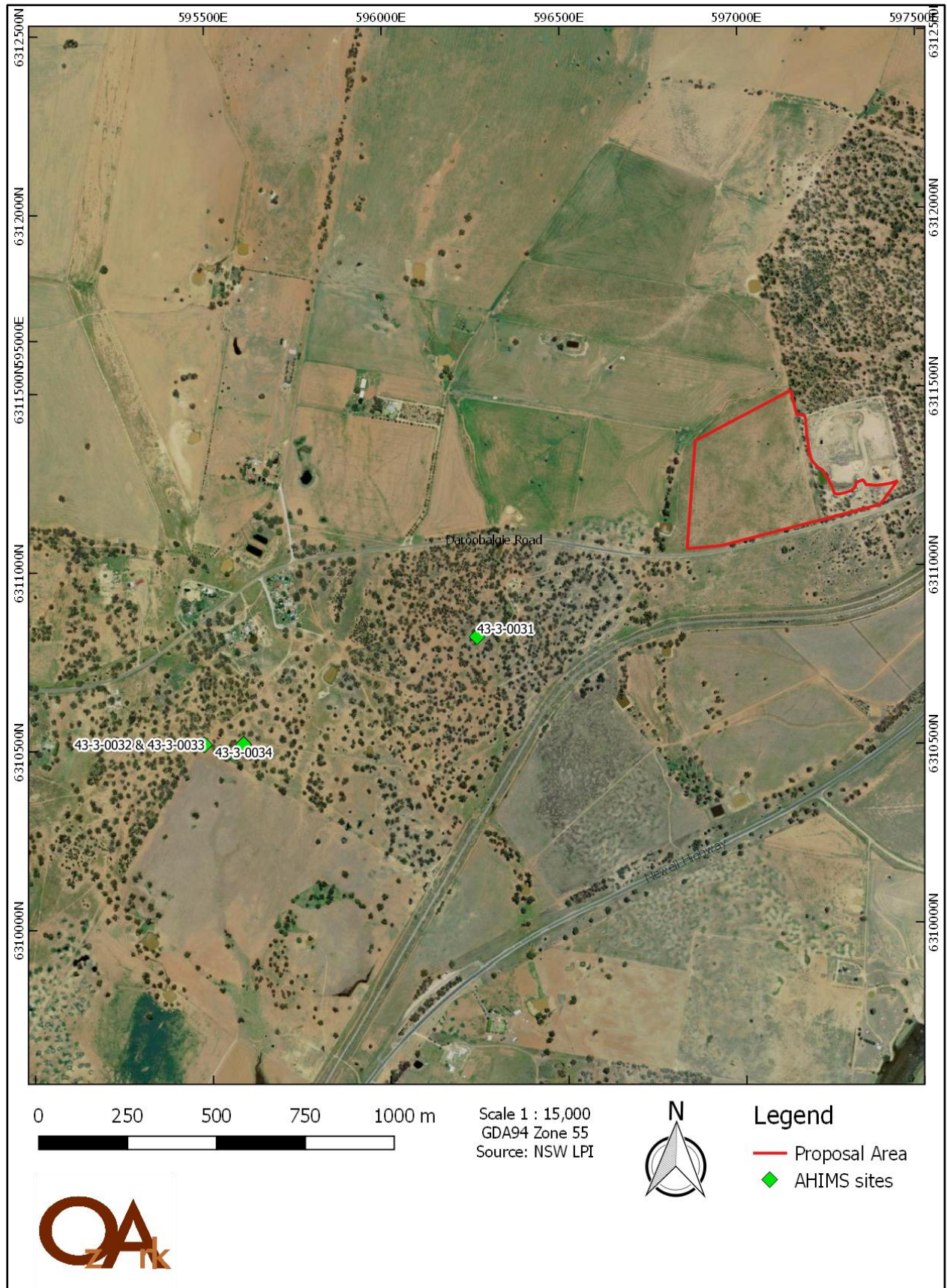
Are there any relevant confirmed site records or other associated landscape feature information on AHIMS?

