7.6 Initial site investigation

The initial site investigation was conducted on an 80m x 80m grid across the site (Figure 6 and Appendix 5).

The site has a historical land-use of grazing. Minor amounts of cropping are expected to have occurred on the mid to lower slopes of the site.

Scattered eucalypts occur along the northern boundary of the site on the neighbouring property. Isolated pepper tree, white cedar and casuarina are located in the paddocks. A small tree nursery providing trees for landscaping on the adjoining subdivision has been established in the central western section of the site. Pasture species are exotic grasses and legumes with weeds. The weed species include Paterson's curse, cat head, fleabane, clover, saffron thistle, couch grass, flatweed and khaki weed. Vegetation cover was greater than 80% across the majority of the site. Bare areas were due to farm tracks and desiccation resulting from low rainfalls.

The majority of the site was very gently inclined with slopes ranging from 0 to 2%. Slope increased to 8% in the north eastern section.

Many basalt cobbles were identified in the north eastern and eastern sections of the site.

No indicators of salinity were observed.

7.7 Soil characteristics

Boreholes were constructed to depths of 1.5m, 3m 10m or drill refusal. Drill refusal due to rock at depths less than 1,000mm was encountered in several boreholes constructed in the north western and north eastern sections of the site. Borelogs are presented in Appendix 6.

7.7.1 Texture and colour

Soils on the site comprised topsoil of dark brown to brown silty clay to sandy clay loam (Table 12). Subsoils were yellowish red to reddish brown fine sandy clay loam, sandy clay, light to medium clay to silty sand with increasing weathered basalt cobble and weathered rock with depth. Basalt cobbles and weathered rock consisting of quartz sandstone in the north east and basalt in the west were encountered from varying depths over the site between 0.2 to 12.0m (Appendix 6).

The soil was generally dry to moist throughout the profile. Wet soil was identified in Borehole 20 from 3.5 to 4.0m. No free water was identified in any borehole.

7.7.2 Salinity (electrical conductivity)

All topsoils samples were determined to be non-saline. Subsoils in the majority of the site were classified as non-saline (BH33, BH44, BH53, BH59 and BH62) with electrical conductivity of less than 1dS/m (Figure 11).

The electrical conductivity of subsoils samples collected between 6.5m and 9.5m in BH56 ranged from 2.03 to 3.91dS/m and are considered slightly saline. The remainder of the samples collected from BH56 were non-saline.

Subsoils samples collected from two boreholes (BH8 and BH20) constructed in the north eastern section of the site contained moderately to highly saline subsoils from 1m and highly to extremely saline subsoils from 2.5m (Table 12).

Table 12. Soil colour, texture, pH, EC and ECe (detailed profile descriptions)

Borehole No - depth (mm) (monitoring well)	Soil colour	Soil texture	pH	EC1:5	ECe (dS/m)	Emerson aggregate test
20-100 (MW1)	Dark brown	Silty clay loam	4.51	0.15	1.29	2
20-200 (MW1)	Dark brown	Silty clay	4.79	0.10	0.75	2
20-300 (MW1)	Dark brown	Sandy clay	5.45	0.04	0.30	2
20-500 (MW1)	Dark brown	Sandy clay	6.26	0.06	0.45	1
20-1000 (MW1)	Dark brown	Sandy clay	7.67	0.13	0.98	1
20-1500 (MW1)	Dark brownish red	Sandy clay with gravel	7.91	0.36	2.70	1
20-2000 (MW1)	Light brownish grey	Light clay	8.34	0.32	2.40	2
20-2500 (MW1)	Greyish brown	Light clay	7.98	0.93	6.98	5
20-3000 (MW1)	Greyish brown	Light clay	8.19	0.95	7.13	2
20-3500 (MW1)	Brown	Sandy clay	8.30	0.90	6.75	2
20-4000 (MW1)	Greyish brown	Sandy clay with gravel	8.59	1.00	7.50	2
20-4500 (MW1)	Light greyish brown	Sandy clay with gravel	8.65	1.03	7.73	2
20-5000 (MW1)	Pale brown	Clayey sand	8.97	1.02	23.5	2
20-5500 (MW1)	Pale brown	Clayey sand	8.92	0.95	21.8	2
20-6000 (MW1)	Pale brown	Clayey sand	9.05	0.72	16.6	2
20-6500(MW1)	Pale brown	Clayey sand	9.02	0.65	14.9	2
20-7000 (MW1)	Pale yellowish grey	Clayey sand	9.13	0.53	12.2	2
20-7500 (MW1)	Pale yellowish grey	Clayey sand	9.04	0.59	13.6	2
20-8000 (MW1)	Pale yellowish grey	Clayey sand	9.14	0.50	11.5	2
20-8500 (MW1)	Pale yellowish grey	Clayey sand	9.11	0.49	11.3	2
20-9000 (MW1)	Light grey	Clayey sand	8.96	0.52	11.9	2
20-9500 (MW1)	Light grey	Silty clay	8.81	0.29	2.18	2
20-10000 (MW1)	Light grey	Silty clay	8.84	0.28	2.10	2
44-100 (MW2)	Dark brown	Sandy clay loam	5.02	0.10	0.95	3
44-200 (MW2)	Dark brown	Sandy clay loam	6.58	0.03	0.29	3
44-300 (MW2)	Reddish brown	Sandy clay	6.24	0.04	0.30	3
44-500 (MW2)	Yellowish red	Fine sandy clay loam	6.60	0.05	0.43	3
44-1000 (MW2)	Yellowish red	Fine sandy clay loam	7.25	0.07	0.60	5
44-1500 (MW2)	Yellowish red	Fine sandy clay loam	7.10	0.07	0.60	5
44-2000 (MW2)	Yellowish red	Fine sandy clay loam	7.36	0.06	0.52	3
44-2500 (MW2)	Yellowish brown	Light clay	7.27	0.04	0.30	2
44-3000 (MW2)	Yellowish brown	Sandy clay with gravel	7.08	0.04	0.30	2
44-3500 (MW2)	Yellowish brown	Sandy clay	7.22	0.05	0.38	2
44-4000 (MW2)	Yellowish brown	Sandy clay	6.99	0.04	0.30	2
44-4500 (MW2)	Yellowish brown	Sandy clay	6.66	0.06	0.45	2
44-5000 (MW2)	Yellowish brown	Sandy clay	6.48	0.07	0.52	2
44-5500 (MW2)	Yellowish brown	Sandy clay with gravel	6.53	0.08	0.60	2
44-6000 (MW2)	Brown	Sandy clay	6.55	0.07	0.52	2
44-6500 (MW2)	Brown	Sandy clay	6.41	0.08	0.60	2
44-7000 (MW2)	Yellowish brown	Sandy clay	7.10	0.08	0.60	1
44-7500 (MW2)	Yellowish brown	Light medium clay	6.74	0.07	0.41	1
44-8000 (MW2)	Brown	Light medium clay	6.67	0.07	0.41	1
44-8500 (MW2)	Greyish brown	Light medium clay with gravel	6.60	0.08	0.45	3
44-9000 (MW2)	Yellowish brown	Light medium clay with gravel	6.70	0.09	0.52	3
44-9500 (MW2)	Brown	Light clay with gravel	6.95	0.10	0.75	1
44-10000 (MW2)	Brown	Light clay with gravel	6.93	0.08	0.60	1
56-100 (MW3)	Dark brown	Silty clay loam	6.62	0.07	0.60	2
56-200 (MW3)	Dark brown	Silty clay loam	6.48	0.04	0.30	2
56-300 (MW3)	Dark brown	Sandy clay	6.31	0.05	0.38	2
56-500 (MW3)	Yellowish red	Sandy clay	6.34	0.02	0.15	1
56-1000 (MW3)	Yellowish red	Sandy clay	6.93	0.04	0.30	1
56-1500 (MW3)	Yellowish red	Sandy clay	7.42	0.06	0.45	1

56-2000 (MW3)	Yellowish brown	Sandy clay	6.66	0.02	0.15	2
56-2500 (MW3)	Yellowish brown	Sandy clay with gravel	8.02	0.19	1.43	2
56-3000 (MW3)	Yellowish brown	Sandy clay with gravel	8.07	0.21	1.58	2
56-3500 (MW3)	Yellowish brown	Sandy clay with gravel	8.12	0.26	1.95	2
56-4000 (MW3)	Dark yellowish brown	Sandy clay with gravel	7.92	0.20	1.50	2
56-4500 (MW3)	Dark yellowish brown	Light clay with gravel	7.78	0.22	1.65	2
56-5000 (MW3)	Dark yellowish brown	Light clay with gravel	7.52	0.26	1.95	1
56-5500 (MW3)	Dark yellowish brown	Light clay with gravel	7.50	0.23	1.73	1
56-6000 (MW3)	Dark yellowish brown	Sandy clay with gravel	7.45	0.18	1.35	1
56-6500 (MW3)	Yellowish brown	Clayey sand	7.82	0.17	3.91	2
56-7000 (MW3)	Greyish brown	Sandy clay with gravel	7.80	0.22	1.65	2
56-7500 (MW3)	Greyish brown	Sandy clay	8.23	0.36	2.70	2
56-8000 (MW3)	Brown	Sandy clay	8.16	0.27	2.03	2
56-8500 (MW3)	Light brownish grey	Sandy clay	8.14	0.34	2.55	1
56-9000 (MW3)	Light brownish grey	Sandy clay	8.28	0.29	2.18	1
56-9500 (MW3)	Light brownish grey	Light clay	8.30	0.29	2.18	1
56-1000 (MW3)	Light brownish grey	Light clay	8.13	0.25	1.88	1
8-100	Dark brown	Sandy clay loam	5.75	0.04	0.38	1
8-200	Dark brown	Sandy clay loam	6.35	0.05	0.48	1
8-300	Dark brown	Sandy clay loam	7.01	0.10	0.95	1
8-500	Brown	Sandy clay	7.98	0.18	1.35	1
8-1000	Reddish brown	Sandy clay	8.25	0.48	3.60	2
8-1500	Reddish brown	Sandy clay	8.54	0.60	4.50	2
8-2000	Brown	Sandy clay with gravel	8.53	0.65	4.88	2
8-2500	Brown	Sandy clay with gravel	8.44	0.61	4.58	2
8-3000	Brown	Sandy clay with gravel	8.04	0.40	3.00	2
8-3500	Yellowish brown	Sandy clay	8.36	0.50	3.75	2
8-4000	Yellowish brown	Sandy clay with gravel	8.69	0.48	3.60	2
8-4500	Yellowish brown	Sandy clay with gravel	8.70	0.50	3.75	2
8-5000	Yellowish brown	Sandy clay with gravel	8.86	0.31	2.33	3
8-5500	White	Clayey sand with gravel	8.64	0.09	2.07	3
8-6000	White	Sandy clay with gravel	8.58	0.28	2.10	2
8-6500	White	Sandy clay with gravel	8.48	0.16	1.20	2
8-7000	Pale brown	Sandy clay	8.56	0.18	1.35	2
8-7500	White	Clayey sand	8.18	0.05	1.15	3
8-8000	Very pale brown	Clayey sand	8.34	0.12	2.76	3
8-8500	Pale yellow	Sandy clay	8.52	0.16	1.20	2
33-100	Brown	Sandy clay loam	4.35	0.02	0.19	3
33-200	Brown	Sandy clay loam	4.63	0.03	0.29	3
33-300	Brown	Sandy clay	4.83	0.02	0.15	3
33-500	Brown	Sandy clay	5.34	0.02	0.15	3
33-1000	Yellowish red	Sandy clay	6.26	0.02	0.15	6
33-1500	Yellowish red	Sandy clay	6.82	0.04	0.30	6
33-2000	Red	Sandy clay with gravel	7.00	0.04	0.30	3
33-2500	Red	Sandy clay with gravel	7.27	0.04	0.30	2
33-3000	Yellowish red	Sandy clay	7.12	0.04	0.30	2
33-3500	Yellowish red	Sandy clay	6.72	0.04	0.30	1
33-4000	Yellowish red	Sandy clay with gravel	6.50	0.03	0.30	1
33-4500	Yellowish red	Sandy clay with gravel	6.27	0.03	0.30	1
33-5000	Yellowish red	Light clay with gravel	6.40	0.04	0.23	1
33-5500	Yellowish red	Light clay	6.56	0.05	0.29	1
33-6000	Yellowish red	Sandy clay	6.42	0.05	0.38	1
33-6500	Reddish yellow	Sandy clay	6.63	0.03	0.23	1
33-7000	Reddish brown	Sandy clay	6.18	0.04	0.30	1
33-7500	Reddish brown	Light clay	6.37	0.03	0.17	1
33-8000	Yellowish brown	Light clay	6.57	0.04	0.23	1
33-8500	Yellowish brown	Light clay	6.03	0.05	0.29	1
33-9000	Yellowish brown	Light clay	6.38	0.04	0.23	1

53-100	Brown	Sandy clay loam	6.06	0.06	0.57	3
53-200	Brown	Sandy clay loam	6.31	0.07	0.67	2
53-300	Brown	Sandy loam	6.35	0.08	1.12	2
53-500	Reddish brown	Sandy loam	6.70	0.06	0.84	3
53-1000	Reddish brown	Sandy clay	6.87	0.05	0.38	2
53-1500	Yellowish red	Sandy clay with gravel	6.80	0.07	0.52	1
53-2000	Yellowish red	Sandy clay with gravel	6.79	0.07	0.52	1
53-2500	Yellowish brown	Sandy clay with gravel	6.45	0.04	0.23	1
53-3000	Brown	Sandy clay with gravel	6.03	0.04	0.23	3
53-3500	Brown	Sandy clay with gravel	6.23	0.05	0.29	3
53-4000	Brown	Sandy clay with gravel	6.12	0.05	0.29	3
53-4500	Brown	Sandy clay with gravel	6.30	0.03	0.17	3
53-5000	Brown	Sandy clay with gravel	6.66	0.04	0.23	3
59-100	Brown	Sandy clay loam	5.68	0.04	0.38	3
59-200	Reddish brown	Fine sandy clay loam	5.15	0.03	0.42	2
59-300	Red	Sandy clay	5.85	0.05	0.38	2
59-500	Red	Sandy clay	6.15	0.06	0.45	3
59-1000	Reddish brown	Sandy clay	7.09	0.06	0.45	3
59-1500	Reddish brown	Sandy clay	7.39	0.13	0.98	3
59-2000	Pale brown	Sandy clay	8.25	0.20	1.50	5
59-2500	Pale brown	Sandy clay	8.11	0.17	1.28	3
59-3000	Yellowish brown	Sandy clay	7.68	0.15	1.13	2
59-3500	Yellowish brown	Sandy clay with gravel	8.13	0.22	1.65	3
59-4000	Yellowish brown	Sandy clay with gravel	8.02	0.21	1.58	2
59-4500	Yellowish brown	Sandy clay with gravel	8.03	0.11	0.83	2
59-5000	Yellowish brown	Sandy clay with gravel	7.88	0.12	0.90	2
59-5500	Brown	Sandy clay with gravel	8.11	0.16	1.20	2
59-6000	Brown	Sandy clay with gravel	8.04	0.14	1.05	2
59-6500	Yellowish brown	Light clay	7.80	0.12	0.90	2
59-7000	Yellowish brown	Light clay	7.83	0.17	1.28	2
59-7500	Yellowish brown	Light clay	7.60	0.14	1.05	2
59-8000	Yellowish brown	Light clay	7.90	0.12	0.90	2
59-8500	Yellowish brown	Light clay	7.59	0.14	1.05	2
59-9000	Yellowish brown	Light clay	7.60	0.16	1.20	2
62-100	Brown	Sandy clay loam	5.50	0.02	0.19	2
62-200	Brown	Sandy clay loam	5.22	0.01	0.09	2
62-300	Yellowish brown	Sandy clay loam	5.41	0.01	0.09	2
62-500	Dark brown	Sandy clay	6.53	0.03	0.23	3
62-1000	Dark brown	Sandy clay	6.76	0.02	0.15	3
62-1500	Dark brown	Sandy clay	6.47	0.03	0.23	3
62-2000	Brown	Sandy clay with gravel	6.32	0.03	0.23	3
62-2500	Brown	Sandy clay with gravel	6.52	0.03	0.23	3
62-3000	Reddish brown	Sandy clay with gravel	7.36	0.12	0.90	3
62-3500	Brown	Sandy clay with gravel	6.92	0.40	3.0	2

7.7.3 pH

The topsoil was slightly acidic (Table 12). The pH generally increased with increasing depth. Subsoil was generally strongly acidic to slightly alkaline.

