Flora and Fauna

survey and assessment

Proposed stockpile site,
Lot 281 DP 571171, 285 Adams Road
Luddenham, NSW.

March 2016

Lesnok ENVIRONMENTAL

Cover photographs:

Left: Character of the exotic grassland present in the subject site.
Right: Character of the Casuarina woodland that lines Oaky Creek.

Report produced at the request of:

National Integrated Creative Solution

On behalf of

Epic Mining Pty Limited

by

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			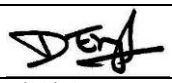	
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			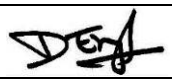	

This report is prepared in accordance with both the 6th Edition of the Commonwealth of Australia (2002) Style Manual.

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Glossary

Abbreviation	Definition
ASL	Above Sea Level
^{0}C	Degrees Celsius
DECC	NSW Department of Environment and Climate Change (now known as the NSW Office of Environment and Heritage)
DE	Commonwealth Department of the Environment
DPI	NSW Department of Primary Industries
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPA Act	NSW *Environmental Planning and Assessment Act 1979*
GPS	Global Positioning System[1]
LEP	Local Environmental Plan
LGA	Local Government Area
mm/cm/m/km/m^2	Millimetres, centimetres, metres, kilometres, square metres
NSW	New South Wales
NPW Act	NSW *National Parks and Wildlife Act 1974*
NPWS	NSW National Parks and Wildlife Service (now known as the NSW Office of Environment and Heritage)
NW Act	NSW *Noxious Weeds Act 1993*
OEH	NSW Office of Environment and Heritage
PMST	Protected Matters Search Tool
RoTAP	Rare of Threatened Australian Plant
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TSC Act	NSW *Threatened Species Conservation Act 1995*

For the purpose of this investigation:

Subject site	is defined as 'the area directly affected by the proposed works' (as per DECC 2007).
Study area	is defined as 'the subject site and any additional areas that are likely to be affected by the proposed works, either directly or indirectly' (DECC 2007).
Study region	is considered to 'include the lands that surround the subject site for a distance of 10 km' (DECC 2007).
Proposal	is considered to include 'all activities likely to be undertaken within the subject site' (DECC 2007).
Local population	of a threatened species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area (DECC 2007).
Important population	is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range (DE 2013).

[1] Coordinate system used: WGS84 ± 5 m to 10 m.

1. Introduction

At the request of National Integrated Creative Solution, on behalf of Epic Mining Pty Limited, a flora and fauna investigation has been carried out at Lot 281 DP 571171, 285 Adams Road, Luddenham, NSW (Figure 1). The investigation has been undertaken as Epic Mining Pty Ltd, who currently operate a quarry to the south of the subject site, are proposing to establish several stockpiles within the area investigated.

Not to scale Source: Google maps (2016)

Figure 1. Subject site (outlined in red) and study area

The proposal is to include:

- the clearing of the entire subject site
- the establishment of stockpiles containing excavated material from the Epic Mining Pty Limited owned mine to the south
- construction of a sedimentation pond in the south-east of the subject site
- diversion drains that channel any runoff to the sedimentation pond
- reuse of collected runoff within the subject site as part of dust suppression and revegetation works
- the retention of vegetation buffer adjacent to Oaky Creek in accordance with DPI (water) requirements
- a buffer of tree plantings along the northern and western boundaries of the subject site to minimise visual and noise impacts.

The assessment of possible impacts associated with the proposal of the former farming property is based on a field investigation of the subject site, a literature review of previous studies undertaken in both the region and this portion of the Liverpool City Council LGA, the consultation of standard databases and a consideration of the objectives of the EPBC Act, EPA Act, NPW Act and TSC Act, and any relevant SEPP.

2. Legislative requirements

A number of Commonwealth, State and local Acts, policies and documents are relevant to the proposal and its possible impact on both the site's and localities ecology. The most relevant of these are listed in Table 1.

Table 1. Summary of legislative and policy requirements

Level	Relevant Legislation/Policy	Relevance to study area
Commonwealth	*Environment Protection and Biodiversity Conservation Act 1999*	Under this Act an action will require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance. Matters of national environmental significance include listed threatened species and ecological communities, and those migratory species protected under international agreements. Where found, the assessment criteria relevant to this Act will be drawn upon to determine whether there would be a significant effect on these species and communities and hence whether referral to the Federal Environment Minister is required. No threatened ecological communities or species were recorded. No assessments have been undertaken. Referral of the matter to the Federal Minister for the Environment is not necessary.
State	NSW *Environmental Planning and Assessment Act 1979*	Part 1, Section 5A of this Act requires that a determination be made as to whether a proposed action is likely to have a significant effect on species, populations and ecological communities listed on Schedules 1, 1A and 2 of the NSW *Threatened Species Conservation Act 1995*. Where found, the assessment criteria relevant to this Act (seven-part test) will be drawn upon to determine whether there would be a significant effect on these species and hence whether a Species Impact Statement is required. No threatened ecological communities or species were recorded. No assessments have been undertaken. Preparation of a SIS is not necessary.
	NSW *Threatened Species Conservation Act 1995/Amendment 2002*	This Act makes further provision with respect to the conservation of threatened species, populations and ecological communities of animals and plants.
	NSW *National Parks and Wildlife Act 1974*	This Act defines those species listed as protected in NSW. No assessment is required under this Act, however potential impacts of the proposed works on these species will be considered.
	NSW *Noxious Weeds Act 1993*	Part 3, Division 1, Section 13 of this Act requires individuals to control noxious weeds on their own land. No noxious weeds were recorded.