A search of AHIMS was conducted on 24 April 2018 using a 5km radius around the Proposal Area. The search detailed there were four sites within the 5km radius, three scarred trees and one isolated artefact. The isolated artefact (AHIMS #43-3-0031) is located 900m southwest of the Proposal Area, while the scarred trees (AHIMS #43-3-0032, #43-3-0033 and #43-3-0034) are located approximately 1.9km southwest. **Table 2-1** and **Figure 2-1** outline the type, frequency and location of these sites.

Table 2-1: AHIMS site types and frequencies.

Site Type	Number	% Frequency
Scarred tree	3	75
Isolated artefact	1	25

Figure 2-1: The Proposal Area in relation to previously recorded sites.



2.3.3 Step 2b)

Are there any other sources of information of which a person is already aware?

At the time of European settlement, the Proposal Area was situated within the territory of the people belonging to the *Wiradjuri* tribal and linguistic group (Tindale 1974). The Wiradjuri people referred to the Lachlan River as Galiyarr (Kass 2003). The Wiradjuri tribal area is situated within the Murray-Darling Basin, covering three primary physiographic divisions (White 1986):

- The riverine plains in the west;
- The transitional western slopes in between; and
- The highlands or central tablelands in the east.

The Proposal Area falls within the central division, being the transitional western slopes into the central tablelands, the heart of Wiradjuri territory.

As in most parts of NSW, white diseases were a precursor to white settlement and this was already having an impact on the population encountered by early settlers. By the 1820s, tales of white settlement include stories of clashes including massacres of the natives and revenge attacks. The colonial authorities formed military outposts at Bathurst and Wellington, and defensive homesteads became a characteristic of white settlement west of the Blue Mountains. Throughout the following decades, significant numbers of Aboriginal people continued to follow a traditional lifestyle on the Lachlan Plains; with the expansion of agriculture and pastoralism, however, many traditional practices became increasingly difficult. The establishment of reserves and missions from the 1890s emphasised the segregation of Indigenous and non-Indigenous communities and exacerbated poverty and lack of access to services. However, it also enabled Wiradjuri families to remain intact and develop a sense of identity and resilience (Kass 2003).

A number of development-driven studies have been conducted in the Forbes area. During the 1990s, Kelton (1994a, 1994b, 1995a, 1995b, and 1996) recorded at least 14 scarred trees, five isolated finds and two open sites associated with gilgai landforms. As a result of these studies, Kelton postulated that scarred trees were commonly located within road corridors and public lands due to the fact that Aboriginal people were restricted to such areas during the historical period (Kelton 1996). Also during the 1990s, Huys and Johnston (1995) identified seven (7) Aboriginal open sites during a survey for a new road and 132kV electricity transmission line to the west of Forbes. Six of these sites were small, with low artefact densities. A seventh site was situated on raised ground overlooking the Lake Cowal flood plains and was considerably larger than the other six, with the authors recording a sample of 28 artefacts. The authors argued that the source of the chert and quartz materials was probably Wamboyne and the Manna Mountains, located to the north-west, whilst the silcrete was thought to be derived locally.

OzArk (2011) conducted surveys located to the north and west of Forbes in relation to Country Energy's proposed 66kV electricity transmission line. Four previously unrecorded Aboriginal sites—all scarred trees—were identified during that survey and two previously recorded Aboriginal sites (AHIMS #43-2-0025 and #26-3-0015) were ground-truthed.

Finally, OzArk (2013) conducted a survey along a corridor proposed for a heavy vehicle bypass between Bogan Gate Road to the Newell Highway, which included Daroobalgie Road directly south of the DWD. Three isolated stone artefacts were recorded along the western half of the bypass corridor during the survey.

There are no known cultural values or Aboriginal sites pertaining directly to the Proposal Area. No Aboriginal community members accompanied the current visual inspection.

2.3.4 Step 2c)

Are there any landscape features that are likely to indicate presence of Aboriginal objects?

The Proposal Area is located on the Calarie Plains landscape. The Calarie Plains landscape is formed on Silurian and Devonian quartzite, sandstone, conglomerate and small areas of limestone (Mitchell 2002). There is an unnamed watercourse to the west and north of the Proposal Area. According to satellite imagery, there is also a small dam along the length of the watercourse outside the southwest corner of the Proposal Area. The Proposal Area is on 'Parkes' erosional and 'Bald Hill' erosional soils. The remaining vegetation within the Proposal Area is classified as being not native or Western Grey box tall grassy woodland (OEH 2015).