7.7.4 Emerson aggregate test

Topsoil and subsoil on the site was highly dispersive to slightly dispersive (Table 12).

7.7.5 Chlorides

Levels of chlorides in the samples analysed were less than 2,000mg/kg and considered non-aggressive soils for concrete and steel piles (Table 13).

Table 13. Soil results for chlorides and exchangeable sodium percentage (ESP) (Appendix 7)

Sample ID	Borehole and depth (mm) (Figure 5)	Chlorides (mg/kg)	ESP (%)	Total cations (meq/100g)
20(100) (MW1)	20-100	80	7.8	6.4
20(1500) (MW1)	20-1500	1,750	22.6	21.2
56(100) (MW3)	56-100	740	0.6	16.3
56(1000) (MW3)	56-1000	20	0.7	15.1

ND – Not detected at the laboratory limits

7.7.6 Exchangeable sodium percentage

Exchangeable sodium percentage for samples collected from Borehole 20 located in the north eastern section of the site were 8% and 23% and are considered highly sodic. Exchangeable sodium percentage for samples collected from Borehole 56 located in the south western section of the site was less than 5% and were non-sodic (Table 13).

7.8 Indicators of salinity

7.8.1 Bare soil

No bare soil resulting from sheet erosion or salinity were present on site

7.8.2 Salt crystals

No salt crystals present on site.

7.8.3 Vegetation indicators

No highly salt tolerant plant species are present on site.

7.8.4 Die back

No vegetation or tree die back was observed on or surrounding the site.

7.8.5 Effects on buildings

The existing dwelling located west of the site has no evidence of salinity impact.

7.8.6 Conditions of roads

No evidence of surface undulations or break-up of bitumen on the roads surrounding the site.

7.9 Soil moisture model

The soil moisture varies with rainfall in all land-use scenarios of the CLASS U3M model. Soil moisture at 1m depth under all land-uses are saturated seasonally or under periods of high rainfall (Figure 12). At the 3 metres soil depth in the pasture, road verges and trees land-uses the soils not saturated in the simulation period. (Figure 13). Lawn land-use scenario has saturated soil at 3 metres as the model simulates overwatering by 1mm/day. The scenario of trees plus 1mm/day does not have saturated soil at 3m depth.

No excess soil moisture is observed at 3m depth in pasture, road verges, trees and trees plus 1mm/day land-uses (Table 14). Lawn has excess soil moisture which will be utilised by the additional capacity of the trees as demonstrated in the trees+1mm/day scenario (Table 14). It is a reasonable assumption that lateral moisture movement will occur on the clayey subsoils of low permeability and unsaturated flows will be utilized by trees located in buffer areas.

Management of areas with elevated salinity with permanent vegetation will prevent mobilization of salts in the surface or subsurface.

Table 14. Excess soil moisture at 3m depth from the simulation

Land-use	Total excess moisture at 3m 1980 to 2014 (m/m^3)
Pasture	0
Lawn	0.005 (0.5%)
Road verges	0
Trees	0
Trees plus 1mm/day	0

7.10 Nitrogen

Nitrogen soil levels in the grazing system are typically low with concentrated areas around animal wastes. Nitrogen fertilisers are also used in cropping operations and biological synthesis occurs in legumes. Off-site movement occurs from sediment loss. Water soluble nitrogen has potential to leach into the groundwater.

Post development sources of nitrogen are from fertilisers applied to lawns. Post development fertilisation will only occur in a small proportion of the site that is lawns and gardens. Nitrogen fertilisation is not expected to occur on the road verge. Nitrogen fertiliser will not be required in native gardens. The impact from lawn fertilisers will be less than the impact of animal wastes. Maintained gardens and lawns will have the capacity to utilise the nitrogen applied. The impact of nitrogen fertiliser post development will be reduced.

The nutrient balance indicates the development will reduce nitrogen export by 657 kg/year under the median scenarios (Table 15). Reduced pasture area has resulted in a decrease in the nitrogen loss.

Table 15. Land-use nitrogen export pre and post development (kg/year)

Land-use areas	Pre-development	Post-development	Impact
Native bushlands	0.00	29.76	-29.76
Disturbed landscapes	238.80	0.00	238.80
Remediated gullies	0.00	45.00	-45.00
Improved pasture	984.28	0.00	984.28
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	150.60	-150.60
Roads (earth)	1.12	0.00	1.12
Urban (lawns)	0.00	140.30	-140.30
Urban (open space)	0.00	201.60	-201.60
TOTAL	**1,224.19**	**567.26**	**656.93**

7.11 Phosphorus

The main phosphorus sources pre-development are from animal waste and fertilisers. Cattle are currently grazed on the site. Off-site movement of phosphorus will occur in sediments and susceptible times are when vegetation cover is low.

Stock numbers will decrease in the post development land-use. Domestic pet numbers on the site are expected to increase. The majority of domestic pet scats are expected to be disposed to landfill by collection of the scats by owners or removal with kitty litter. The result will be a decrease contribution of phosphorus on the site.

Phosphorus binds to soil and the primary method of movement is in sediments. Vegetation cover is expected to be higher post development resulting in filtering of runoff, reduced sediment loads exported and consequently lower phosphorus export.

The nutrient balance indicates the development will decrease phosphorus export by 71 kg/year under the median scenarios (Table 16). Riparian planting and wetland design can reduce phosphorus levels at stormwater discharge areas.

Table 16. Land-use phosphorus exports pre and post development (kg/year)

Land-use areas	Pre-development	Post-development	Impact
Native bushlands	0.00	1.61	-1.61
Disturbed landscapes	24.68	0.00	24.68
Remediated gullies	0.00	4.65	-4.65
Improved pasture	149.30	0.00	149.30
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	45.18	-45.18
Roads (earth)	0.87	0.00	0.87
Urban (lawns)	0.00	41.86	-41.86
Urban (open spaces)	0.00	10.71	-10.71
TOTAL	**174.85**	**104.01**	**70.84**

7.12 Sediment

The nutrient balance indicates the development will reduce sediment by 36,784 kg/year under the median scenario (Table 17). Sediments are reduced due to the decrease in contribution from the pasture area.

Table 17. Land-use sediment export pre and post development (kg/year)

Land-use areas	Pre-development	Post-development	Impact
Native bushlands	0.00	496.00	-496.00
Disturbed landscapes	17313.00	0.00	17313.00
Remediated gullies	0.00	3262.50	-3262.50
Improved pasture	57508.36	0.00	57508.36
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	4769.00	-4769.00
Roads (earth)	70.98	0.00	70.98
Urban (lawns)	0.00	6900.00	-6900.00
Urban (open spaces)	0.00	22680.00	-22680.00
TOTAL	**74,892.34**	**38,107.50**	**36,784.84**

7.13 Garden fertilisers and chemicals

Minor usage of herbicides may occur post development on lawns. All fertilisers and agricultural chemicals will be utilised by the vegetation or degrade rapidly in the environment. No impact on surface water or groundwater will occur.

No industrial activities including bulk storage or use of chemicals will occur in the development.

7.14 Other contaminants

7.14.1 Greywater reuse

NSW Health approves the following methods for greywater reuse:

- Bucketing: Generally only small volumes of greywater are reused and the action is unlikely to occur during wet weather. Risk of overwatering and therefore impact on groundwater is low.
- Greywater diversion devices: Does not require Council approval if conditions relating to installation and use are met. Conditions include undertaking checks and maintenance of the irrigation system, use biodegradable detergents low in phosphorus, sodium, boron and chloride, no irrigation during rain, undertake a water balance prior to installation, monitor soil and plant response to irrigation, do not overwater and notify the local water utility of the

device. Notification to the local water utility (Dubbo City Council) ensures Council is aware the system is in place and can check on compliance. Conditions ensure the water is used sustainably with minimal impact on the groundwater.

- Greywater treatment system: Requires approval from Council. Council can regulate the suitability and number of systems in the locality and check on the satisfactory operation of the system. Regulation of the system ensures minimal impact on groundwater.

7.14.2 Car washing

Minor washing of cars by householders is expected to be undertaken post development. Most car owner clean cars in commercial washing bays. Small numbers of cars will be washed either on permeable areas resulting in infiltration or non-permeable areas with water moving into the reticulated stormwater system and off-site. Water and detergents infiltrating permeable areas will be utilised by vegetation. Some deeper infiltration may occur but volumes are not expected to be significant. Car washing is not expected to occur during rain.

8. Soil and water impact assessment

8.1 Soil

Surface soil was non-saline. Subsoils in the majority of the site were classified as non-saline to slightly saline. Moderate to extremely saline subsoil were identified in the north east corner of the assessment area at a depth greater than 1.0m. The moderate to extremely saline subsoils are associated with the sandstone lithology. Excavation works from the development are not expected to intercept the saline subsoil, following adoption of the recommendations in this report

8.2 Water

8.2.1 Surface water

Runoff will be directed into a piped stormwater system. The pipes will discharge into the drainage line which will be modified to form a stormwater management system. The existing dams located on site which are fed by contour banks will be decommissioned. Lakes will be constructed to form the basis for the stormwater management system. Lakes will be lined and vegetation planted to minimise the interaction between the groundwater and stormwater management system.

8.2.2 Groundwater

8.2.2.1 Recharge

Groundwater recharge has potential to increase as a result of irrigation of lawns. Modelling has shown under a number of scenarios that soil moisture increases will not be significant and the proposed planting of deep-rooted vegetation as street trees, parkland and along the drainage lines will aid in the extraction of soil moisture within the profile and reduce the occurrence of deep infiltration. The increase in infiltration in the north-east area from lawn areas will be utilized by trees planted downslope along the drainage line.

Additional infiltration in the non-saline areas from possible over irrigation of lawn will not contribute to salinity. Large areas of impervious surface (roads and roof areas) will increase in rainfall runoff and reduce infiltration. Deep infiltration of groundwater within the area is expected to be similar pre and post development. Groundwater levels are not expected to rise as a result of the development and groundwater levels across most of the upper Macquarie Alluvium groundwater management area have shown steady term decline over the Hennessey Road (Smithson, 2010).

8.2.2.2 Discharge

No shallow groundwater discharge areas were identified on the site. It is possible the drainage line in the north of the site is a drainage area at times of high rainfall. Discharge has potential to occur at the boundary between the basalt and sandstone lithology in the north eastern section.

8.2.2.3 Clause 7.5 of the Dubbo LEP 2011

(1) The objective of this clause is to maintain the hydrological functions of key groundwater systems and to protect vulnerable groundwater resources from depletion and contamination as a result of inappropriate development.

Response: The development and groundwater at the site is described in the Groundwater and Salinity report prepared by Envirowest Consulting Pty Ltd (Report number R5737s3).

(2) This clause applies to the land identified as "Groundwater vulnerability" on the Natural Resources – Groundwater Vulnerability Map.

Response: The south western section of the site is located in a mapped high groundwater vulnerability area. The remainder of the site has a moderately high groundwater vulnerability.

(3) Before determining a development application for development on land to which this clause applies, the consent authority must consider:

(a) whether the development (including any on-site storage or disposal of solid or liquid waste chemicals) will cause any groundwater contamination or any adverse effect on groundwater dependent ecosystems.

Response:

The development has a low potential to adversely affect groundwater and groundwater dependent ecosystems. Groundwater and groundwater dependent ecosystems may be impacted by use of fertilisers on lawns and gardens, greywater reuse and car washing. The post development impact is expected to be similar or less than under the pre-development agricultural land-use.

Post development lawn inputs will only occur in a small proportion of the site that is lawns and gardens. Nitrogen fertiliser will not be required in native gardens. The impact from lawn fertilisers will be managed by riparian vegetation and stormwater design which will removed any potential increase in nitrogen rich fertilizers. Maintained gardens and lawns will have the capacity to utilise the nitrogen applied. The impact of nitrogen inputs post development will be reduced.

The post development scenario is expected to result in a decrease in contribution of phosphorus, nitrogen and suspended sediments. Fertilizer use in the residential subdivision with be less than the agricultural land-use. Stock numbers will decrease in the post development land-use while domestic pet numbers on the site are expected to increase. The majority of domestic pet scats are expected to be disposed to landfill by collection of the scats by owners or removal with kitty litter disposed as refuse to landfill.

Minor usage of herbicides may occur post development on lawns. All fertilisers and agricultural chemicals are not residual and will be utilised by the vegetation or degrade rapidly in the environment. No impact on surface water or groundwater will occur.

NSW Health approves the following methods for greywater reuse:

- Bucketing: Generally only small volumes of greywater are reused and the action is unlikely to occur during wet weather. Risk of overwatering and therefore impact on groundwater is low.
- Greywater diversion devices: Does not require Council approval if conditions relating to installation and use are met. Conditions include undertaking checks and maintenance of the irrigation system, use biodegradable detergents low in phosphorus, sodium, boron and chloride, no irrigation during rain, undertake a water balance prior to installation, monitor soil and plant response to irrigation, do not overwater and notify the local water utility of the device. Notification to the local water utility (Dubbo City Council) ensures Council is aware the system is in place and can check on compliance. Conditions ensure the water is used sustainably with minimal impact on the groundwater.
- Greywater treatment system: Requires approval from Council. Council can regulate the suitability and number of systems in the locality and check on the satisfactory operation of the system. Regulation of the system ensures minimal impact on groundwater.

Minor washing of cars by householders is expected to be undertaken post development. Most car owners clean cars in commercial washing bays. Small numbers of cars will be washed either on permeable areas resulting in infiltration or non-permeable areas with water moving into the reticulated stormwater system and off-site. Water and detergents infiltrating permeable areas will be utilised by vegetation. Some deeper infiltration may occur but volumes are not expected to be significant. Car washing is not expected to occur during rain.

No industrial activities including bulk storage or use of chemicals will occur in the development.