Level	Relevant Legislation/Policy	Relevance to study area
	NSW State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) SEPP 44 cont.	Clause 8 of this SEPP requires consideration of whether a proposal will affect core koala habitat as defined in the SEPP. If so, a plan of management for the Koala must be prepared in accordance with Part 3 of the SEPP. Being cleared, the subject site is not considered to constitute potential or core koala habitat. No further consideration of this matter is required. The preparation of a Koala Plan Of Management is not required.
Local	The Liverpool Local Environmental Plan 2008	This plan aims to make local environmental planning provisions for land in Liverpool in accordance with the relevant standard environmental planning instrument under Section 33A of the EPA Act. Particular aims of this plan that are relevant to the proposal are: (aim a) to foster economic, environmental and social well-being so that Liverpool continues to develop as a sustainable and prosperous place to live, work and visit (aim h) to protect and enhance the natural environment in Liverpool, incorporating ecologically sustainable development.

3. Environmental setting

The subject site is located within Luddenham, around 27 km south/south-west of the city of Parramatta, in the Liverpool City LGA. The subject site covers an area of around 57,000 m^2, the site being zoned RU1 – Primary Production on the Liverpool LEP 2008.

The subject site is bounded to the west by Adams Road, to the north by Elizabeth Drive and east by Oaky Creek (Figure 1). The southern boundary of the subject site is primarily with Lot 3 DP 623799, which is currently occupied by Epic Mining Pty Limited. This site is approved as extractive industries for the extraction of shale and clay.

This portion of the LGA is characterised by modified rural properties, consisting of grazing, poultry farms, crops in hot house environments and some dwellings. Rural residential development is the dominant land use in the surrounding area to the north, east and south; whilst further land use in the surrounding region includes a mix of agricultural, rural industrial and rural residential development set within a rural landscape. Prominent rural land uses in the surrounding area also include a land-fill facility to the north-east, mining works to the south, Hubertus Country Club to the south-west, and the township of Luddenham to the south-south-west.

The subject site, which has been previously cleared and formerly used for the production of silage, consists of introduced pasture grasses and isolated trees. The subject site supports a number of derelict dairy sheds and water tanks. An occupied house and numerous sheds occur to the south of the proposed stockpile area, the house being retained as a property managers residence as part of the development.

For reference, a photographic record of the area investigated has been provided (Appendix 1).

With reference to aerial photography, three small farm dams appear to be present within the subject site. However, only one of these was located/inspected during the field investigation, this being located in the north-western portion of the subject site. No permanent flowing water bodies occur within the subject site itself, Oaky Creek being the nearest drainage line (Figure 1). This creek is ephemeral and only flows after significant rainfall events. Being ephemeral, Oaky Creek would not be an area of suitable habitat for fish.

The land is relatively flat and slopes gently towards the east and south-east. Natural elevations within the area investigated are between 58 m and 68 m ASL.
The annual average rainfall in the region is 970.6 mm with the greatest falls being experienced between January and March[2]. Average temperatures range from a July minimum of 6.2^{o}C to a January high of 28.4^{o}C (Bureau of Meteorology 2016).

The subject site is mapped as occurring on the Blacktown and South Creek soil landscapes (Bannerman and Hazelton 1990).

The geology of the Blacktown Landscape is derived from the Wianamatta Group – Ashfield Shale, this consisting of laminate and dark grey silt-stone, Bringelly Shale which consists of shale with occasional calcareous claystone, laminate and infrequent coal, and Minchinbury Sandstone consisting of fine to medium-grained quartz lithic sandstone (Bannerman and Hazelton 1990). This consists of shallow to moderately deep (<100 cm) hardsetting mottled texture contrast soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines (Bannerman and Hazelton 1990). These soils have moderately reactive highly plastic subsoil, are of low fertility, poor drainage and of a slight to moderate erosion hazard (Bannerman and Hazelton 1990).

The geology of the South Creek landscape is Quaternary alluvium derived from Wianamatta Group shales and Hawkesbury Sandstone. This consists of often very deep layered sediments over bedrock or relict soils (Bannerman and Hazelton 1990). Where pedogenesis has occurred structure plastic clays or structured loams in and immediately adjacent to drainage lines; red and yellow podzolic soils are most common on terraces with small areas of structured grey clays, leached clay and yellow solodic soils (Bannerman and Hazelton 1990). These soils have low fertility, are subject to frequent flooding and are of a very high to extreme erosion hazard (Bannerman and Hazelton 1990).

Through reference to the listings provided under both the EPBC and TSC Acts, it is noted that no gazetted areas of critical habitat for any flora or fauna species, populations or communities occur within, or in the vicinity of, the study area.

4. Literature review and field guides

Prior to undertaking any fieldwork, previous studies conducted in the region and known databases were consulted to identify the diversity of ecological communities, flora and fauna species known for, or potentially occurring in, the study region. The identification of those known or potentially occurring native species and communities that have been previously recorded within this portion of Liverpool City LGA, particularly those listed under the Schedules to the EPBC and/or TSC Acts, thereby permits the tailoring of the field survey strategies to the detection of these plants, animals and vegetation associations, or their necessary habitat requirements. By identifying likely species, particularly any threatened plants and animals, the most appropriate species-specific survey techniques may be selected should their associated vegetation communities/habitat requirements be present. The undertaking of a literature search also ensures that the results from surveys conducted during different climatic, seasonal and date periods are considered and drawn upon as required. This approach therefore increases the probability of considering the presence of, and possible impacts on, all known and likely native species, particularly any that are of regional, State and/or national conservation concern. This approach also avoids issues inherent with a one off ‘snap shot’ study.

The studies, reports and databases referred to include:

- the DE PMST (DE 2016)
- the OEH BioNet database [Atlas of NSW Wildlife] (OEH 2016a)
- the OEH Threatened Species website (OEH 2016b)
- the NPWS Urban Bushland Biodiversity Survey (NPWS 1997a, 1997b)

[2] Parramatta North (Masons Drive) - this being the nearest operating weather station to the site.

- biodiversity audits of bushland reserves/remnants that occur within the Liverpool LGA (Lesryk Environmental Pty Ltd 1996, Lesryk Environmental Pty Ltd 2015)
- Liverpool City Council's LEP.