Culturally modified trees are the most commonly recorded Aboriginal site in the vicinity of the Proposal Area. Most have been recorded in areas containing remnant stands of mature native trees. As such, this site type could occur in the Proposal Area if remnant mature native trees exist. Artefact sites (including artefact scatters and isolated finds) are the next most commonly recorded Aboriginal sites in the vicinity of the Proposal Area. These types of sites are often located in the vicinity of watercourses. Due to the proximity of the unnamed watercourse along the north and west boundary of the Proposal Area, it is possible that artefacts may be located there.

Although not required by the Due Diligence process, the Proponent has elected to apply the precautionary principle and proceed to visual inspection of the Proposal Area (**Section 2.3.6**) in order to ground-truth the findings of the above desktop level assessment.

2.3.5 Step 3

Can harm to Aboriginal objects listed on AHIMS or identified by other sources of information and/or can the carrying out of the activity at the relevant landscape features be avoided?

No. The Proposal Area could include landscape features that contain, or have the potential to contain Aboriginal objects and sites, and these landscape features are not able to be avoided. There are also mature trees within the Proposal Area, and therefore there is the potential for culturally modified trees.

2.3.6 Step 4

Does a desktop assessment and visual inspection confirm that there are Aboriginal objects or that they are likely?

No. There were no Aboriginal sites or culturally modified trees identified during the visual inspection and the Proposal Area has been assessed as having low potential for Aboriginal cultural heritage.

The visual inspection of the Proposal Area was undertaken by OzArk Project Archaeologist, Dr Alyce Cameron, on Friday 27 April 2018. The visual inspection involved an assessment of the Proposal Area outside the current DWD (**Figure 2-2**). The field inspection was undertaken on foot and sections where there was good ground surface visibility were targeted. The edges of the watercourse and any mature trees within the Proposal Area were also specifically checked. The watercourse is outside the Proposal Area and was a shallow dry drainage line. It runs into the man-made dam outside the southwest corner of the Proposal Area when there is sufficient water (**Figure 2-3**). The trees within the tree line along the eastern edge of the Proposal Area and between Daroobalgie Road the current DWD consisted of younger native trees and none had been culturally modified (**Figure 2-4**).

Discussion

The landscape of the Proposal Area is likely to have been hospitable to Aboriginal people in antiquity. However, the high level of disturbance across nearly the entire Proposal Area from activities such as vegetation clearance, cultivation and grazing, and creation of the current DWD would have affected the intactness of any deposit based archaeological sites, if they had been present.

A 'no' answer for Step 4, results in the following outcome (DECCW 2010):

AHIP (Aboriginal Heritage Impact Permit) application not necessary. Proceed with caution. If any Aboriginal objects are found, stop work and notify OEH (Office of Environment and Heritage). If human remains are found, stop work, secure the site and notify NSW Police and OEH.