(b) The cumulative impact (including the impact on nearby groundwater extraction for potable water supply or stock water supply) of the development and any other existing development on groundwater.

Response:
Impact on groundwater from nitrogen contamination is expected to be less post development compared to pre-development due to lower contributions from animals and fertilisers. Other contaminates such as greywater reuse and car washing are expected to have a negligible impact on groundwater quality due to low risk of overwatering resulting in deep infiltration and regulation. The cumulative impact of the development and adjacent existing development on groundwater quality is expected to be negligible.

(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

(a) The development is designed, sited and will be managed to avoid any significant adverse environmental impact, or
(b) If that impact cannot be avoided by adopting feasible alternatives – the development is designed, sited and will be managed to minimise that impact, or
(c) If that impact cannot be minimised – the development will be managed to mitigate that impact.

No impacts from the development are expected if additional implementations are adopted. Offset contingences have also been proposed to provide additional assurance.

Mitigation measures will be adopted within the development to off-set the unlikely impacts on groundwater quality. The mitigation measures will comprise planting of deep-rooted vegetation off-

sets in proposed open space adjacent the development and along proposed stormwater wetlands. The vegetation will intercept groundwater and nutrients and will reduce the potential impact on groundwater quality.

Deep-rooted vegetation comprising native species selected from the species list provided in DCC Water Wise and Salt Tolerant Plants list (no date) will be planted in proposed open space. Trees will also be planted along road verges as part of the street scaping which will additionally mitigate any impact.

8.3 Vegetation

Most of the site contains annual species which are shallow rooted. No impact from saline soils and groundwater on the vegetation was observed.

Pasture grasses will be replaced with introduced garden species including deep rooted perennials. Garden species to be planted will be shallow rooted or salt tolerant and no impact on growth is expected. Trees will be planted in the proposed parkland. The proposed residential development will contain irrigated and unirrigated lawns with plantings of shrubs and trees. Ecowise gardens of native and drought tolerant species will be promoted in the development. Costs associated with irrigation will ensure overwatering and leaching does not occur. On-site shallow groundwater is not expected to be a viable source of irrigation water due to the unreliable shallow groundwater aquifer. The deeper confined aquifer has been proven as a reliable source however recent reports suggest licences may be difficult due to groundwater decline within the upper Macquarie groundwater management area. The use of fertiliser and herbicides on lawn will be utilised by plants and will not move out of the rooting zone.

The new land-use will contain a mix of shallow and deep rooted vegetation. Species planted in lawns will utilise soil moisture all year round compared to the current pasture species mix which are mostly summer active only. Trees will be planted along roadways and garden areas.

8.4 Infrastructure

Non to slightly saline soils were identified to a depth of 1.0m across the majority of the site which is below the footing depth for residential buildings. Moderately to extremely saline soils were identified from 1.0m in the north east corner of the assessment area. Excavations that are required to be at depths greater than 1.0m in the north east section of the assessment area should be consider salt protected materials for services and be undertaken in accordance with building in saline areas. Groundwater is present at depths greater than building depths. No special construction requirements addressing salinity are expected to be required for infrastructure including roads and buildings in the remainder of the site.

8.5 Pollution risk control

The subsoil is clay with depth of greater than 8 metres to groundwater. The soil layer provides significant filtration and absorption capacity to reduce contamination loading.

Occasional fertilizer and chemical use is expected from the residential land-use. Fertilisers will be utilised by plants. All agricultural chemicals degrade rapidly in the environment. No impact on surface water or groundwater will occur.

The site currently has a grazing land-use. Waste from the animals contains significant nutrients and pathogens which has potential to move in surface water flows.

Stock will be excluded in the post development land-use. Domestic pet numbers on the site are expected to increase. The majority of domestic pet scats are expected to be disposed to landfill by collection of the scats by owners or removal with kitty litter. The result will be a decrease contribution by animals to nutrients on the site.
Vegetation cover around the dwellings and in the nature strips will provide a biofilter resulting in reduced sediment loads exported. Nutrient impact on surface water will be reduced post development.

The site area is considered important as it forms part of the Macquarie River catchment. ANZECC (2000) has determined water quality indicators for river systems in regard to various environmental values (Table 18). The environmental values relate to the protection of:

- aquatic ecosystems
- aquatic foods
- primary contact recreation
- secondary contact recreation
- drinking water
- visual amenity
- irrigation water supplies
- homestead water supplies
- livestock water supplies
- human consumption of fish

The irrigation water quality indicators are considered appropriate for the catchment. The potential impact of the development on each water quality indicator has been assessed (Table 18). Potential issues relate to current and future land-use and management of the site.

The impact of the development on each water quality indicator will be negligible.

8.6 Earthworks

Moderate earthworks are expected for the development. Excavations in the northeast section of the site should be restricted to depths of less than 1m reducing the risk of exposure of saline subsoils. The roads will be designed to ensure road levels are as close as possible to the existing natural levels to ensure saline-subsoils are not exposed. Subsoils in the majority of the site were classified as non-saline to slightly saline.

8.7 Other impacts of the development

Nil

Table 18. Impacts of development on water quality (Environmental objectives)

Indicator	Objective	Impact of development
Nitrogen	5 mg/L	Nitrogen may be applied to the site as fertilisers. Nitrogen will be used by plants, digested by microbes or volatilised into the atmosphere. Infiltration for nitrogen into the subsoil and impact on groundwater systems will not occur. Maintenance of groundcover by minimal cultivation and no grazing are important factors in reducing nitrogen export. Nutrient modelling indicates nitrogen will decrease on site.
Faecal coliform	<10 cfu/100mL to 10,000cfu/100mL	The site will be serviced by the town sewer. No impact on faecal coliform levels is expected to result from the development.
Aluminium	5 mg/L	No impact.
Iron	0.2 mg/L	No impact.
Manganese	0.2 mg/L	No impact.
Dissolved oxygen	>6.5 mg/L	No effluent applied to the site. Vegetated areas are expected to be managed. No impact.
Phosphorus	0.05mg/L	Phosphorus may be applied to the site as fertilisers or in domestic pet scats. Domestic pet scats are expected to be removed by collection by owners or disposal of kitty litter and will not significantly contribute to phosphorus levels on the site. Phosphorus will be used by plants and absorbed in the soil. Groundcover will be enhanced in the development resulting in reduced sediment and phosphorus export. Post development fertiliser application rates will be reduced and the effect on phosphorus less. Nutrient modelling indicates phosphorous will decrease on site post development. Riparian planting and will additionally reduce phosphorus levels at stormwater discharge areas.
pH	between 6.0 and 8.5	Fertilisers have a declining influence on pH and effects off-site will be negligible.
Cyanobacteria	-	Cyanobacteria are dependent on the levels of nitrogen, phosphorus and water temperature. The development will not increase nitrogen and phosphorus therefore will have negligible impact. No cyanobacteria are present in fertilisers.
Conductivity	-	Exposure of saline soils and off-site movement will be minimised by adoption of recommendations including minimising depth of cut and implementation of erosion and sediment control plans. No impact expected.
Turbidity	-	Negligible impact due to small size of the development and the absence of any disturbed areas on site.

9. Management recommendation

9.1 Design

An Electromagnetic survey of the north eastern section of the site will provide data on the location of the sandstone/basalt interface. Construction of additional boreholes and analysis of soil samples will confirm the presence of saline soils. The location of the geological interface should be used to incorporate the planting of deep rooted vegetation into the final design of the subdivision.

The development water and soil design will include:

- Establishment of parkland areas with native species which do not require irrigation
- Promote plantings of deep rooted vegetation along roads and public space
- Additional plantings of deep rooted vegetation throughout the parkland. The trees should be planted with 20m spacings (25 trees/ha).
- Planting of trees in expected areas of lithological/hydrological interfaces to minimise saline soils/groundwater
- Piping of surface water off-site
- Stormwater retention basins lined with an impermeable layer
- Design road levels similar to natural soil levels to minimise excavations
- Earthworks comprising cut should be minimised
- Excavated material with elevated salinity should be backfilled, utilised as fill under roads or disposed to landfill

9.2 Buildings

Soil saturated extract electrical conductivity (EC_e) was determined to be less than 1.35 dS/m in the soil samples tested within the expected footing depth range of 0.6m (exposure classification B2). The lowest soil pH was 4.4 (exposure classification B1). Design characteristic strength for concrete is a minimum 32MPa and minimum curing requirement is continuous curing for at least 7 days will be required for the most aggressive sites (Appendix 2). Minimum reinforcement cover for concrete in soils is 55mm (Appendix 2). Site specific testing should be undertaken to classify the soil for footing design and construction in accordance with AS2870-2011 and confirm exposure classification (Appendix 2).

9.3 Exposure classification for concrete

Soil saturated extract electrical conductivity (EC_e) was determined to be <4dS/m in the soil samples tested (Table 13). The soil pH ranged between 4.4 and 9.1. Exposure classification for concrete is B1. Minimum design characteristic strength for concrete is 32MPa and minimum curing requirement is continuous curing for at least 7 days (Appendix 2). Minimum reinforcement cover for concrete in soils is 55mm (Appendix 2).

10. Conclusions

The site had a pasture grazing land-use. No bare areas resulting from sheet erosion or salinity were identified. The risk of erosion is low

Soils on the site comprised topsoil of dark brown to brown silty clay to sandy clay loam. Subsoils were yellowish red to reddish brown fine sandy clay loam, sandy clay, light to medium clay to silty sand with increasing weathered basalt cobble and weathered rock with depth. Basalt cobbles and weathered rock consisting of quartz sandstone and olive basalt were encountered from varying depths over the site between 0.2 to 12.0m. The Dubbo (LEP) maps indicate the site is located within a vulnerable groundwater area.

The majority of the site is located within the Old Dubbo Road Hydrogeological Landscape (HGL). Lithology of the Old Dubbo Road HGL consists of Napperby Formation comprising siltstone thinly interbedded with fine to medium grained lithic quartz and minor conglomerates. This has been overlaid by colluvial and alluvial weathered basalt. The Old Dubbo Road HGL is generally non-saline.

An area in the north eastern section of the site is located in the Dubbo Basalt HGL. Lithology of the Dubbo Basalt HGL consists of Cainozoic basalt comprising in situ Olivine rich alkali basalt with

some colluvial material and quartzite derived from the underlying sandstone and siltstone. The investigation identified saline strata in the Dubbo Basalt HGL.

A small hillock is located within the north eastern section. The hillock comprises rounded quartz sandstone with hematite cementing and is expected to be part of the Purlawaugh Formation which is mapped to the north east of the site. The sandstone provides a geological contrast with the overlaying basalt and may provide potential sites for salt discharges at the sandstone/basalt interface.

Subsoils in the majority of the site were classified as non-saline to slightly saline. These areas correspond with the Old Dubbo Road HGL. Saline subsoils were identified in two boreholes (BH20 and BH8) located in the north eastern section at depths greater than 1m. Soil electrical conductivity generally increased with depth in the north east section. The location of saline soil corresponds with the Dubbo Basalt HGL.

Infiltration of groundwater over most of the site will not result in mobilisation of salts. Groundwater was encountered in MW1 located in the north eastern section of the site from 8.12m. Electrical conductivity of groundwater taken from MW1 was 4.6dS/m which under the Dubbo City Urban Salinity Implementation Plan is classed as moderately saline. No groundwater was identified in MW2 and MW3 to a depth of 10m on light clay.

No groundwater discharge areas were identified on the site. Potable and stock supply bores have been constructed in the locality. Bores in the locality generally have water bearing zones greater than 10m in gravels and sands. The majority of Dubbo City Council monitoring bores have been dry since the start of monitoring. Highly saline groundwater has been identified in one groundwater monitoring bore located west of the site.

Modelling of soil moisture levels over the past 34 years indicated variations in infiltration occur with the amount of rainfall pre and post development. Most land uses do not contribute to groundwater recharge in the CLASS U3M model. Overwatering of lawn has potential to increase recharge. The amount of irrigated lawn will be small over the area and quantity will not be significant. Over the site the infiltration will be reduced in the development. Reduced soil moisture is a result of the increase in runoff due to impermeable areas (roads, roofs, driveways) and increase in deep rooted vegetation extracting soil moisture from depth. The establishment of trees in strategic areas will offset any additional infiltration from lawn over watering.

The risk of groundwater contamination from the proposed land-use is equal or lower to the current land-use. Nitrogen contributions will decrease as a result of smaller available areas for fertilisation and a decrease in animal waste; domestic pet waste will generally be disposed off-site. Phosphorous and sediment contributions will also decrease and reduce the impact on site. Washing of cars on permeable areas will not be a significant contributor to nutrient levels. Reuse of greywater will be small volumes of unregulated use or larger volumes which require specific conditions or use of regulation by Council. Conditions of use and regulation will ensure overwatering does not occur.

No impact on groundwater including contamination and changed groundwater levels is expected from the development if recommendations are adopted. The development will not impact on quantity or quality of both unconfined and confined aquifers.

11. Recommendations

An Electromagnetic survey of the north eastern section of the site will provide data on the location of the sandstone/basalt interface. The location of the geological interface should be used to incorporate the planting of deep rooted vegetation into the final design of the subdivision.

Planning and development controls are recommended to prevent mobilisation of salt in the soil and groundwater resulting in on and off-site impacts. Controls include:

- Planting of trees in areas of lithological/hydrological interfaces as identified by the electromagnetic (EM) survey to minimise mobilisation of salt in the soil by rising groundwater tables.
- Establishment of parkland areas with native species which do not require irrigation
- Plantings of deep rooted vegetation along roads
- Plantings of deep rooted vegetation throughout the parkland
- Piping of surface water off-site
- Stormwater retention basins lined with an impermeable layer
- Design road levels similar to natural soil levels to minimise excavations
- Earthworks comprising cut should be minimised
- Excavated material with elevated salinity should be backfilled, utilised as fill under roads or disposed to landfill

11. Report limitations and intellectual property

This report has been prepared for the use of the client to achieve the objectives given the clients requirements. The level of confidence of the conclusion reached is governed by the scope of the investigation and the availability and quality of existing data. Where limitations or uncertainties are known, they are identified in the report. No liability can be accepted for failure to identify conditions or issues which arise in the future and which could not reasonably have been predicted using the scope of the investigation and the information obtained.

The investigation identifies the actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing is interpreted by geologists, engineers or scientists who then render an opinion about overall conditions, the nature and extent of likely impacts of the proposed development, and appropriate remediation measures. Actual conditions may differ from those inferred to exist, because no professional, no matter how well qualified, and no sub surface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock or time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. It is thus import to understand the limitations of the investigation and recognise that we are not responsible for these limitations.