Other reports and documents referred to are provided within the bibliography section of this report.

When accessing the DE and OEH databases, the search area specified was a 10 km buffer around the study area. The data searches were carried out on 15/02/2016.

All these databases and reports were reviewed and drawn upon where relevant. Whilst reviewing these documents, particular attention was paid to identifying relevant ecological matters listed under the Schedules of the EPBC and/or TSC Acts, plants, animals and ecological communities that have been recorded in the region and which may occur within, or in the vicinity of, the study area.

Field guides and standard texts used include:

- Harden (1992, 1993, 2000 and 2002), Robinson (2003) and Fairley and Moore (2010) (used for the identification of plants)
- Cogger (2014) (reptiles and frogs)
- Simpson and Day (2010) (birds)
- Van Dyck and Strahan (2008) (non-flying mammals)
- Churchill (2008) (insectivorous bats)
- Triggs (1996) (identification of scats, tracks and markings).

The naming of those species recorded or known for the region follows the nomenclature presented in these texts, or within the EPBC and TSC Acts.

It is noted that the current accepted scientific names for some of the threatened fauna species previously recorded in this locality are not consistent with the names used/provided under either the EPBC or TSC Acts. In these instances, nomenclature used within this report follow the current approved scientific conventions.

The conservation significance of those ecological communities, plants and animals recorded is made with reference to:

- a RoTAP publication (Briggs and Leigh 1996)
- the EPBC and TSC Acts
- vegetation mapping of the study region (NPWS 2002a).

5. Results of the literature review

5.1. Threatened flora

A review of the DE and OEH databases (DE 2016, OEH 2016a) identified 22 threatened plants listed under the EPBC and/or TSC Acts that have been previously recorded, or are considered to have habitat, in the study region (Appendix 2). The subject site is not considered to contain suitable habitat for any of these plants.

5.2. Threatened ecological communities

Vegetation mapping of the study area was undertaken as part of the Cumberland Plain Vegetation mapping by NPWS (NPWS 2002a). This mapping indicates that Alluvial Woodland occurs in association with Oaky Creek to the east of the proposal area. Alluvial Woodland may be a component of the following TSC Act listed endangered ecological communities:

- Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions
- River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.

5.3. Threatened fauna

A review of the DE and OEH databases (DE 2016, OEH 2016a) identified 43 fauna species listed under the EPBC and/or schedules of the TSC Act that have been previously recorded, or are considered to have habitat, in the study region (Appendix 2).

Based on a consideration of the habitat needs of these threatened species (as provided in standard texts – refer to the bibliography section of this report for those used), combined with the identification of those habitats present within the study area, there is the potential for some of the animals listed in Appendix 2 to occur within, or in the vicinity of, the subject site. As such, during the course of the field investigation, targeted surveys for these species, or their necessary habitats, were undertaken.

It is acknowledged that some of the species listed in Appendix 2 may fly over or use the study area on occasion (e.g. insectivorous bats [microchiropteran], Grey-headed Flying-fox *Pteropus poliocephalus*). Whilst this is the case, none of these animals would be considered to rely solely upon the exotic grasslands present in the subject site, such that the proposal would have a significant impact on the local populations of these species, or their habitats. As with the threatened fauna species considered unlikely to occur, it is considered unnecessary that any further assessments on the likely impacts of the proposal on these animals be conducted.

6. Field survey methods

A survey of the study area was undertaken by Stephen Bloomfield (B.App.Sc) and Deryk Engel (B.Env.Sc HONS) on 17 February, 2016. The weather conditions experienced during the site investigations were warm temperatures (26 ˚C), overcast skies (50% cloud cover) and a light breeze.

The purpose of the field investigation was to locate within the area surveyed any plants, animals or vegetation communities that are of regional, State and/or national conservation significance. When conducting the field investigation, the 'Random Meander Method' (as per Cropper 1993) (or a modification of this that is applicable to fauna surveys) was employed. This method is suitable for covering large areas and for locating any rare species (and their associated vegetation communities/habitat types) that may occur within a particular site.

The survey methods employed during the field investigation were:

- the identification of those plants and vegetation communities present within the area of likely disturbance, including both direct and indirect impacts
- the identification of the structure of those vegetation communities and fauna habitats present
- the direct observation of those fauna species present within, or adjacent to, the subject site
- diurnal call identifications of fauna species with all calls being identified in the field
- the identification of indirect evidence including tracks, scats, scratchings and diggings that would suggest the presence of a particular fauna species
- litter and ground debris searches for reptiles and frogs.

Whilst conducting the site investigation, efforts were made to document the diversity, structure and value of those fauna habitats present within, and adjacent to, the subject site. This involved assessing the structure of the vegetation communities and fauna habitats present and determining their significance for native species, particularly any that are of State and/or national conservation concern. Whilst conducting the habitat assessments, efforts were made to identify features such as known vegetation associations, geological features,

feed trees, mature trees with hollows, aquatic environments and other habitat features important to the life cycle needs of those threatened plants and animals previously recorded in the study region (as listed in Appendix 2).

By the completion of the field investigations, approximately two person hours of active searching had been accumulated. During the field surveys no limitations to the overall outcomes of the site investigation, such as adverse climatic conditions, or reduced site visibility, were encountered. Access to all parts of the former farming property was possible, thereby ensuring that all portions of the subject site were sampled.

Based on the observations made during the diurnal investigation it was considered that no nocturnal survey work was required. No resources of significant value (i.e. hollow-bearing trees, woodlands or natural water bodies) for those nocturnal species that are known to occur in the surrounding region, particularly those that are of conservation significance, are present within, or close to the limits of, the subject site. Therefore, none would be adversely affected by the proposal.