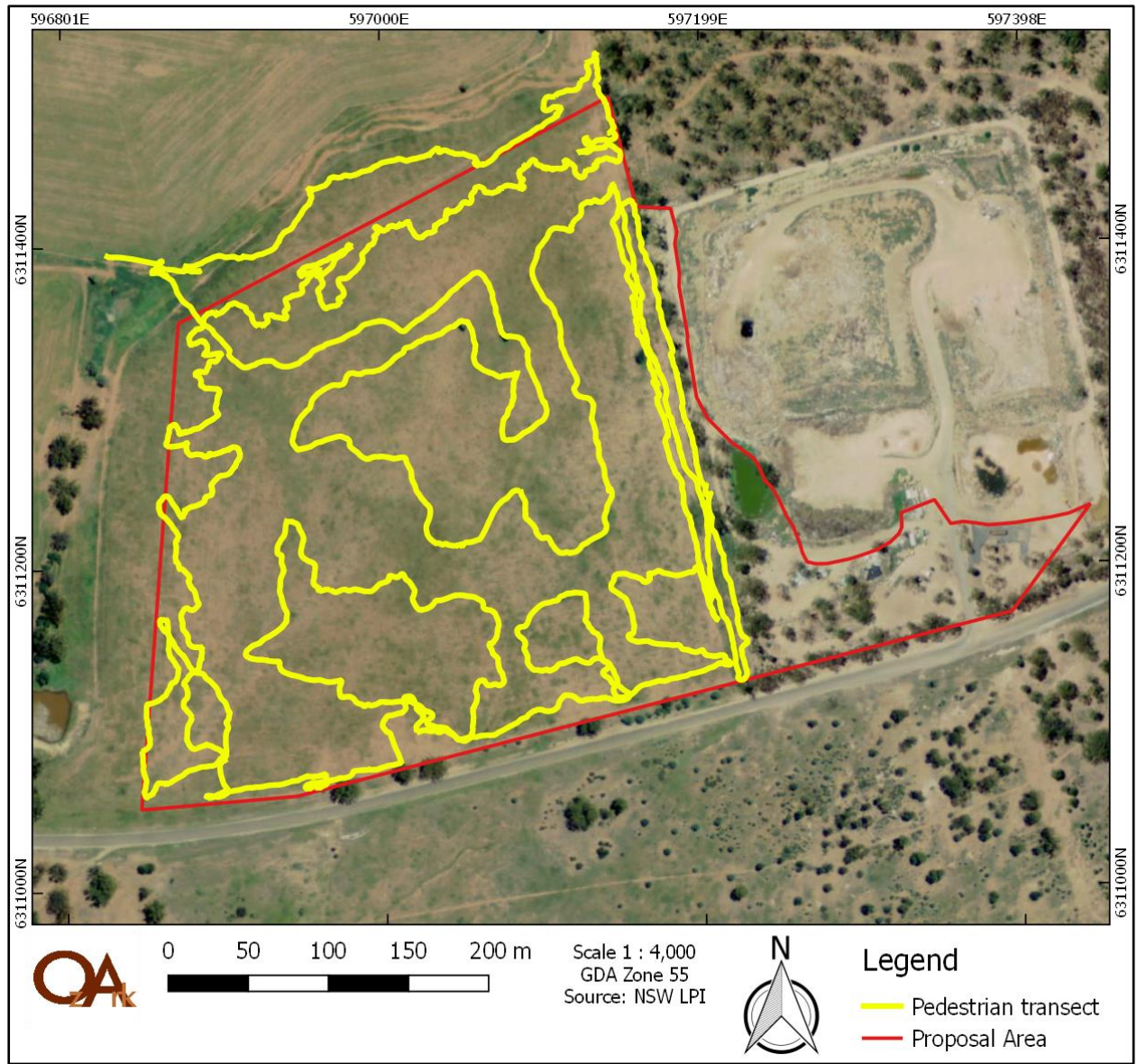
Figure 2-2: Survey coverage within the Proposal Area.

Figure 2-3: View south across Proposal Area with unnamed dry watercourse.



Figure 2-4: View south, of tree line from northeast corner of the Proposal Area. Note the current Daroobalgie Waste Depot.



3 MANAGEMENT RECOMMENDATIONS

The undertaking of the Due Diligence process resulted in the conclusion that the proposed works will have an impact on the ground surface, however, no Aboriginal objects or intact archaeological deposits will be harmed by the Proposal. This moves the Proposal to the following outcome:

AHIP application not necessary. Proceed with caution. If any Aboriginal objects are found, stop work and notify OEH. If human remains are found, stop work, secure the site and notify NSW Police and OEH.

To ensure the greatest possible protection to the area's Aboriginal cultural heritage values, the following recommendations are made:

- 1) The proposed work may proceed at the Daroobalgie Landfill Expansion area without further archaeological investigation under the following conditions:
 - a) All land and ground disturbance activities must be confined to within the Proposal Area, as this will eliminate the risk of harm to Aboriginal objects in adjacent, archaeologically sensitive landforms. Should the parameters of the Proposal extend beyond the assessed areas, then further archaeological assessment may be required.
 - b) All staff and contractors involved in the proposed work should be made aware of the legislative protection requirements for all Aboriginal sites and objects.
- 2) This assessment has concluded that there is a low likelihood that the proposed work will adversely harm Aboriginal cultural heritage items or sites. However, during the course of works, if Aboriginal artefacts or skeletal material are noted, all work should cease and the procedures in the *Unanticipated Finds Protocol* (**Appendix 2**) should be followed;
- 3) Work crews should undergo cultural heritage induction to ensure they recognise Aboriginal artefacts (see **Appendix 3**) and are aware of the legislative protection of Aboriginal objects under the NPW Act and the contents of the *Unanticipated Finds Protocol*.
- 4) The information presented here meets the requirements of the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. It should be retained as shelf documentation for five years as it may be used to support a defence against prosecution in the event of unanticipated harm to Aboriginal objects.