12. References

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Figures

North

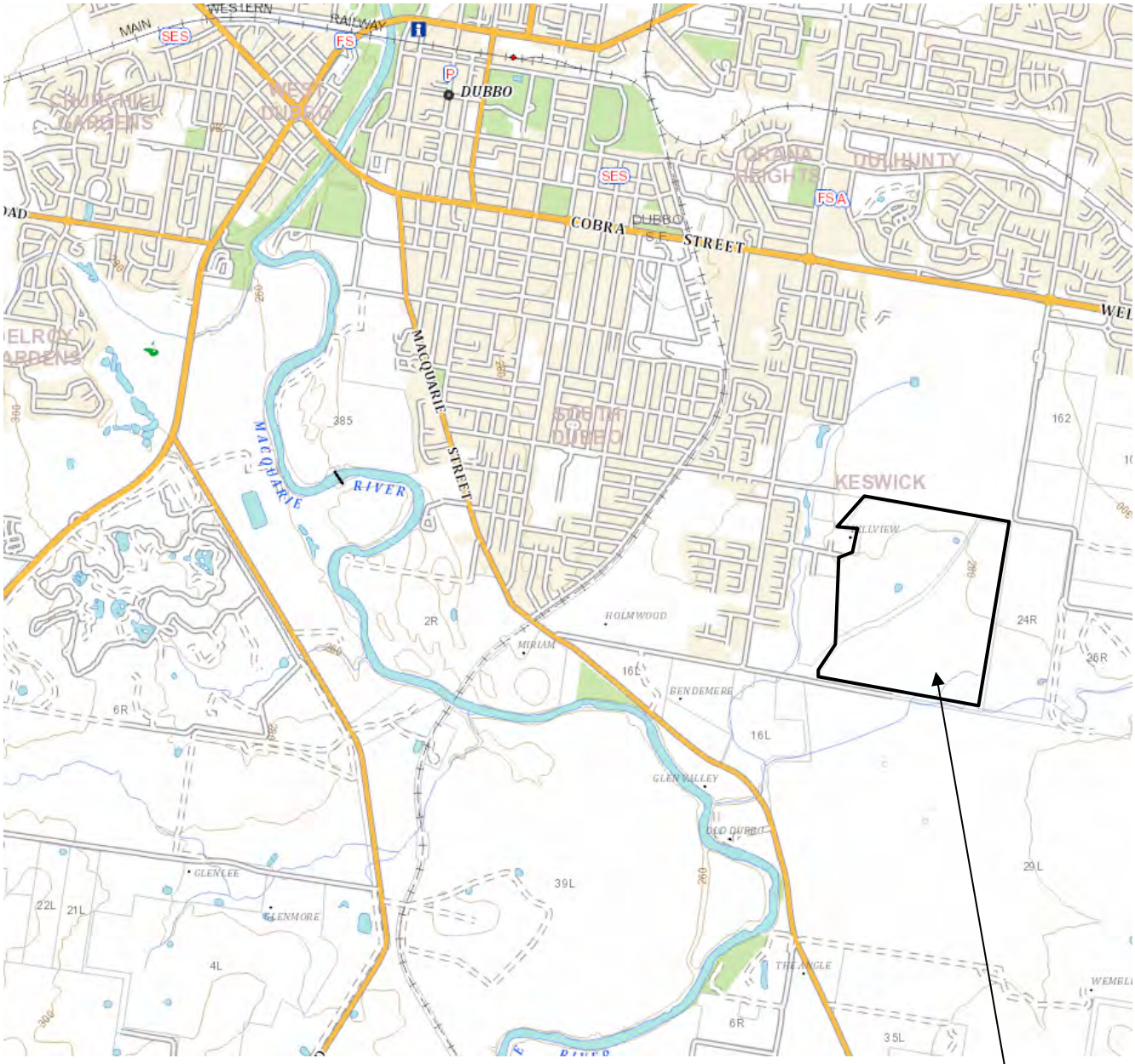
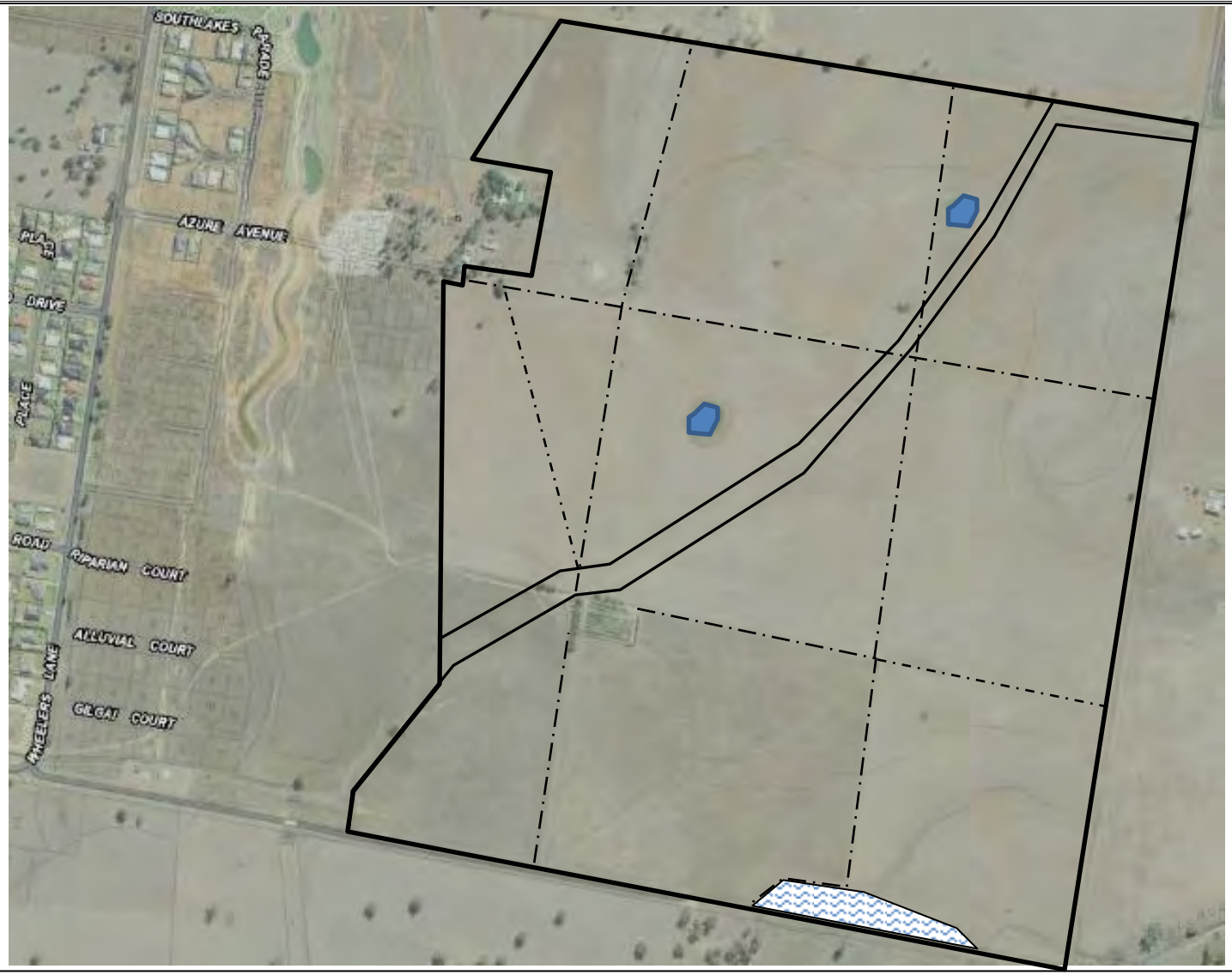


Figure 1: Locality plan		
Lot 399 DP1199356 & Lot 503 DP1152321, Dubbo NSW		
	Envirowest Consulting Pty Ltd	
Job – R5737s3	Drawn by: DL	Date: 30/06/2015



North

Legend

- ⊗ Sampling location
- Lot boundary
- Dam
- Drainage depression
- Fence

Approximate Scale 1: 9,500

0 95 190 380m

Figure 2: Site plan		
Lot 399 DP1199356 and Lot 503 DP1152321, Dubbo NSW		
	Envirowest Consulting Pty Ltd	
Job: R5737c	Drawn by: DL	Date:30/06/2015