7. Results

7.1. Flora species recorded

By the completion of the flora survey, 11 native species and 24 exotic plants had been recorded (Appendix 3). It is noted that Appendix 3 is not intended to be a comprehensive list of all species present within the subject site, and only represents those plants that were recorded whilst undertaking searches for:

- those native species and ecological communities of State and/or national conservation concern that are known, or expected to occur, in the locality
- noxious weeds that would require treatment.

Whilst their presence was considered and targeted investigations undertaken, none of the plants listed in Appendix 2 (nor any species being considered for inclusion on the EPBC and/or TSC Acts) were recorded within, or close to, the subject site. Nor are any considered likely to occur. As such, the proposal is not likely to have a direct or indirect impact on any threatened plant.

Similarly, no RoTAP species was recorded.

None of the introduced plants recorded are listed as noxious within the Liverpool LGA as per the NW Act.

7.2. Vegetation communities and habitats recorded

The subject site is dominated by an exotic grassland with a small dam present in the north-western portion of the area investigated.

The grassland is dominated by a 0.5 m high density layer of introduced grasses, herbs and forbs. Common species include Pigeon Grass (*Setaria gracilis*), Barnyard Grass (*Echinochloa crus-galli*), Paspalum (*Paspalum dilatatum*), Rhodes Grass (*Chloris gayana*), Kikuyu Grass (*Cenchrus clandestinus*), Couch (*Cynodon dactylon*), Lamb's Tongue (*Plantago lanceolata*), Carolina Mallow (*Modiola caroliniana*), Farmers Friend (*Bidens pilosa*) and Fleabane (*Conyza bonariensis*). The native plant Early Spring Grass (*Eriochloa pseudoacrotricha*) is also common.

The dam investigated is approximately 15 m long and 10 m wide. At the time of the field investigation the dam contained water, the surface of which was covered with Azolla (*Azolla sp.*). A 2 m high density layer of Cumbungi (*Typha orientalis*) dominates the aquatic growth within the dam. Other species present include Freshwater Couch (*Paspalum distichum*) and Common Rush (*Juncus usitatus*).

Isolated trees are present in the south of the subject site, none of which were observed to contain hollows.

7.2.1. Conservation Significance of the vegetation and value of the habitats present

The exotic grassland is of no conservation significance.

7.3. Fauna species recorded during the field investigation

The subject site exhibits a history of agricultural practices (including dairy farming). Due to the undertaking of these practices, the area proposed to be used for the stockpiling of material has been cleared, contoured and sown with exotic pasture grasses. As would be expected for such a highly disturbed and modified rural site, few native species were recorded. Those that were detected are listed in Table 2, along with their detection method.

Table 2. Fauna species recorded during the field survey

Key
* - introduced species

Common Name	Scientific Name	Detection Method
BIRDS		
Red-rumped Parrot	*Psephotus haematonotus*	Heard calling beyond site
Magpie-lark	*Grallina cyanoleuca*	Heard calling beyond site
Brown Thornbill	*Acanthiza pusilla*	Heard calling beyond site
Australian Raven	*Corvus coronoides*	Heard calling beyond site
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Observed off site
Tawny Grassbird	*Megalurus timoriensis*	Observed on site
Australian Reed-Warbler	*Acrocephalus australis*	Heard calling on site
* Common Myna	*Sturnus tristis*	Observed on site
REPTILES		
Dark-flecked Garden Sun-skink	*Lampropholis delicata*	Observed on site
AMPHIBIANS		
Brown-striped Frog	*Limnodynastes peronii*	Heard calling on site

The subject site is highly modified and disturbed and no habitats, including those occupied by species such as the State listed Cumberland Plain Land Snail (*Meridolum corneovirens*), are present.

Of those animals recorded, none are listed, or currently being considered for listing, on the Schedules to the EPBC or TSC Acts.

All of the native species recorded during the field survey are protected, as defined by the NPW Act, but considered to be common to abundant throughout the surrounding region. Within the surrounding region, these species have been recorded in association with a range of woodland and forest habitats. The species recorded would not be solely reliant upon the exotic grassland present, such that the removal or further disturbance of this habitat type would threaten the occurrence of these animals.
A number of the fauna species listed in Appendix 2 may fly over (e.g. the microchiropterans and Grey-headed Flying-fox) or forage within (e.g. Cattle Egret *Ardea ibis*) the site on occasion. However, the subject site only represents a very small portion of potential habitat for these animals, areas of better habitat occurring beyond the limits of the area investigated. No habitat resources crucial to the life-cycle requirements of such species (e.g. intact stands of woodland) are present on site. As such, the proposal is not likely to have a direct or indirect impact on any of these species. Therefore, it is considered that further assessment of impacts under the relevant legislation is not necessary.

Being ephemeral Oaky Creek would not be permanently occupied by any fish. Urban tolerant species, such as Eels (*Anguilla sp.*), may occur within Oaky Creek during rainfall periods. The scope of works would not affect the occasional occurrence of these species or present any barriers to their movement patterns.

7.4. Wildlife corridors and vegetation links

The area expected to be impacted by the proposed development is not considered to be part of any important local or regional wildlife corridor or vegetation link. Given the existing character of the study locality, and the limited vegetation present within the former farming property, it is considered that the proposal would not present any further barriers to the movement patterns of any native animals such that their local populations would be adversely affected.

The vegetation that lines Oaky Creek will be retained in accordance with DPI (water) requirements for riparian buffers. This vegetated creek line provides a tenuous link north and south of the subject site. This link is expected to be used by flying species, or ground-traversing urban tolerant animals (e.g. the Common Brushtail Possum *Trichosurus vulpecula*). With the retention of Oaky Creek, the movement patterns of these species will not be adversely affected. Similarly, the works proposed would not present any barriers, or further fragment any habitat areas.

8. Legislative considerations

8.1. Commonwealth - *Environment Protection and Biodiversity Conservation Act 1999*

By the completion of the field investigation no flora or fauna species, populations or ecological communities listed under the EPBC Act had been recorded within, or in close proximity to, the subject site. Similarly none were considered likely to occur within, or be reliant upon, the habitats present.