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PLATES



Plate 1: View east, from western boarder of Proposal Area. Note the current Daroobalgie Waste Depot in background.



Plate 2: View south, along the western boarder of Proposal Area.

APPENDIX 1: AHIMS SEARCH RESULTS

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Environment
& Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 1939

Client Service ID : 341045

SiteID	SiteName	Datum	Zone	Easting	Northings	Context	Site Status	SiteFeatures	SiteTypes	Reports
43-3-0031	C-IF-1 (Forbes)	AGD	55	596140	6310810	Open site	Valid	Artefact :-	Isolated Find	3543
	<u>Contact</u>	<u>Recorders</u>	Central West Archaeological and Heritage Services Pty Ltd					<u>Permits</u>		
43-3-0032	C-ST-1;	AGD	55	595370	6310330	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	<u>Contact</u>	<u>Recorders</u>	Central West Archaeological and Heritage Services Pty Ltd					<u>Permits</u>		
43-3-0033	C-ST-3;	AGD	55	595370	6310330	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	<u>Contact</u>	<u>Recorders</u>	Central West Archaeological and Heritage Services Pty Ltd					<u>Permits</u>		
43-3-0034	C-ST-2;	AGD	55	595480	6310330	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	<u>Contact</u>	<u>Recorders</u>	Central West Archaeological and Heritage Services Pty Ltd					<u>Permits</u>		

Report generated by AHIMS Web Service on 24/04/2018 for Alyce Cameron for the following area at Datum :GDA, Zone : 55, Eastings : 592811 - 601251, Northings : 6307087 - 6315452 with a Buffer of 0 meters. Additional Info : DD. Number of Aboriginal sites and Aboriginal objects found is 4

This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

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APPENDIX 2: ABORIGINAL HERITAGE: UNANTICIPATED FINDS PROTOCOL

An Aboriginal artefact is anything which is the result of past Aboriginal activity. This includes stone (artefacts, rock engravings etc.), plant (culturally scarred trees) and animal (if showing signs of modification; i.e. smoothing, use). Human bone (skeletal) remains may also be uncovered while onsite.

Cultural heritage significance is assessed by the Aboriginal community and is typically based on traditional and contemporary lore, spiritual values, and oral history, and may also take into account scientific and educational value.

Protocol to be followed in the event that previously unrecorded or unanticipated Aboriginal object(s) are encountered:

1. If any Aboriginal object is discovered and/or harmed in, or under the land, while undertaking the proposed development activities, the proponent must:
 - a. Not further harm the object;
 - b. Immediately cease all work at the particular location;
 - c. Secure the area so as to avoid further harm to the Aboriginal object;
 - d. Notify OEH as soon as practical on 131 555, providing any details of the Aboriginal object and its location; and
 - e. Not recommence any work at the particular location unless authorised in writing by OEH.
2. In the event that Aboriginal burials are unexpectedly encountered during the activity, work must stop immediately, the area secured to prevent unauthorised access and NSW Police and OEH contacted.
3. Cooperate with the appropriate authorities and relevant Aboriginal community representatives to facilitate:
 - a. The recording and assessment of the find(s);
 - b. The fulfilment of any legal constraints arising from the find(s), including complying with OEH directions; and
 - c. The development and implementation of appropriate management strategies, including consultation with stakeholders and the assessment of the significance of the find(s).

Where the find(s) are determined to be Aboriginal object(s), recommencement of work in the area of the find(s) can only occur in accordance with any consequential legal requirements and after gaining written approval from OEH (normally an Aboriginal Heritage Impact Permit).

APPENDIX 3: ABORIGINAL HERITAGE: ARTEFACT IDENTIFICATION

	
Retouched blades (scale = 1cm)	Flakes
	
Microliths (scale = 1cm)	Scraper (scale = 1cm)
	
Flake characteristics (scale = 1cm)	Core from which flakes have been removed (scale = 1cm)