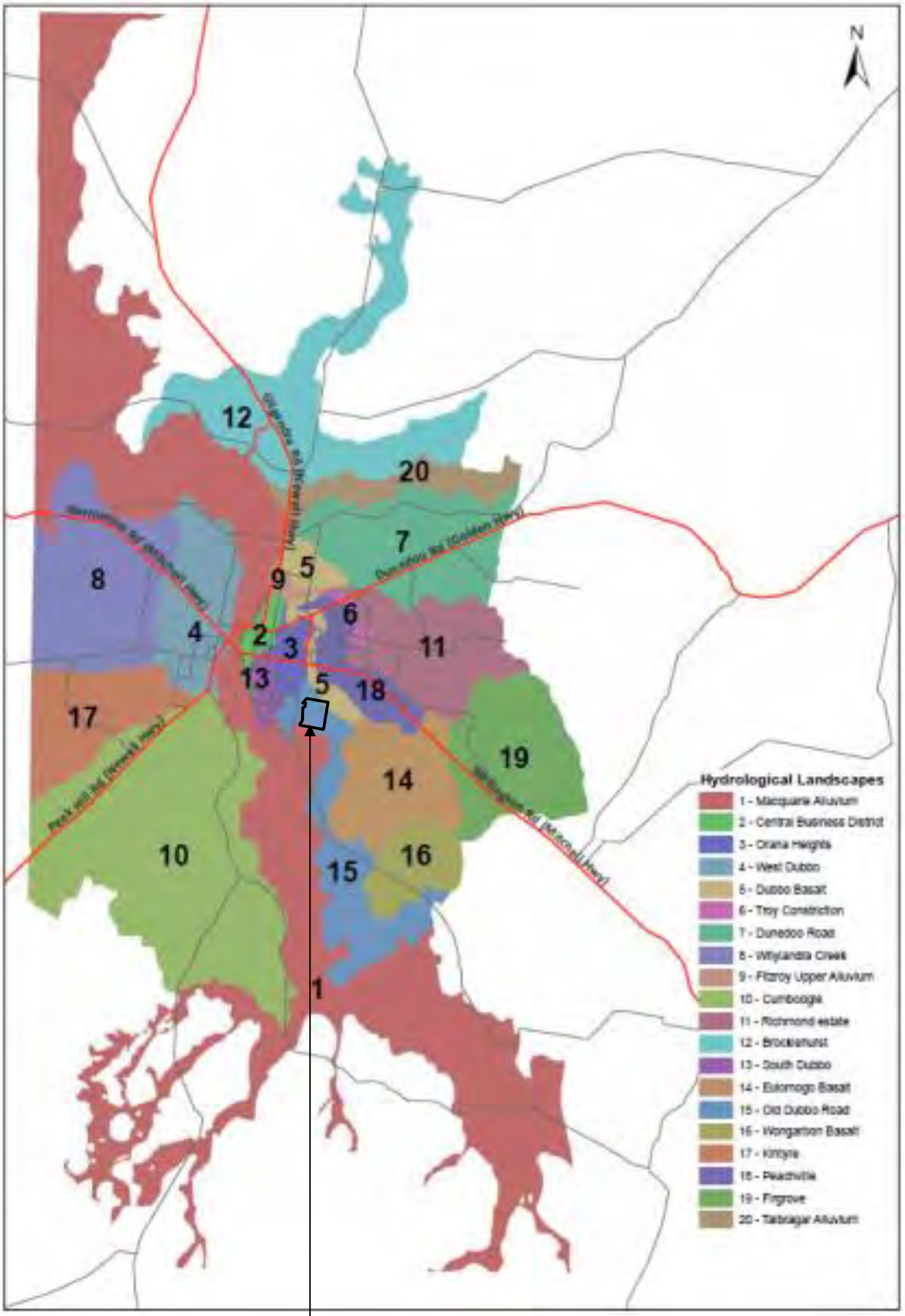


Figure 3: Hydro-geological landscapes of the Dubbo area

Lot 399 DP1199356 and Lot 503 DP1152321, Dubbo NSW

Envirowest Consulting Pty Ltd

Job – R5735s	Drawn by: -	Date: 30/6/2015

DUBBO GROUNDWATER VULNERABILITY MAP

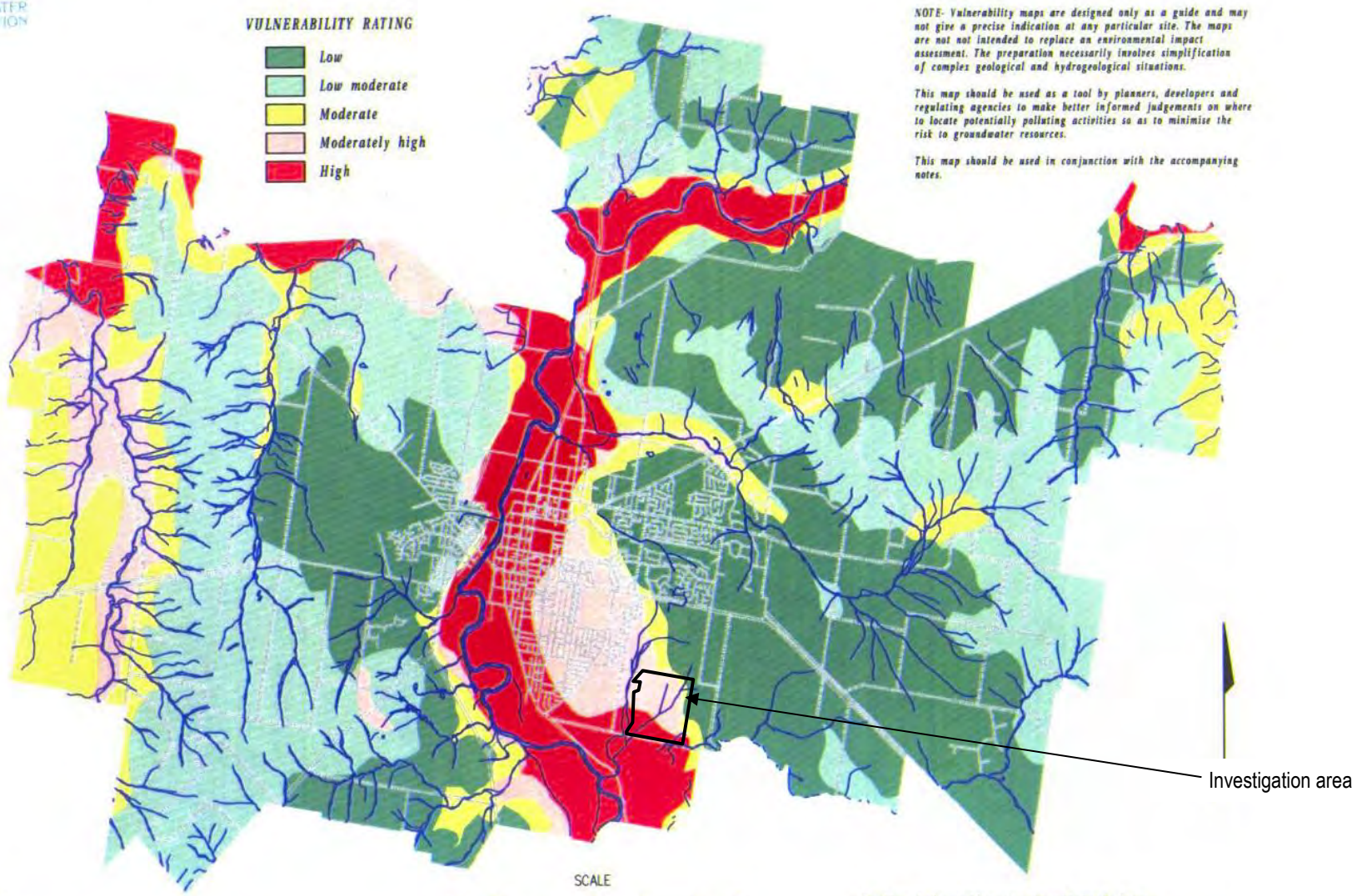


Figure 4: Groundwater vulnerability map of Dubbo - DECCW

Lot 399 DP1199356 & Lot 503 DP1152321, Dubbo NSW

Envirowest Consulting Pty Ltd

Job: R5737s3	Drawn by: -	Date: 30/06/2015

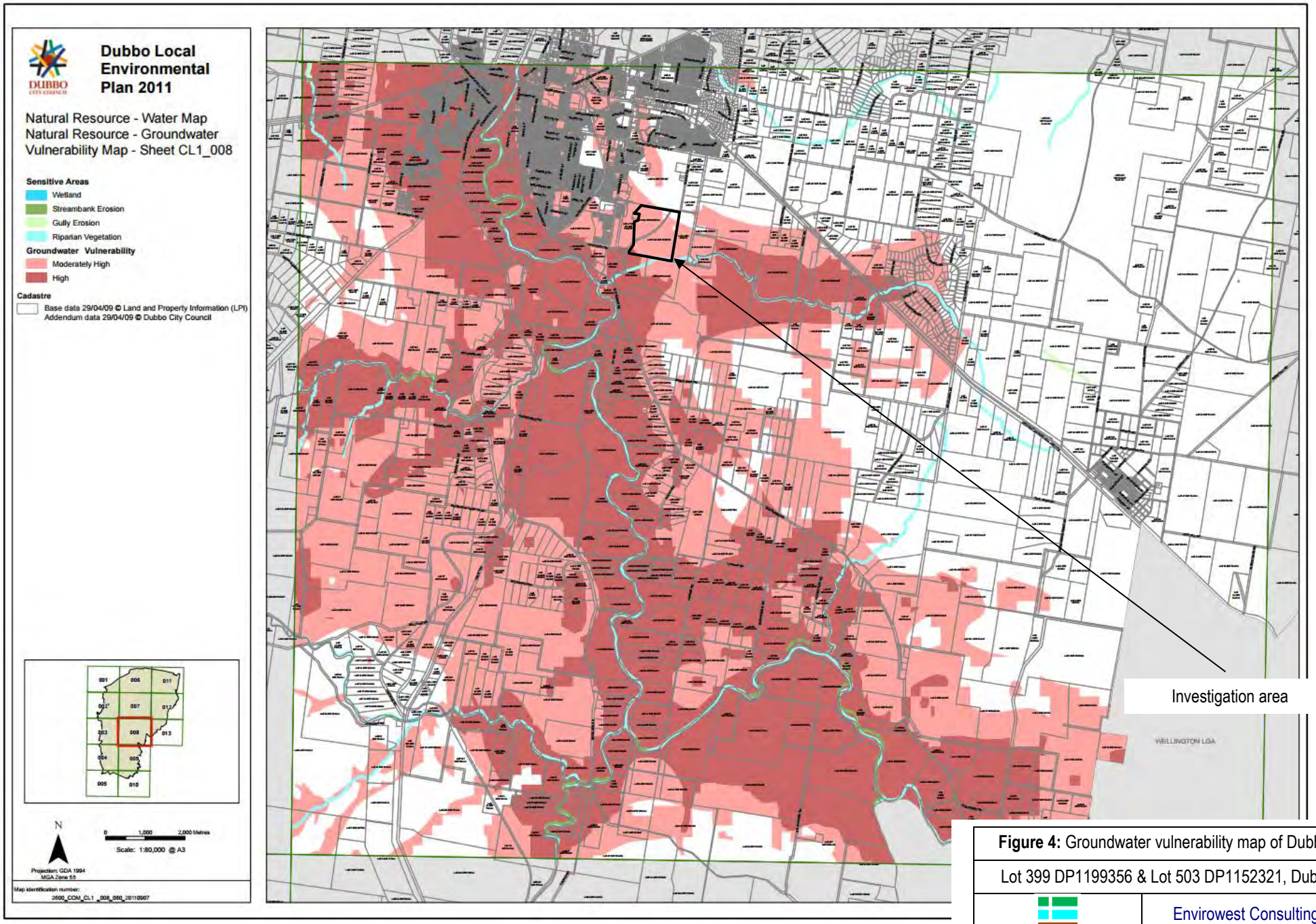


Figure 4: Groundwater vulnerability map of Dubbo - DCC

Lot 399 DP1199356 & Lot 503 DP1152321, Dubbo NSW

Envirowest Consulting Pty Ltd

Job: R5737s3	Drawn by: -	Date: 30/06/2015

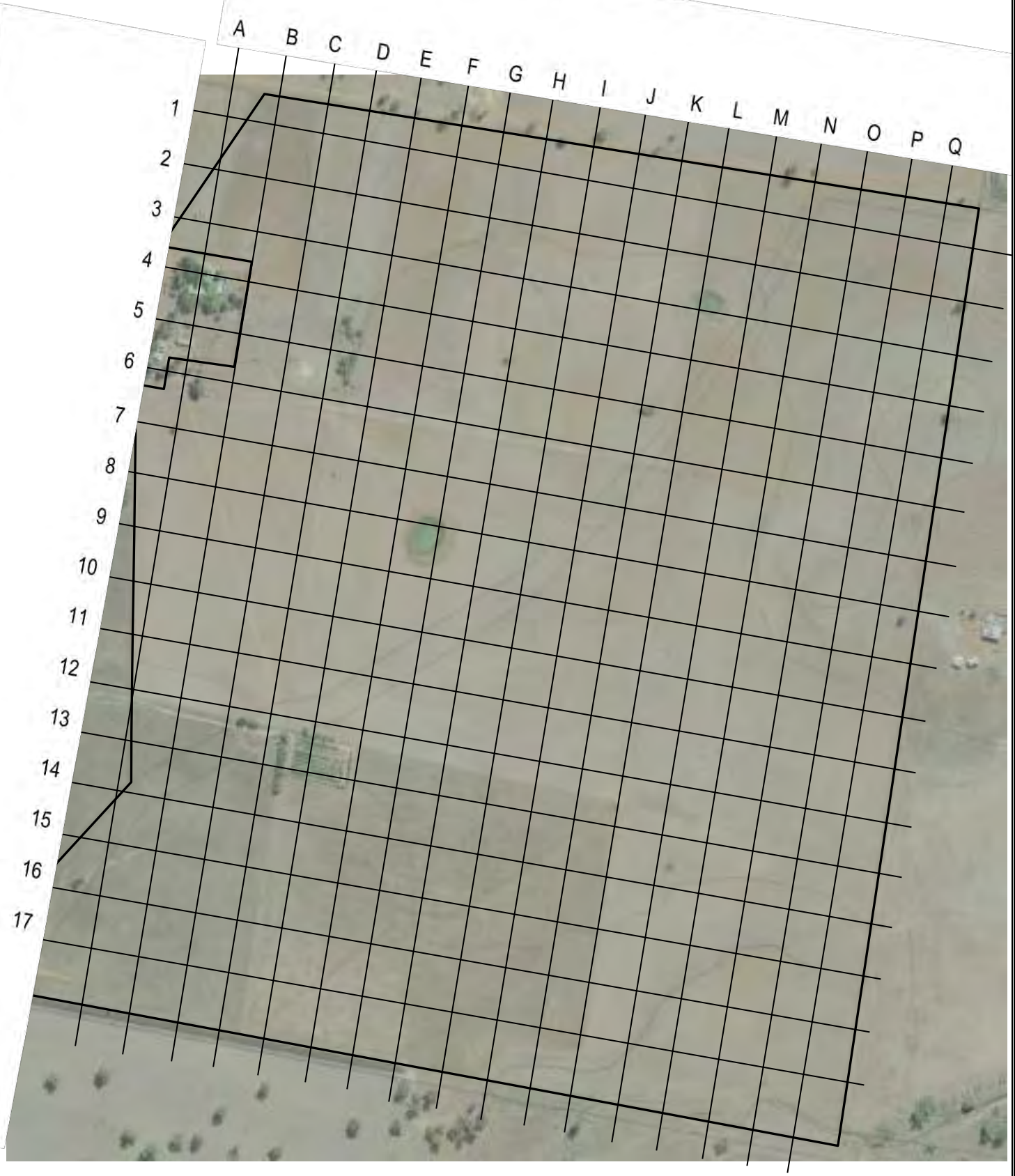
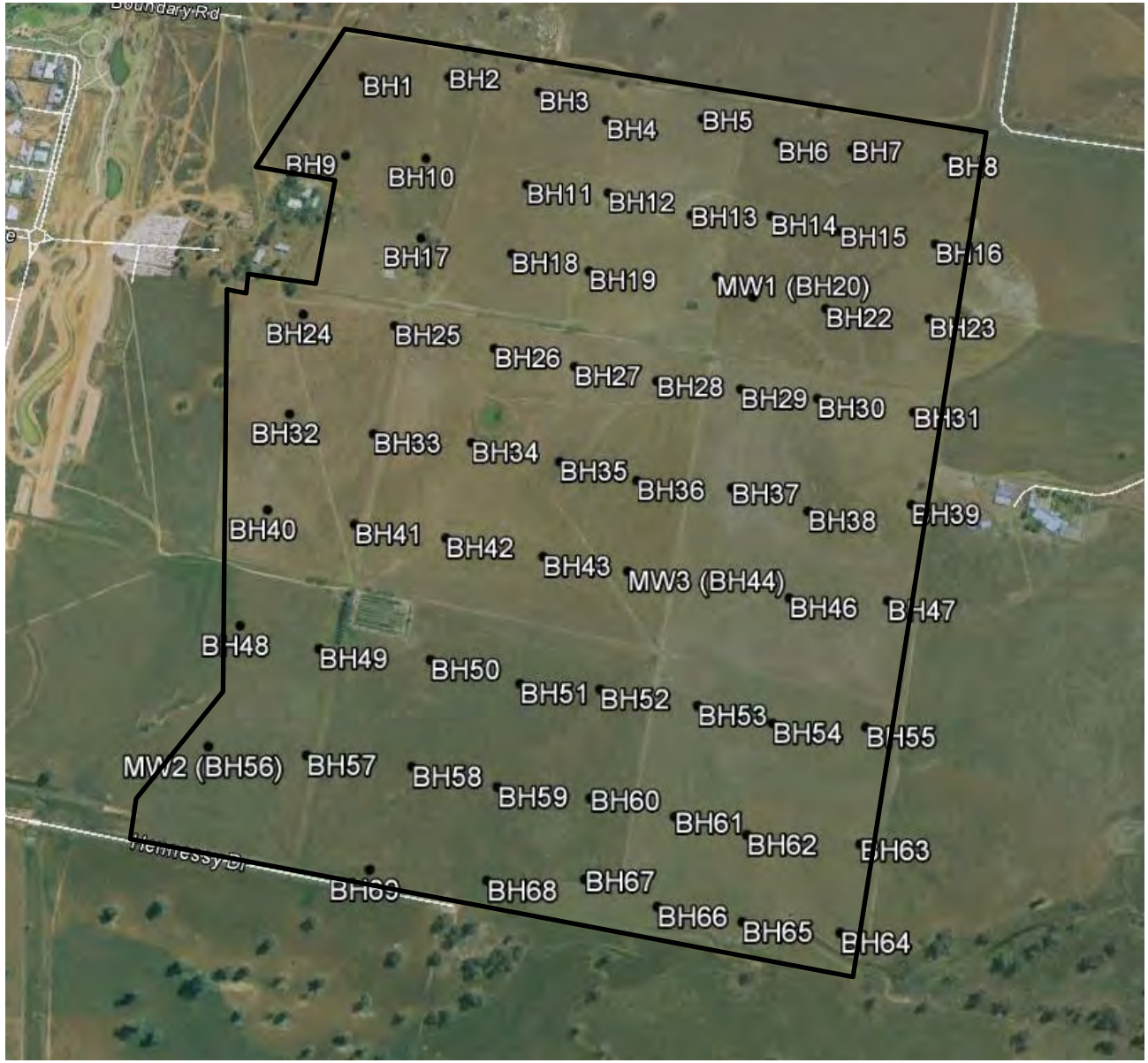


Figure 6: Initial investigation locations		
Lot 399 DP1199356 and Lot 503 DP1152321, Dubbo NSW		
	Envirowest Consulting Pty Ltd	
Job – R5735s	Drawn by: LD	Date: 30/6/2015

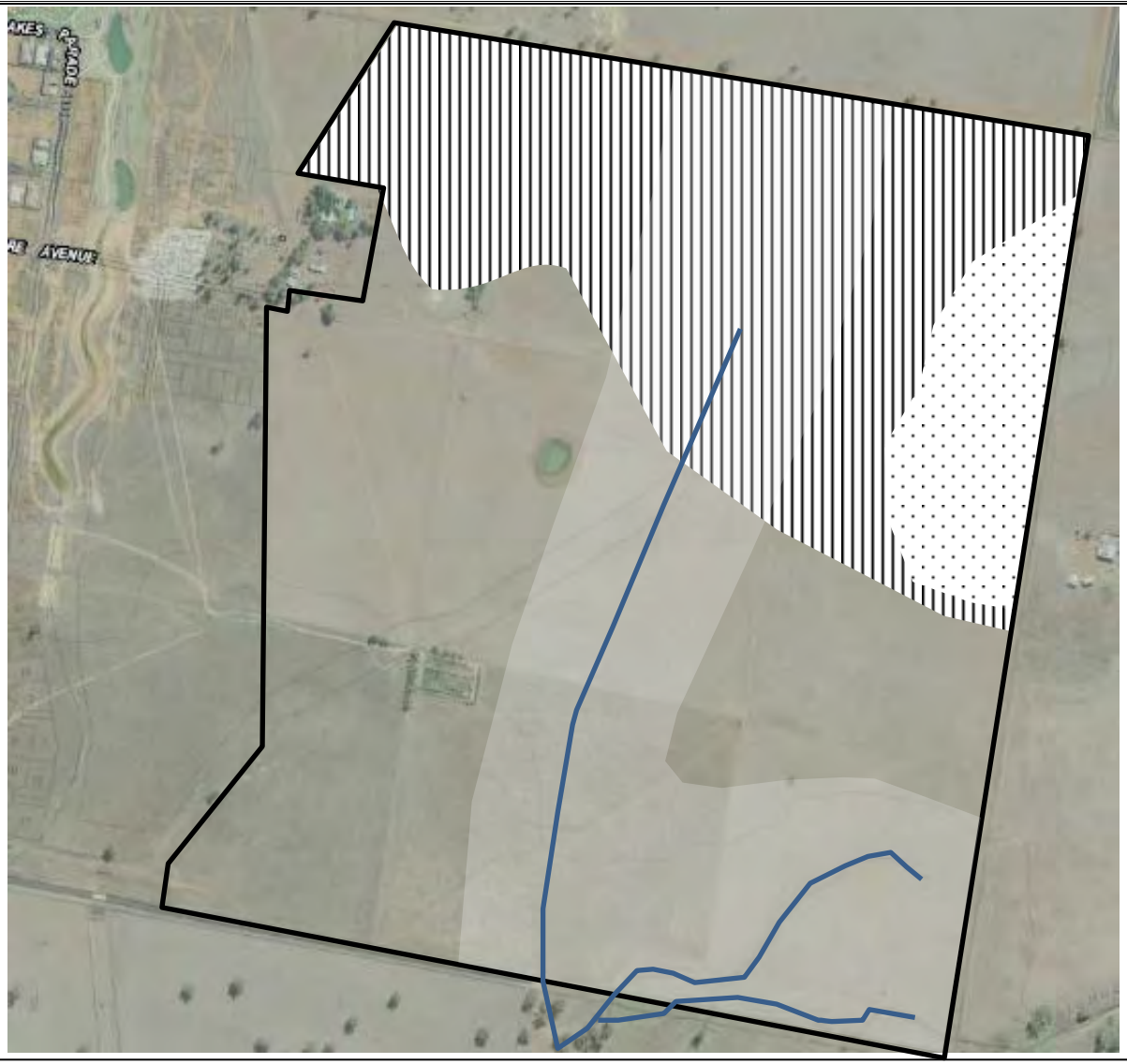


North

Approximate Scale 1: 9,500

0 95 190 380m

Figure 7: Detailed investigation locations		
Lot 399 DP1199356 & Lot 503 DP1152321, Dubbo NSW		
	Envirowest Consulting Pty Ltd	
Job: R5737s3	Drawn by: DL	Date: 30/06/2015