As such, no assessment referring to the EPBC Act's Significant Impact Guidelines to determine if there is likely to be a significant impact on a nationally listed species has been carried out.

The proposed work would not have a detrimental impact on any ecological communities, flora or fauna species of national conservation significance. Therefore it is considered that the matter does not require referral to the Federal Minister for the Environment for further consideration or approval.

8.2. State - *Environmental Planning and Assessment Act 1979*

By the completion of the field investigation no flora or fauna species, populations or ecological communities listed under the TSC Act had been recorded within, or in close proximity to, the subject site. Similarly none were considered likely to occur within, or be reliant upon, the habitats present.

As such, no assessment referring to the criteria provided under Part 1, Section 5A of the EPA Act to determine if there is likely to be a significant impact on a State listed species has been carried out.

The proposed work would not have a significant effect on any ecological communities, flora or fauna species or populations of State conservation significance. The preparation of a SIS is not required.

9. Conclusion

By the completion of the field investigation, no ecological communities, flora or fauna species, or populations listed under the EPBC or TSC Acts had been recorded. Similarly, none would be reliant upon the subject site for any of their necessary nesting, roosting, or foraging requirements. As such, no assessments using the criteria provided under the EPBC Act (i.e. Significant Impact Guidelines) or Part 1, Section 5A of the EPA Act were carried out.

Referral of the matter to the Federal Minister for the Environment for further consideration or approval in relation to the proposed work would not be necessary; nor would the preparation of an SIS to further assess the scope of work proposed be required.

By the completion of the field investigation, no limitations to the proposal proceeding as planned were identified. Adoption of those mitigation measures provided would ensure that the works proposed are carried out in an ecologically sustainable manner.

10. Recommendations

Based on the principles of Ecologically Sustainable Development, as identified in Schedule 2 of the Environmental Planning and Assessment Regulation, the following recommendations are provided:

- Install erosion, sediment and water quality controls to prevent any surface runoff entering Oaky Creek.

- Newly exposed surfaces should be stabilised as soon as possible in order to reduce the potential for soil erosion. This should be done through the planting of native species endemic to the study area or non-invasive grasses.

- Any shrub or tree plantings to be undertaken as part of landscaping works should include a suite of native plants endemic to the study locality.

- The riparian buffer that is to be retained between the vegetation that lines Oaky Creek and the proposed stockpile site should be clearly marked on site by way of fencing and on any site plan that is to be produced. This area should be a no-go zone and all works personnel must be made aware of it.

- If the stockpiles are to be retained insitu for an extended period of time, they should be sown with grass to reduce the potential for dust and sediment runoff.

11. Bibliography

Bannerman, SM and Hazelton, PA 1990, *Soil Landscapes of the Penrith 1:1000 000 Sheet*, Soil Conservation Service of NSW, Sydney, NSW

Briggs, J and Leigh, J 1996, *Rare or Threatened Australian Plants*, CSIRO Publishing, Collingwood, Victoria

Bureau of Meteorology 2016, Bureau of Meteorology Climate Averages, viewed February 2016 <http://www.bom.gov.au/climate/averages>

Churchill, S 2008, *Australian bats - 2nd Edition*, Allen and Unwin, Crows Nest, NSW

Cogger, H 2014, *Reptiles and amphibians of Australia*, Reed Books, Chatswood, NSW

Cropper, S 1993, *Management of Endangered Plants*, CSIRO, Melbourne, Victoria

Department of Environment and Climate Change 2007, *Threatened species assessment guidelines: The assessment of significance,* Department of Environment and Climate Change, Hurstville, NSW

Department of the Environment 2013, *Matters of National Environmental Significance: Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*, viewed January 2016 <http://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nes-guidelines_1.pdf>

- 2016, *Protected Matters Search Tool*, viewed February 2016 <http://www.environment.gov.au/epbc/db/index.html>

Department of Primary Industries 2016, *Agriculture - Weeds declared in the Local Control Authority area of Liverpool City Council*, viewed February 2016 <http://weeds.dpi.nsw.gov.au/WeedDeclarations?RegionId=70>

Fairley, A and Moore, P 2010, *Native Plants of the Sydney Region*, Jacana Books, Allen & Unwin, Crows Nest, NSW

Frith, HJ (Ed) 2007, *Complete book of Australian birds*. Readers Digest, Surry Hills, NSW.

Harden, G (Ed) 1992-2002, *Flora of New South Wales Vol 1,2,3 and 4,* NSW University Press, Kensington, NSW.

Google Maps 2016, *Google Maps*, viewed February 2016, <https://www.google.com.au/maps>

Keith, D 2004, Ocean Shores to Desert Dunes; the native vegetation of New South Wales and the ACT, NSW National Parks & Wildlife Service, Sydney, NSW

Lesryk Environmental Pty Ltd 1996 *Fauna assessment of five remnant tracts in the Liverpool LGA: Bents Basin, Badgerys Creek, Rossmore Grange, Hinchinbrook Creek and Eloura Nature Reserve*, report prepared for Liverpool City Council by Lesryk Environmental Pty Ltd, Bundeena, NSW

- 2015 *Biodiversity audit for five reserves within the Liverpool LGA: Bill Anderson Park, Lt Cantello Reserve, Riverside Park, Starr Park and Voyager Point Bushland Reserve*, report prepared for Liverpool City Council by Lesryk Environmental Pty Ltd, Bundeena, NSW

Liverpool City Council 2008, *Local Environmental Plan*, viewed February 2016, <http://legislation.nsw.gov.au/maintop/view/inforce/epi+403+2008+cd+0+N>

National Parks and Wildlife Service 1997a, *Native flora of Western Sydney urban bushland biodiversity survey*, NSW National Parks and Wildlife Service, Hurstville, NSW

- 1997b, *Native fauna of Western Sydney urban bushland biodiversity survey*, NSW National Parks and Wildlife Service, Hurstville, NSW

– 2002a, *Native vegetation of the Cumberland Plain, Map 4 of 16 Liverpool LGA (Western Section), Penrith LGA (Southern Section) and Wollondilly LGA (Northern Section)*, NSW National Parks and Wildlife Service, Hurstville, NSW

– 2002b, *Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain, Western Sydney*, NSW National Parks and Wildlife Service, Hurstville, NSW

Office of Environment and Heritage 2016a, *BioNet (Atlas of NSW Wildlife) Database*, data downloaded February 2016 <http://www.bionet.nsw.gov.au/>

– 2016b, *Threatened species, populations and ecological communities of NSW – profiles*, viewed February 2016 <http://www.environment.nsw.gov.au/threatenedspecies/>

Robinson, L 2003, *Field guide to the native plants of Sydney*, Second edition, Kangaroo Press, Sydney, NSW

Simpson, K and Day, N 2010, *Field guide to the birds of Australia*, 8th Edition, Penguin Books Australia, Victoria

Triggs, B 1996, *Tracks, scats and other traces: a field guide to Australian mammals*, Oxford University Press, Melbourne, Victoria

Van Dyck, S and Strahan, R 2008, *The mammals of Australia* (3rd edition), Reed New Holland, Sydney, NSW

Appendix 1. Photographic record of the study area

Plate 1. Character of the exotic grassland present in the subject site.

Plate 2. Character of the Casuarina woodland that lines Oaky Creek.

Plate 3. The dam that is present the subject site and the associated dominant Cumbungi.

Plate 4. The presence of the existing buildings and water tanks within the southern portion of the subject site.

Appendix 2. Threatened flora and fauna species previously recorded in the study region and their likelihood of occurrence

Key
EP – endangered population V – vulnerable E – endangered CE – critically endangered M – migratory

A State or nationally listed threatened species is considered to have a:

- High likelihood of occurrence if it has been recorded within 10 km of the subject site and suitable habitat for this species is present within the subject site.
- Moderate likelihood of occurrence if they have a predicted occurrence (via the EPBC Act Protected Matters Search Tool or OEH geographic search) and there is suitable habitat present.
- Low likelihood of occurrence if suitable habitat for an animal is not present regardless of whether they have been recorded within 10 km, or have a predicted occurrence.

Note: Species underlined are those which only the EPBC PMST predicted as having habitat in the search area. All other species have been recorded within 10 km of the subject site.

* - habitat requirements were generally extracted from Harden (1992-2002), Frith (2007), Churchill (2008), Cogger (2014), Van Dyck and Strahan (2008) and OEH (2016b), with other references used being identified in the bibliography.

Species	Status		Habitat*	Likelihood of Occurrence	Possible Impacts
	EPBC Act	TSC Act			
PLANTS					
Marsdenia viridiflora subsp. viridiflora		EP	Grows in vine thickets and open shale woodland.	Low. Habitat absent.	None
Dillwynia tenuifolia		V	In western Sydney, may be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	Low. Habitat absent.	None
Pultenaea parviflora	V	E	May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland.	Low. Habitat absent.	None

Species	Status		Habitat*	Likelihood of Occurrence	Possible Impacts
	EPBC Act	TSC Act			
Allocasuarina glareicola	E	E	Restricted to the Penrith to Richmond area where it grows in Castlereagh woodland on lateritic soil. Found in open woodland with *Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora*	Low. Habitat absent.	None
White-flowered Wax Plant *Cynanchum elegans*	V	V	Usually on the edge of dry rainforest vegetation but also in littoral rainforest, coastal scrubs, Forest Red Gum woodland and Spotted Gum open forest/ woodland	Low. Habitat absent.	None
Camden White Gum *Eucalyptus benthamii*	V	V	Open forest in alluvial soils along the Nepean River and its tributaries	Low. Habitat absent.	None
Juniper-leaved Grevillea *Grevillea juniperina* subsp. *juniperina*		V	Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels.	Low. Habitat absent.	None
Small-flower Grevillea *Grevillea parviflora* subsp. *parviflora*	V	V	Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on Tertiary sands and alluvium, and soils derived from the Mittagong Formation. Soil landscapes include Lucas Heights or Berkshire Park.	Low. Habitat absent.	None
Nodding Geebung *Persoonia nutans*	E	E	Northern populations are confined to aeolian and alluvial sediments and occur in a range of sclerophyll forest and woodland vegetation communities, with the majority of individuals occurring within Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland and some in Cooks River/Castlereagh Ironbark Forests. Southern populations also occupy tertiary alluvium, but extend onto shale sandstone transition communities and into Cooks River/Castlereagh Ironbark Forest.	Low. Habitat absent.	None
Leafless Tongue-orchid *Cryptostylis hunteriana*	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland.	Low. Habitat absent.	None
Bauer's Midge Orchid *Genoplesium baueri*	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone.	Low. Habitat absent.	None
Kangaloon Sun-orchid *Thelymitra kangaloonica*	CE	CE	Only known from three swamps that are above the Kangaloon Aquifer in the Moss Vale/Kangaloon/Fitzroy Falls area. Found in swamps in sedgelands over grey silty grey loam soils	Low. Habitat absent.	None