North

Legend

- Napperby Formation (siltstone)
- Cainozoic Basalt (tholeiite, alkali basalt and alkali ultramafic)
- Sandstone
- Drainage line
- Alluvium

Approximate Scale 1: 9,500

0 95 190 380m

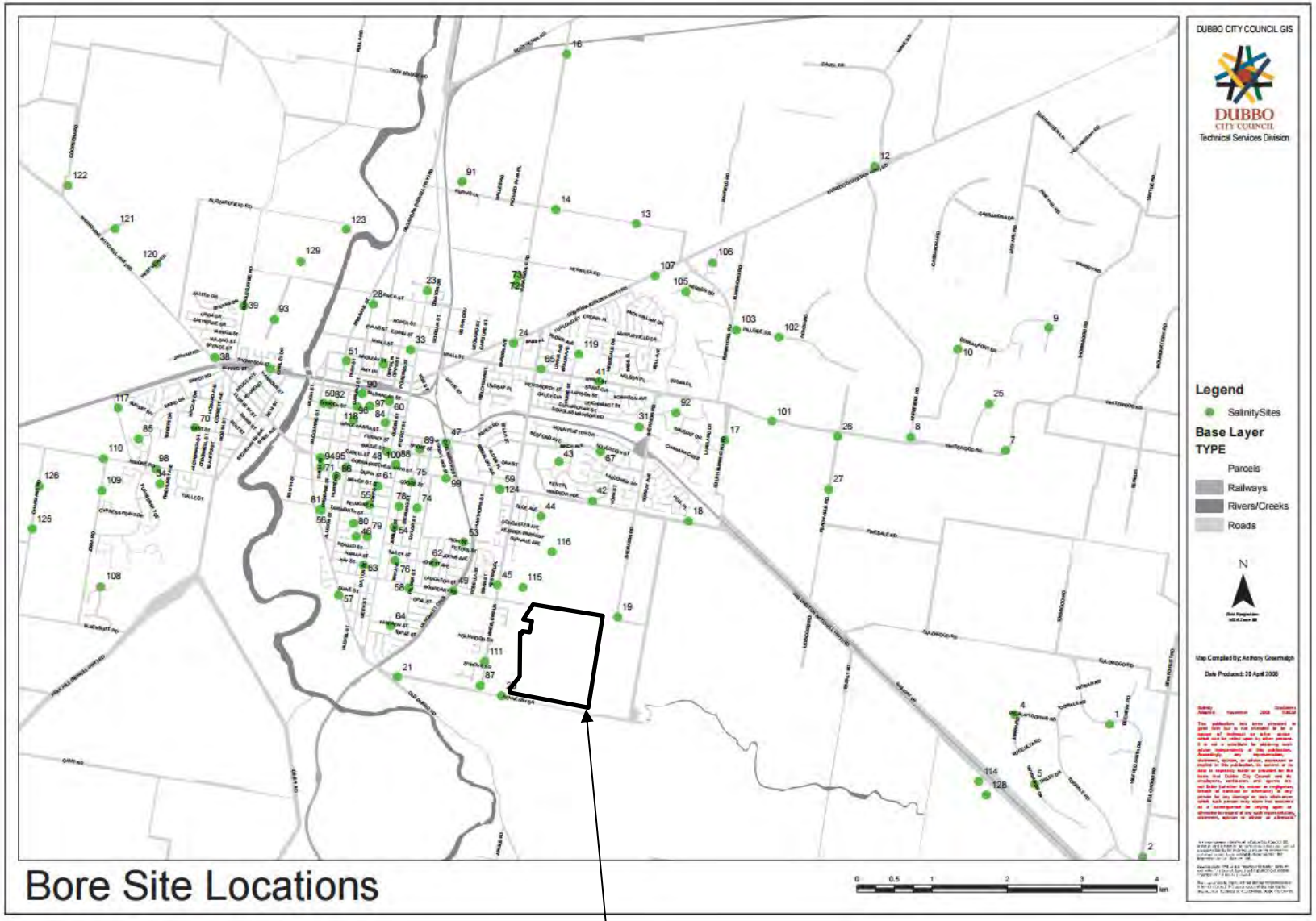
Figure 8: Lithology of the site

Lot 399 DP1199356 and Lot 503 DP1152321, Dubbo NSW

Envirowest Consulting Pty Ltd

Job: R5737c	Drawn by: LD	Date:30/06/2015

Figure 9: Location of groundwater bores within 2km of the site		
Lots 1 and 3 DP1054104 Newell Highway, Dubbo NSW		
	Envirowest Consulting Pty Ltd	
Job – R5737s3	Drawn by: DL	Date: 30/06/2015



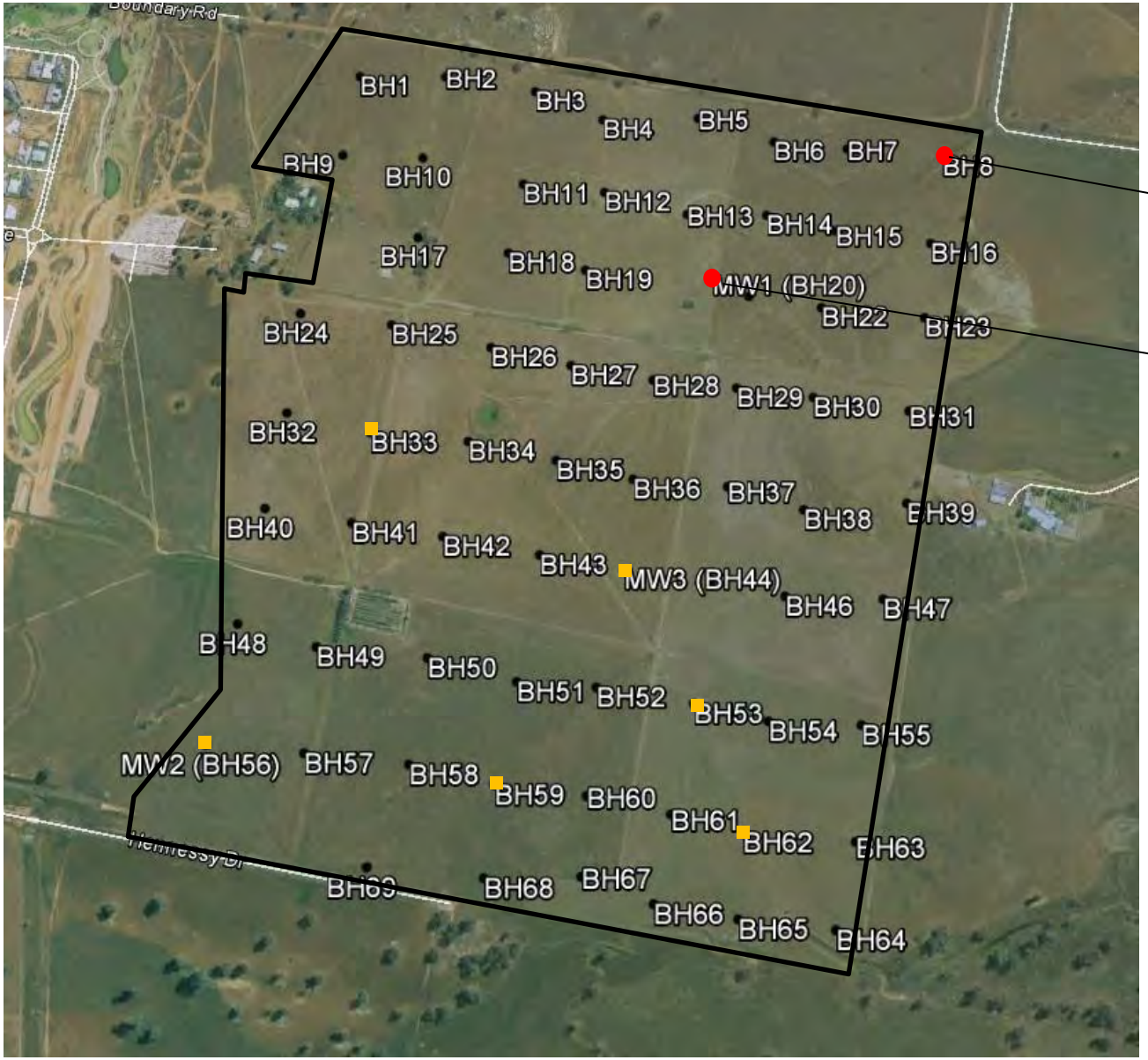
North

Figure 10: Dubbo City Council Salinity Network

Lot 399 DP1199356 & Lot 503 DP1152321, Dubbo NSW

Envirowest Consulting Pty Ltd

Job: R5737s3	Drawn by: DL	Date: 30/06/2015



North

Moderately saline soils from 1 to 4.5m

Moderately to extremely saline soils from 1.5 to 9m
Groundwater moderately saline at 8.6m SWL

Legend

- Investigation area
- Saline soil identified in profile
- Non-saline to slightly saline soil identified in soil profile to drilling depth

Approximate Scale 1: 9,500

0 95 190 380m

Figure 11: Soil analysis results for salinity		
Lot 399 DP1199356 & Lot 503 DP1152321, Dubbo NSW		
	Envirowest Consulting Pty Ltd	
Job: R5737s3	Drawn by: DL	Date: 30/06/2015

Figure 12. Soil moisture at 1m

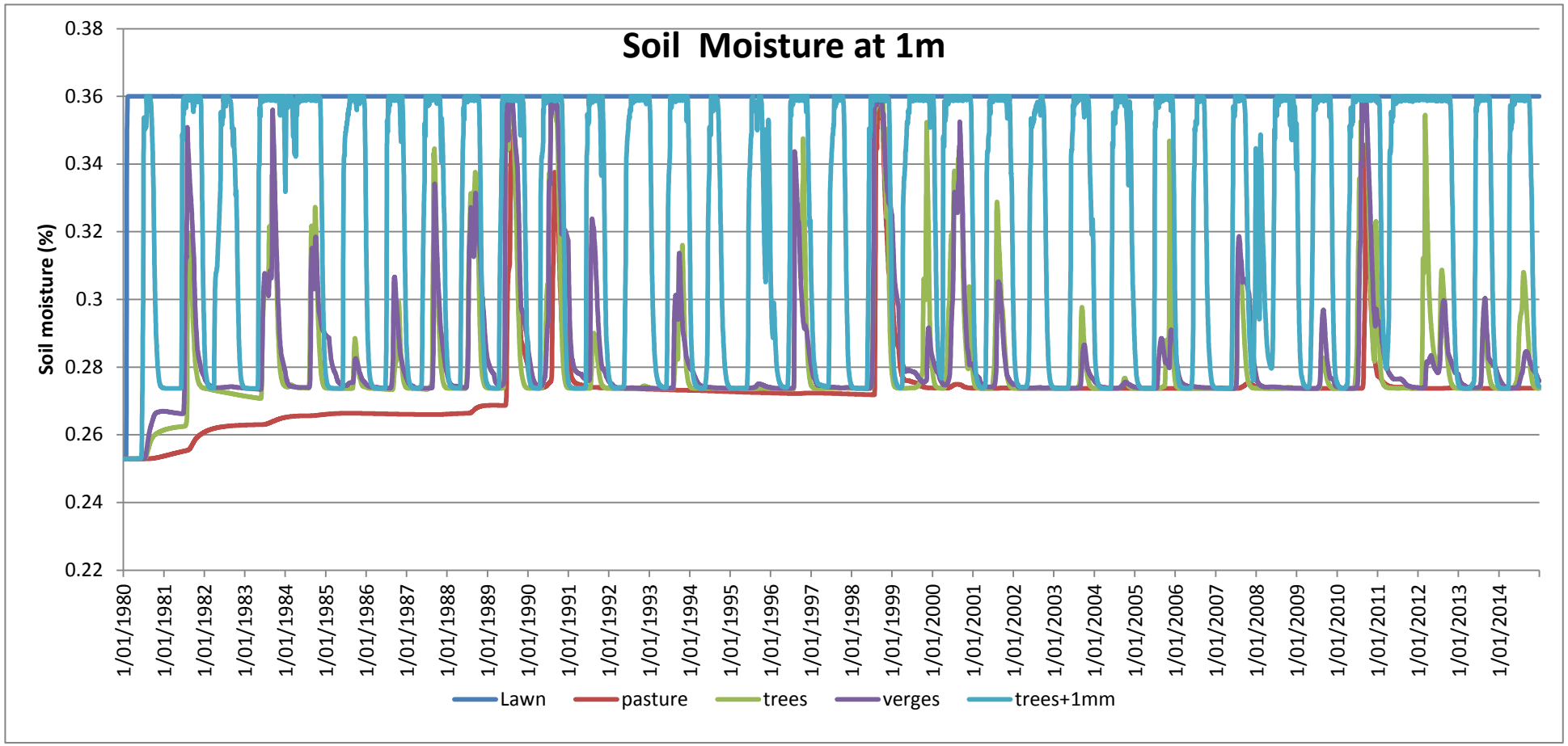


Figure 12. Soil Moisture at 1m		
Lots 1 and 3 DP1054104 Newell Highway, Dubbo NSW		
	Envirowest Consulting Pty Ltd	
Job – R5737s3	Drawn by: DL	Date: 30/06/2015