Species	Status		Habitat*	Likelihood of Occurrence	Possible Impacts
	EPBC Act	TSC Act			
Spiked Rice-flower *Pimelea spicata*	E	E	On the Cumberland Plain it is associated with Grey Box and Ironbark on well-structured clay soils.	Low. Habitat absent.	None
Downy Wattle *Acacia pubescens*	V	V	Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland.	Low. Habitat absent.	None
Black Gum *Eucalyptus aggregata*	V	V	Grows in the lowest parts of the landscape. Grows on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers.	Low. Habitat absent.	None
Wingless Raspwort *Haloragis exalata* subsp. *exalata*	V	V	Appears to require protected and shaded damp situations in riparian habitats.	Low. Habitat absent.	None
Omeo Stork's-bill *Pelargonium sp. Striatellum* (G.W.Carr 10345)	E		Just above the high water level of irregularly inundated or ephemeral lakes.	Low. Habitat absent.	None
Pimelea curviflora var. *curviflora*	V	V	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands.	Low. Habitat absent.	None
Spiked Rice-flower *Pimelea spicata*	E	E	In the Cumberland Plain environments this species is found on well-structured clay soils. On the Cumberland Plain sites it is associated with Grey Box communities (particularly Cumberland Plain Woodland variants and Moist Shale Woodland) and in areas of ironbark.	Low. Habitat absent.	None
Rufous Pomaderris *Pomaderris brunnea*	V	V	Moist woodland or forest on clay and alluvial soils of flood plains and creek lines.	Low. Habitat absent.	None
Sydney Plains Greenhood *Pterostylis saxicola*	E	E	Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where *Pterostylis saxicola* occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	Low. Habitat absent.	None
Austral Toadflax *Thesium australe*	V	V	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*).	Low. Habitat absent.	None
MAMMALS					
Spotted-tailed Quoll *Dasyurus maculatus*		V	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Low. Habitat absent.	None

Species	Status		Habitat*	Likelihood of Occurrence	Possible Impacts
	EPBC Act	TSC Act			
Koala *Phascolarctos cinereus*	V	V	Open eucalypt forest and woodland, containing a variety of 'preferred' food tree species.	Low. Habitat absent.	None
Brush-tailed Rock-wallaby *Petrogale penicillata*	V	E	Areas containing numerous ledges, caves and crevices, cliffs (usually over 15 m high) with many mid-level ledges and caves and/or overhangs. Also present where isolated rock stacks occur.	Low. Habitat absent.	None
Grey-headed Flying-fox *Pteropus poliocephalus*	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Low. Habitat absent.	None
Eastern Freetail-bat *Mormopterus norfolkensis*		V	Dry sclerophyll forest and woodland east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in man-made structures.	Low. Habitat absent.	None
Large-eared Pied Bat *Chalinolobus dwyeri*	V	V	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.	Low. Habitat absent.	None
Eastern Bentwing-bat *Miniopterus schreibersii oceanensis*		V	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures.	Low. Habitat absent.	None
Southern Myotis *Myotis macropus*		V	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	Low. Habitat absent.	None
Greater Broad-nosed Bat *Scoteanax rueppellii*		V	Variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Usually roosts in tree hollows, but has also been found in buildings.	Low. Habitat absent.	None
New Holland Mouse *Pseudomys novaehollandiae*	V		Open heathland, open woodland with a heathland understorey and vegetated sand dunes.	Low. Habitat absent	None
BIRDS					
Cattle Egret *Ardea ibis*	M		Wet pasture with tall grass, shallow open wetland and margins, mudflats.	Moderate. Species may traverse, and forage within, site but unlikely to be affected by the proposed action.	None

Species	Status		Habitat*	Likelihood of Occurrence	Possible Impacts
	EPBC Act	TSC Act			
Great Egret *Ardea alba*	M		Wetland, flooded crops, pasture, dams, roadside ditches, estuarine mudflats, mangroves and reefs.	Moderate. Species may traverse site but unlikely to be affected by the proposed action.	None
Black-necked Stork *Ephippiorhynchus asiaticus*		E	Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	Low. Habitat absent	None
Australasian Bittern *Botaurus poiciloptilus*	E	E	Shallow, vegetated freshwater or brackish swamps, usually dominated by tall, dense reed beds of *Typha sp*, *Juncus sp* and *Phragmites sp*.	Low. Habitat absent	None
Latham's Snipe *Gallinago hardwickii*	M		Wet, treeless, tussocky grasslands, short grasses and/or marshes along freshwater streams and channels, though it can also be found in any vegetation around freshwater wetlands, in sedges, grasses, lignum, reeds and rushes, saltmarshes, creek edges, crops and pastures.	Low. Habitat absent	None
Australian Painted Snipe *Rostratula australis*	E	E	This species prefers shallow freshwater swamps.	Low. Habitat absent	None
Bush Stone-curlew *Burhinus grallarius*		E	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber.	Low. Habitat absent	None
Black-tailed Godwit *Limosa limosa*	M	V	Primarily a coastal species. Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats.	Low. Habitat absent	None
Tringa nebularia Common Greenshanlk	M		The Common Greenshank prefers coastal lagoons, estuaries and bays that are sheltered sandy and muddy. Also found on fresh marshes near streams, dams and sewage farms. Sometimes found at inland lakes.	Low. Habitat absent.	None
Gang-gang Cockatoo *Callocephalon fimbriatum*		V	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas.	Low. Habitat absent.	None

Species	Status		Habitat*	Likelihood of Occurrence	Possible Impacts
	EPBC Act	TSC Act			
Swift Parrot *Lathamus discolor*	E	E	Non-breeding migrant to Australian south-east mainland from Tasmania between March and October. Occurs in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*	Low. Habitat absent.	None
Oriental Cuckoo *Culculus optatus*	M		Mainly inhabits forests, occurring in mixed, deciduous and coniferous forest.	Low. Habitat absent.	None
Powerful Owl *Ninox strenua*		V	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest.	Low. Habitat absent.	None
Masked Owl *Tyto novaehollandiae*		V	Lives in dry eucalypt forests and woodlands from sea level to 1100 m.	Low. Habitat absent.	None
Rainbow Bee-eater *Merops ornatus*	M		Breeding migrant to southern Australia occurring in usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water.	Low. Habitat absent.	None
Fork-tailed Swift *Apus pacificus*	M		The Fork-tailed Swift is almost exclusively aerial. Takes insects on wing over a range of habitat types.	Moderate. Species may forage aerially over site but unlikely to be affected by the proposed action.	None
Eastern Osprey *Pandion haliaetus*	M	V	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes.	Low. Habitat absent.	None
White-throated Needletail *Hirundapus caudacutus*	M		Almost exclusively aerial. Occur over most types of habitat, though probably recorded most often above wooded areas, including open forest and rainforest. Forages for insects over a wide variety of habitats.	Moderate. Species may forage aerially over site but unlikely to be affected by the proposed action.	None