Figure 13. Soil moisture at 3m

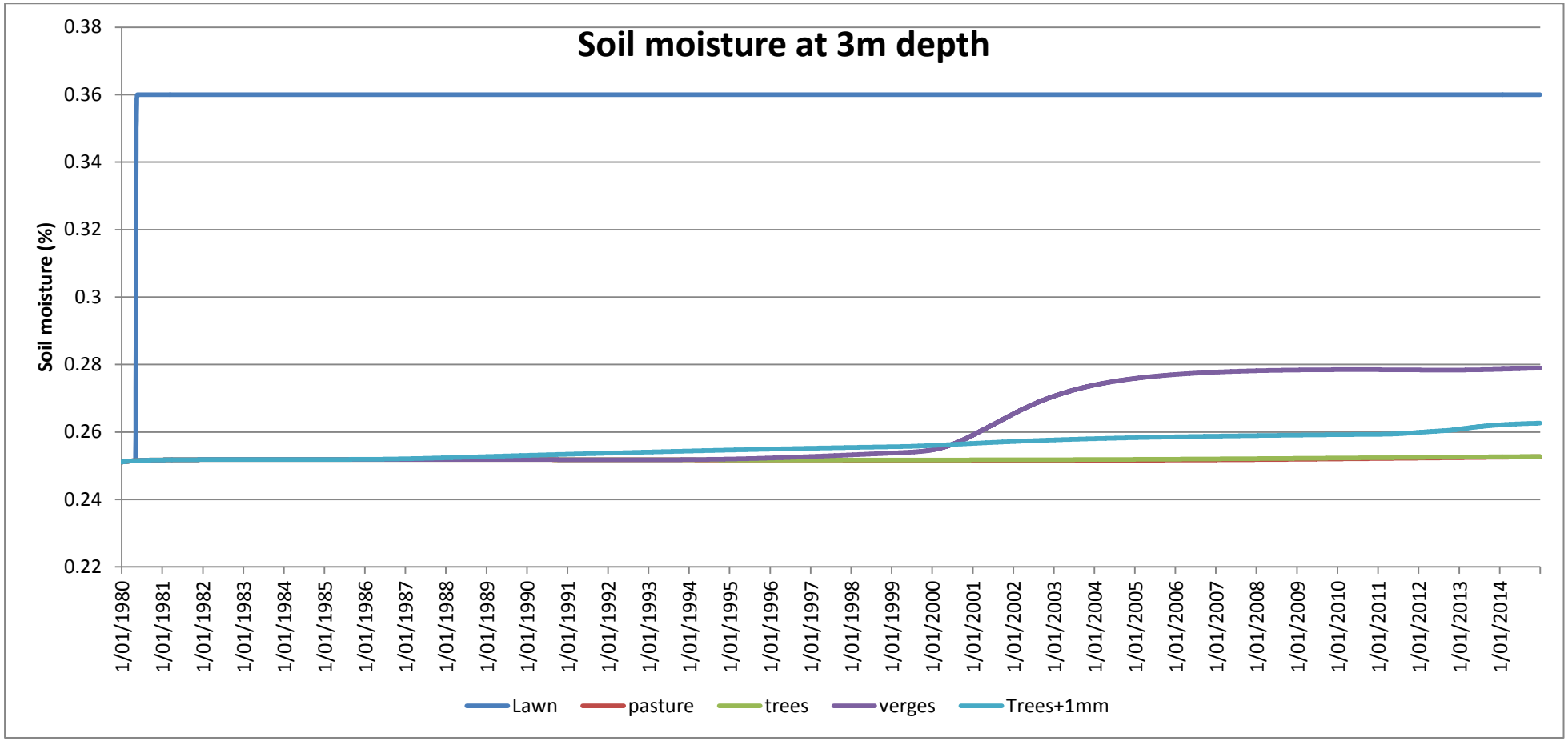


Figure 13. Soil Moisture at 3m		
Lots 1 and 3 DP1054104 Newell Highway, Dubbo NSW		
	Envirowest Consulting Pty Ltd	
Job – R5737s3	Drawn by: DL	Date: 30/06/2015

Figure 14. Photographs of the site

Looking north east across paddocks

North over central section of the site

Looking south over wet area

Looking south west over the site

Appendices

Appendix 1. Nutrient and sediment modelling
Appendix 2. Aggressive soils, extract from Australia Standards, AS 2870-2011, 2011
Appendix 3. Details of registered bores within 1km of the site – NSW Department of Primary Industries
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Appendix 6. Field and laboratory sheets
Appendix 7. Reference methods for soil testing
Appendix 8. ALS laboratory report ES1520581 and chain of custody form

Appendix 1. Nutrient and sediment modelling

Land-use export rates for sediments, nitrogen and phosphorus mg/kg/year (Chafer 2003)

	Suspended sediment (kg/ha/yr)		
Land use class	Low	Median	High
Native bushland	20	40	60
Disturbed landscapes	330	870	2290
Remediated gullies	165	435	1145
Cropped	420	570	720
Pine plantations	65	380	680
Improved pasture	140	520	870
Unimproved pasture	140	190	230
Roads (sealed)	140	190	230
Roads (earth)	25	140	500
Urban	30	300	1200
Urban (open space)	160	360	1000
Rural residential	140	190	230
Industrial	180	200	4800
Commercial	180	200	4800
Golf course	0	10	20
Orchard	490	680	870

	Total Nitrogen (kg/ha/yr)		
Land use class	Low	Median	High
Native bushland	0.9	2.4	4
Disturbed landscapes	4.2	12	20
Remediated gullies	2.1	6	10
Cropped	4.2	8.9	13.5
Pine plantations	0.8	2.9	8.3
Improved pasture	4.2	8.9	13.5
Unimproved pasture	1.3	3.2	5.1
Roads (sealed)	2	6	10
Roads (earth)	1.3	2.2	3.1
Urban	2.2	6.1	10
Urban (open space)	1.3	3.2	5.1
Rural residential	2.2	6.1	10
Industrial	4	7.4	10
Commercial	4	7.4	10
Golf course	0	3.2	5
Orchard	1.7	8.9	5

	Total Phosphorus		
Land use class	Low	Median	High
Native bushland	0.01	0.13	0.25
Disturbed landscapes	0.3	1.24	2.2
Remediated gullies	0.15	0.62	1.1
Cropped	0.5	1.35	2.2
Pine plantations	0.1	1.16	2.5
Improved pasture	0.5	1.35	2.2
Unimproved pasture	0.1	0.17	0.25
Roads (sealed)	0.3	1.8	3.4
Roads (earth)	0.3	1.72	3.2
Urban	0.2	1.82	3.6
Urban (open space)	0.1	0.17	0.25
Rural residential	0.2	1.72	3.6
Industrial	1.4	1.82	2.2
Commercial	1.4	1.8	2.2
Golf course	0	0.3	3.6
Orchard	0.1	0.3	0.5

Sediment export kg/yr

LOW	PRE	POST	IMPACT
Native bushland	0.00	248.00	-248.00
Disturbed landscapes	6567.00	0.00	6567.00
Remediated gullies	0.00	1237.50	-1237.50
Cropped	0.00	0.00	0.00
Pine plantations	0.00	0.00	0.00
Improved pasture	15483.02	0.00	15483.02
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	3514.00	-3514.00
Roads (earth)	12.68	0.00	12.68
Urban	0.00	690.00	-690.00
Urban (open space)	0.00	10080.00	-10080.00
Rural residential	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Commercial	0.00	0.00	0.00
Golf course	0.00	0.00	0.00
Orchard	0.00	0.00	0.00
TOTAL	**22062.70**	**15769.50**	**6293.20**

MEDIAN	PRE	POST	IMPACT
Native bushland	0.00	496.00	-496.00
Disturbed landscapes	17313.00	0.00	17313.00
Remediated gullies	0.00	3262.50	-3262.50
Cropped	0.00	0.00	0.00
Pine plantations	0.00	0.00	0.00
Improved pasture	57508.36	0.00	57508.36
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	4769.00	-4769.00
Roads (earth)	70.98	0.00	70.98
Urban	0.00	6900.00	-6900.00
Urban (open space)	0.00	22680.00	-22680.00
Rural residential	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Commercial	0.00	0.00	0.00
Golf course	0.00	0.00	0.00
Orchard	0.00	0.00	0.00
TOTAL	**74892.34**	**38107.50**	**36784.84**

HIGH	PRE	POST	IMPACT
Native bushland	0.00	744.00	-744.00
Disturbed landscapes	45571.00	0.00	45571.00
Remediated gullies	0.00	8587.50	-8587.50
Cropped	0.00	0.00	0.00
Pine plantations	0.00	0.00	0.00
Improved pasture	96215.91	0.00	96215.91
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	5773.00	-5773.00
Roads (earth)	253.50	0.00	253.50
Urban	0.00	27600.00	-27600.00
Urban (open space)	0.00	63000.00	-63000.00
Rural residential	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Commercial	0.00	0.00	0.00
Golf course	0.00	0.00	0.00
Orchard	0.00	0.00	0.00
TOTAL	**142040.41**	**105704.50**	**36335.91**

Total Nitrogen kg/yr

LOW	PRE	POST	IMPACT
Native bushland	0.00	0.00	0.00
Disturbed landscapes	83.58	0.00	83.58
Remediated gullies	0.00	15.75	-15.75
Cropped	0.00	0.00	0.00
Pine plantations	0.00	0.00	0.00
Improved pasture	464.49	0.00	464.49
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	50.20	-50.20
Roads (earth)	0.66	0.00	0.66
Urban	0.00	50.60	-50.60
Urban (open space)	0.00	81.90	-81.90
Rural residential	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Commercial	0.00	0.00	0.00
Golf course	0.00	0.00	0.00
Orchard	0.00	0.00	0.00
TOTAL	**548.73**	**198.45**	**350.28**

MEDIAN	PRE	POST	IMPACT
Native bushland	0.00	29.76	-29.76
Disturbed landscapes	238.80	0.00	238.80
Remediated gullies	0.00	45.00	-45.00
Cropped	0.00	0.00	0.00
Pine plantations	0.00	0.00	0.00
Improved pasture	984.28	0.00	984.28
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	150.60	-150.60
Roads (earth)	1.12	0.00	1.12
Urban	0.00	140.30	-140.30
Urban (open space)	0.00	201.60	-201.60
Rural residential	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Commercial	0.00	0.00	0.00
Golf course	0.00	0.00	0.00
Orchard	0.00	0.00	0.00
TOTAL	**1224.19**	**567.26**	**656.93**

HIGH	PRE	POST	IMPACT
Native bushland	0.00	49.60	-49.60
Disturbed landscapes	398.00	0.00	398.00
Remediated gullies	0.00	75.00	-75.00
Cropped	0.00	0.00	0.00
Pine plantations	0.00	0.00	0.00
Improved pasture	1493.01	0.00	1493.01
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	251.00	-251.00
Roads (earth)	1.57	0.00	1.57
Urban	0.00	230.00	-230.00
Urban (open space)	0.00	321.30	-321.30
Rural residential	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Commercial	0.00	0.00	0.00
Golf course	0.00	0.00	0.00
Orchard	0.00	0.00	0.00
TOTAL	**1892.58**	**926.90**	**965.68**

Total Phosphorus kg/yr

LOW	PRE	POST	IMPACT
Native bushland	0.00	0.12	-0.12
Disturbed landscapes	5.97	0.00	5.97
Remediated gullies	0.00	1.13	-1.13
Cropped	0.00	0.00	0.00
Pine plantations	0.00	0.00	0.00
Improved pasture	55.30	0.00	55.30
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	7.53	-7.53
Roads (earth)	0.15	0.00	0.15
Urban	0.00	4.60	-4.60
Urban (open space)	0.00	6.30	-6.30
Rural residential	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Commercial	0.00	0.00	0.00
Golf course	0.00	0.00	0.00
Orchard	0.00	0.00	0.00
TOTAL	**61.42**	**19.68**	**41.74**

MEDIAN	PRE	POST	IMPACT
Native bushland	0.00	1.61	-1.61
Disturbed landscapes	24.68	0.00	24.68
Remediated gullies	0.00	4.65	-4.65
Cropped	0.00	0.00	0.00
Pine plantations	0.00	0.00	0.00
Improved pasture	149.30	0.00	149.30
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	45.18	-45.18
Roads (earth)	0.87	0.00	0.87
Urban	0.00	41.86	-41.86
Urban (open space)	0.00	10.71	-10.71
Rural residential	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Commercial	0.00	0.00	0.00
Golf course	0.00	0.00	0.00
Orchard	0.00	0.00	0.00
TOTAL	**174.85**	**104.01**	**70.84**

HIGH	PRE	POST	IMPACT
Native bushland	0.00	3.10	-3.10
Disturbed landscapes	43.78	0.00	43.78
Remediated gullies	0.00	8.25	-8.25
Cropped	0.00	0.00	0.00
Pine plantations	0.00	0.00	0.00
Improved pasture	243.30	0.00	243.30
Unimproved pasture	0.00	0.00	0.00
Roads (sealed)	0.00	85.34	-85.34
Roads (earth)	1.62	0.00	1.62
Urban	0.00	82.80	-82.80
Urban (open space)	0.00	15.75	-15.75
Rural residential	0.00	0.00	0.00
Industrial	0.00	0.00	0.00
Commercial	0.00	0.00	0.00
Golf course	0.00	0.00	0.00
Orchard	0.00	0.00	0.00
TOTAL	**288.71**	**195.24**	**93.47**

Appendix 2. Aggressive soils, extract from Australian Standards, *AS 2870-2011*, 2011

Exposure classification for concrete in saline soils

Saturated extract electrical conductivity (EC_e), *dS/m*	Exposure classification
<4	A1
4-8	A2
8-16	B1
>16	B2

Notes:

1. Guidance on concrete in saline soils can be found in CCAA T56
2. Exposure classifications are from AS 3600
3. The currently accepted method of determining the salinity level of the soil is by measuring the extract electrical conductivity (*EC*) of a soil and water mixture in deciSiemens per metre (dS/m) and using conversion factors that allow for the soil texture, to determine the saturated extract electrical conductivity (EC_e)
4. The division between a non-saline and saline soil is generally regarded as an EC_e value of 4dS/m, therefore no increase in the minimum concrete strength is required below this value

Exposure classification for concrete in sulfate soils

Exposure conditions			Exposure classification	
Sulfates (expressed as SO_4)*		pH	Soil conditions A**	Soil conditions B†
In soil (ppm)	In groundwater (ppm)			
<5,000	<1,000	>5.5	A2	A1
5,000-10,000	1,000-3,000	4.5-5.5	B1	A2
10,000-20,000	3,000-10,000	4-4.5	B2	B1
>20,000	>10,000	<4	C2	B2

* Approximately 100ppm SO_4 = 80ppm SO_3

** Soil conditions A – high permeability soils (e.g. sands and gravels) that are in groundwater

† Soil conditions B – low permeability soils (e.g. silts and clays) or all soils above groundwater

Minimum design characteristic strength (f_c') and curing requirements for concrete

Exposure classification	Minimum f_c' MPa	Minimum initial curing requirement
A1	20	Cure continuously for at least 3 days
A2	25	
B1	32	Cure continuously for at least 7 days
B2	40	
C1	≥50	
C2	≥50	

Minimum reinforcement cover for concrete

Exposure classification	Minimum cover in saline soils * mm	Minimum cover in sulfate soils ** (mm)
A1	See Clause 5.3.2	40
A2	45	50
B1	50	60
B2	55	65
C1	†	70
C2	†	85

* Where a damp-proofing membrane is installed, the minimum reinforcement cover in saline soils may be reduced to 30mm.