Species	Status		Habitat*	Likelihood of Occurrence	Possible Impacts
	EPBC Act	TSC Act			
Satin Flycatcher *Myiagra cyanoleuca*	M		Heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	Low. Habitat absent.	None
Black-faced Monarch *Symposiachrus melanopsis*	M		Rainforests, wet sclerophyll forest, scrubs and gullies.	Low. Habitat absent.	None
Rufous Fantail *Rhipidura rufifrons*	M		Mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts.	Low. Habitat absent.	None
Speckled Warbler *Chthonicola sagittata*		V	Wide range of Eucalypt-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.	Low. Habitat absent.	None
Regent Honeyeater *Anthochaera phrygia*	CE	CE	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, riparian forests of River Oak and occasionally planted or remnant trees in urban areas. Woodland habitats have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Low. Habitat absent.	None
Painted Honeyeater *Grantiella picta*	V	V	Inhabits eucalypt woodlands and scrub, usually heavily infested with mistletoe.	Low. Habitat absent.	None
Varied Sittella *Daphoenositta chrysoptera*		V	Eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland.	Low. Habitat absent.	None
Scarlet Robin *Petroica boodang*		V	Dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	Low. Habitat absent.	None
Diamond Firetail *Stagonopleura guttata*		V	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	Low. Habitat absent.	None
AMPHIBIANS					
Giant Burrowing Frog *Heleioporus australiacus*	V	V	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	Low. Habitat absent.	None

Species	Status		Habitat*	Likelihood of Occurrence	Possible Impacts
	EPBC Act	TSC Act			
Green and Golden Bell Frog *Litoria aurea*	V	E	Inhabits a variety of environments, including disturbed sites, ephemeral ponds, wetlands, marshes, dams and stream-sides, particularly those that contain one or more of the following aquatic plants: bullrush (*Typha spp.),* spikerush (*Eleocharis spp*.), *Juncus kraussii*, *Schoenoplectus littoralis* and *Sporobolus virginicus*.	Low. Habitat absent.	None
Littlejohn's Tree Frog Litoria littlejohni	V	V	This species breeds in the upper reaches of permanent streams and in perched swamps.	Low. Habitat absent.	None
REPTILES					
Broad-headed Snake *Hoplocephalus bungaroides*	E	E	Confined to sandstone bushland, within approximately 250 km of Sydney. It shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring; and moves to shelters in hollows in large trees within 200 m of escarpments in summer	Low. Habitat absent.	None
INVERTERBRATES					
Cumberland Land Snail *Meridolum corneovirens*		E	Intact remnants of Cumberland Plain Woodland where it lives amongst litter of bark, leaves and logs, or shelters in loose soil around grass clumps. Occasionally shelters under rubbish.	Low. Habitat absent.	None
Dural Land Snail *Pommerhelix duralensis*	E		The species has a strong affinity for communities in the interface region between shale-derived and sandstone-derived soils, with forested habitats that have good native cover and woody debris. It favours sheltering under rocks or inside curled-up bark. It does not burrow nor climb. The species has also been observed resting in exposed areas, such as on exposed rock or leaf litter, however it will also shelter beneath leaves, rocks and light woody debris.	Low. Habitat absent.	None

Appendix 3. Flora species recorded during the field investigation

Key
* - introduced species

	GENUS Species	Common Name
FILICOPSIDA		
Salviniaceae	*Azolla sp.*	Azolla
MAGNOLIOPSIDA - DICOTYLEDONS		
Asclepiadaceae	*Araujia hortorum* *	Moth Plant
Asteraceae	*Bidens pilosa* *	Farmers Friend
	Cirsium vulgare *	Scotch Thistle
	Conyza bonariensis *	Fleabane
	Hypochaeris radicata *	Catsear
	Sonchus oleraceus *	Sowthistle
Euphorbiaceae	*Glochidion ferdinandi* var. *ferdinandi*	Cheese Tree
Fabaceae: Faboideae	*Trifolium repens* *	White Clover
Malvaceae	*Modiola caroliniana* *	Carolina Mallow
	Sida rhombifolia *	Paddy's Lucerne
Oxalidaceae	*Oxalis sp.* *	Oxalis
Pittosporaceae	*Bursaria spinosa* subsp. *spinosa*	Blackthorn
Plantaginaceae	*Plantago lanceolata* *	Lamb's Tongue
Polygonaceae	*Rumex sp.* *	Dock
Proteaceae	*Grevillea robusta* *	Silky Oak
Solanaceae	*Solanum sp.* *	
Verbenaceae	*Verbena bonariensis* *	Purpletop
MAGNOLIOPSIDA - MONOCOTYLEDONS		
Cyperaceae	*Cyperus eragrotis* *	
	Cyperus gracilis	Slender Flat-sedge
Juncaceae	*Juncus usitatus*	Common Rush
Poaceae	*Austrodanthonia sp.*	A Wallaby Grass
	Bromus catharticus *	Prairie Grass
	Cenchrus clandestinus *	Kikuyu Grass
	Chloris gayana *	Rhodes grass
	Cynodon dactylon *	Couch
	Digitaria sp. *	
	Echinochloa crus-galli *	Barnyard Grass
	Eragrostis curvula *	African Love Grass
	Eriochloa pseudoacrotricha	Early Spring Grass
	Paspalum dilatatum *	Paspalum
	Paspalum distichum	Fresh Water Couch
	Setaria gracilis *	Pigeon Grass
Typhaceae	*Typha orientalis*	Cumbungi