** Where a damp-proofing membrane is installed, the minimum reinforcement cover in sulfate soils may be reduced by 10mm.

† Saline soils have a maximum exposure classification of B2.

Appendix 3. Details of registered bores within 1km of the site – NSW Department of Primary Industries.

Bore record No. (Figure 9)	Eastings	Northings	Drilled / Completed depth (m)	Salinity description	Water bearing zones (m)	Standing water level (m)	Date drilled and or tested	Purpose
GW802625	654071	6429259	3.5	-	2.5-3.5	-	2006	Monitoring
GW802554	654491	6428905	9	-	6.5-7.5	-	2004	Monitoring
GW801343	654944	6428486	59	-	-	-	1992	Unknown
GW801344	655053	6428466	32	-	-	-	1992	Unknown
GW801345	655153	6428459	34	-	-	-	1992	Unknown
GW044627	655566	6428489	68.6	-	-	-	1975	Domestic / Stock
GW802528	654952	6428393	3	-	2-3	2.9	2004	Monitoring
GW005558	654961	6428252	57.9	-	26.2-33.8	18.3	1959	Stock
GW801338	654839	6428083	149	-	-	-	1992	Unknown
GW801339	655140	6428060	29	-	-	-	1992	Unknown
GW011014	655192	6428002	67.1	-	57.9-60.9	-	1954	Stock
GW801341	655069	6427708	83	-	-	-	1992	Unknown
GW066591	654792	6427484	93	-	-	-	1990	Domestic/ Stock
GW801342	654991	6427237	72	-	-	-	1991	Unknown
GW055351	654606	6427302	-	-	-	-	-	Stock
GW801337	654636	6426994	65	-	-	-	1992	Unknown
GW801340	654937	6426884	53	-	-	-	1992	Unknown
GW060589	654612	6425978	12.5	-	-	-	-	Stock
GW037126	654588	6426101	57.9	-	16.7-20.6	6	1973	Public/ test
GW042708	654431	6426104	49.3	Good	7-23.7	6.7	1974	Town water supply
GW801334	654198	6426159	46	-	13-35	12.9	2001	Town water supply
GW043755	654223	6426199	61	Good	7.9-20.7	6	1973	Test
GW035817	653989	6426295	54.8	-	6-25.2	5.1	1973	Test
GW043754	654147	6426385	76.2	-	40.8-46.8	6	1973	Test
GW042707	653923	6426548	46.6	0-500ppm	41.1-46.5	7	1974	Town water
GW096140	653928	6426550	48	-	41.2-47	15.9	2003	Town water
GW043753	654020	6426603	68.5	-	15.2-22.8	7.2	1973	Test bore
GW043756	653652	6426516	44.5	-	26.5-37.1	6.2	1973	Public
GW034418	653391	6426551	-	-	12.2-21.3	7	1971	Test
GW034419	653260	6426553	-	-	14.3-24.3	7	1971	Test
GW034417	653181	6426523	-	-	8.5-16.1	6.9	1971	Town water
GW025041	653261	6426614	25.9	0-500ppm	-	-	1967	Monitoring
GW061110	652814	6426436	19.6	-	9.1-19.8	7.6	1985	Stock/ Domestic
GW800145	653525	6426734	52	Good	18-21	-	1995	Irrigation
GW803538	653432	6426838	48	-	25-34	18.9	2005	Irrigation
GW805136	652978	6426719	32	Good	20-23	16.4	2013	Domestic
GW800933	652895	6426766	36.9	-	-	-	1993	Domestic
GW008319	652662	6426777	21.6	-	16.5-18.9	13.1	1952	Stock/ Domestic
GW060587	653031	6426957	33	-	15.5-15.7	14	1986	Stock/ Domestic
GW034416	653112	6427140	-	-	12.2-14.9	-	1971	Town water
GW025415	652987	6427191	59.2	-	18-20.4	17.7	1970	Town water
GW025413	652905	6427222	64.6	0-500ppm	6.7-11	-	1969	Monitoring

Bore record No. (Figure 9)	Eastings	Northings	Drilled / Completed depth (m)	Salinity description	Water bearing zones (m)	Standing water level (m)	Date drilled and or tested	Purpose
GW034415	652694	6427208	-	-	24.7-25.6	22.9	1971	Town water
GW018573	652404	6427028	22.9	-	18.3-22.9	9.1	1961	Stock/ Domestic
GW060620	652405	6427029	12.2	-	-	-	1884	Domestic
GW803561	652676	6427357	50	-	32-37	35.7	2008	Domestic
GW803584	652868	6427344	60	-	38-44	32	2008	Stock/ Domestic
GW802721	652959	6427398	58	Good	38-44.5	-	2003	Domestic
GW803562	652845	6427430	60	-	38-44	32	2008	Domestic
GW803657	652622	6427371	63	Good	45.5-61.5	35.7	2008	Domestic
GW804247	652248	6427461	9	-	-	-	2010	Monitoring
GW042221	652124	6427586	21.3	Good	-	-	-	Domestic
GW802965	652672	6427483	67	-	46-52	32	2005	Domestic
GW804246	652562	6427707	9	0-500ppm	-	-	2010	Monitoring
GW021498	652883	6427575	74.7	-	30.8-52.7	-	1967	Monitoring
GW802596	653119	6427476	6	-	3.5-5	-	2006	Monitoring
GW802529	653402	6427335	15	-	12-13	14.72	2004	Monitoring
GW058296	653743	6427346	29.5	-	19.8-29.5	19.8	1983	Stock/ Domestic
GW055350	653851	6427529	21.6	-	-	-	-	Stock/ Domestic
GW043751	653118	6427541	59.1	Good	29.8-49	15.2	1973	Test
GW030056	653095	6427726	79.2	-	39.9-46.3	14.6	1970	Test
GW021496	653093	6427603	-	-	-	-	1967	Monitoring
GW802620	653174	6427798	6	-	5-6	5.47	2005	Monitoring
GW802622	6528240	6428144	8	-	-	-	2005	Monitoring
GW003918	652944	6428129	45.4	Fresh	44.2-43	28.7	-	Stock/ Domestic
GW804712	653140	6428170	52	Good	42-49	32.8	2011	Domestic
GW055352	653469	6428244	-	-	-	-	-	Stock
GW060617	652921	6428375	33.5	-	-	-	1884	Stock/ Domestic
GW801091	653375	6428652	36	-	-	-	-	Industrial/ Irrigation
GW802624	653684	6428788	9	-	7-9	-	2005	Monitoring
GW042218	653505	6428921	18.3	-	-	-	1953	Stock/ Domestic

Appendix 4. Salinity and Standing Water Level (SWL) data from Dubbo City Council Salinity Network

Dubbo City Council Salinity Network site number (Figure 10)		DCC18	DCC19	DCC20	DCC21	DCC42	DCC44	DCC45	DCC49	DCC53	DCC58	DCC59	DCC62	DCC64	DCC87	DCC111	DCC115	DCC116	DCC124
Sampling date	**Drilled depth (m)**	**15**	**3**	**15**	**15**	**2**	**6**	**9**	**15**	**9**	**15**	**3**	**9**	**3**	**6**	**6**	**9**	**3.5**	**15**
Mar-05	EC(dS/m)	-	TSTB	TSTB	-	-	-	-	-	-	-	-	0.10	-	-	-	-	-	-
	SWL (m)	DRY	2.9	14.72	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	5.06	DRY	DRY	5.46	DRY	DRY	DRY
Apr-05	EC(dS/m)	-	TSTB	-	-	-	TSTB	0.3	-	-	-	TSTB	25.20	-	-	-	-	-	-
	SWL (m)	5.91	2.83	14.57	DRY	0.2	6	6.8	DRY	DRY	DRY	3	4.80	DRY	DRY	DRY	DRY	DRY	DRY
May-05	EC(dS/m)	-	-	-	-	-	-	0.3	-	-	-	-	12.10	-	-	-	-	-	-
	SWL (m)	DRY	DRY	14.9	DRY	DRY	DRY	5.87	DRY	DRY	DRY	DRY	4.85	DRY	DRY	DRY	DRY	DRY	DRY
Jun-05	EC(dS/m)	-	-	-	-	-	-	1.4	-	-	-	-	11.40	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	5.95	DRY	DRY	DRY	DRY	4.75	DRY	DRY	DRY	DRY	DRY	DRY
Jul-05	EC(dS/m)	-	-	-	-	-	-	1.3	-	-	-	-	11.40	-	-	-	0.3	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	6.9	DRY	DRY	DRY	DRY	4.76	DRY	DRY	DRY	7.01	DRY	DRY
Aug-05	EC(dS/m)	-	-	-	-	-	-	1.3	-	-	-	-	11.30	-	-	-	0.4	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.4	DRY	DRY	DRY	DRY	4.77	DRY	DRY	DRY	8.0	DRY	DRY
Sep-05	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	10.90	-	-	-	0.1	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.76	DRY	DRY	DRY	DRY	4.88	DRY	DRY	DRY	5.87	DRY	DRY
Oct-05	EC(dS/m)	-	-	-	-	-	-	0.9	-	-	-	-	11.10	-	-	-	0.2	0.7	0.3
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.45	DRY	DRY	DRY	DRY	4.89	2.75	DRY	DRY	6.37	2.44	14.3
Nov-05	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	10.60	-	-	1.00	0.2	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.4	DRY	DRY	DRY	DRY	4.40	DRY	DRY	3.81	6.4	DRY	DRY
Dec-05	EC(dS/m)	-	-	-	-	-	-	DRY	-	-	-	-	10.40	-	-	0.80	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	4.22	DRY	DRY	3.71	DRY	DRY	DRY
Jan-06	EC(dS/m)	-	-	-	-	-	-	DRY	-	-	-	-	9.80	-	-	0.90	0.3	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	4.10	DRY	DRY	4.04	8.0	DRY	DRY
Feb-06	EC(dS/m)	-	-	TSTB	-	-	-	TSTB	-	-	-	-	10.30	-	-	0.90	TSTB	TSTB	-
	SWL (m)	DRY	DRY	-	DRY	DRY	DRY	8.75	DRY	DRY	DRY	DRY	3.90	DRY	DRY	3.80	8.5	3.26	DRY
Mar-06	EC(dS/m)	-	-	-	-	-	-	DRY	-	-	-	-	10.80	-	-	0.90	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	3.89	DRY	DRY	4.00	DRY	DRY	DRY
Apr-06	EC(dS/m)	-	-	-	-	-	-	0.9	-	-	-	-	10.10	-	-	1.40	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	4.6	DRY	DRY	DRY	DRY	3.85	DRY	DRY	4.53	DRY	DRY	DRY

TSTB – Too shallow to bail

Dubbo City Council Salinity Network site number (Figure 10)		DCC18	DCC19	DCC20	DCC21	DCC42	DCC44	DCC45	DCC49	DCC53	DCC58	DCC59	DCC62	DCC64	DCC87	DCC111	DCC115	DCC116	DCC124
Sampling date	**Drilled depth (m)**	**15**	**3**	**15**	**15**	**2**	**6**	**9**	**15**	**9**	**15**	**3**	**9**	**3**	**6**	**6**	**9**	**3.5**	**15**
May-06	EC(dS/m)	-	-	-	-	-	-	0.7	-	-	-	-	10.40	-	-	1.10	-	TSTB	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	3.29	DRY	DRY	DRY	DRY	3.95	DRY	DRY	4.98	DRY	3.26	DRY
Jun-06	EC(dS/m)	-	-	-	-	-	-	1.0	-	-	-	-	11.20	-	-	1.00	-	TSTB	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	4.25	DRY	DRY	DRY	DRY	4.17	DRY	DRY	5.30	DRY	3.3	DRY
Jul-06	EC(dS/m)	-	-	-	-	-	-	0.9	-	-	-	-	4.56	-	-	TSTB	0.1	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	2.87	DRY	DRY	DRY	DRY	10.20	DRY	DRY	5.81	5.75	DRY	DRY
Aug-06	EC(dS/m)	-	-	-	-	-	-	0.8	-	-	-	-	9.90	-	-	-	0.3	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.42	DRY	DRY	DRY	DRY	4.56	DRY	DRY	DRY	7.59	DRY	DRY
Sep-06	EC(dS/m)	-	-	-	-	-	-	0.9	-	-	-	-	10.20	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.45	DRY	DRY	DRY	DRY	4.65	DRY	DRY	DRY	DRY	DRY	DRY
Oct-06	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	10.80	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	4.52	DRY	DRY	DRY	DRY	DRY	DRY
Nov-06	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	10.90	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	4.42	DRY	DRY	DRY	DRY	DRY	DRY
Dec-06	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	11.50	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	4.40	DRY	DRY	DRY	DRY	DRY	DRY
Jan-07	EC(dS/m)	-	-	-	-	-	-	0.8	-	TSTB	-	-	13.60	-	-	-	-	TSTB	TSTB
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.5	DRY	8.80	DRY	DRY	4.16	DRY	DRY	DRY	DRY	3.29	14.83
Feb-07	EC(dS/m)	-	-	-	-	-	-	0.9	-	TSTB	-	-	10.90	-	-	-	-	TSTB	TSTB
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	4.96	DRY	8.82	DRY	DRY	4.43	DRY	DRY	DRY	DRY	3.3	14.74
Mar-07	EC(dS/m)	-	-	-	-	-	-	0.8	-	TSTB	-	-	13.20	-	-	-	-	-	TSTB
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.43	DRY	8.75	DRY	DRY	4.28	DRY	DRY	DRY	DRY	DRY	14.76
Apr-07	EC(dS/m)	-	-	-	-	-	-	1.8	-	TSTB	-	-	13.60	-	-	-	-	TSTB	TSTB
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.46	DRY	8.81	DRY	DRY	4.17	DRY	DRY	DRY	DRY	3.3	14.74
May-07	EC(dS/m)	-	-	-	-	-	-	0.8	-	TSTB	-	-	13.50	-	-	-	TSTB	TSTB	TSTB
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.09	DRY	8.82	DRY	DRY	4.20	DRY	DRY	DRY	6.33	3.3	14.22
Jun-07	EC(dS/m)	TSTB	TSTB	-	-	-	-	0.7	-	TSTB	-	-	11.00	-	-	-	-	TSTB	TSTB
	SWL (m)	4.59	2.79	DRY	DRY	DRY	DRY	7.47	DRY	8.85	DRY	DRY	3.85	DRY	DRY	DRY	5.47	3.32	14.65

TSTB – Too shallow to bail

Dubbo City Council Salinity Network site number (Figure 10)		DCC18	DCC19	DCC20	DCC21	DCC42	DCC44	DCC45	DCC49	DCC53	DCC58	DCC59	DCC62	DCC64	DCC87	DCC111	DCC115	DCC116	DCC124
Sampling date	**Drilled depth (m)**	**15**	**3**	**15**	**15**	**2**	**6**	**9**	**15**	**9**	**15**	**3**	**9**	**3**	**6**	**6**	**9**	**3.5**	**15**
Jul-07	EC(dS/m)	-	-	-	-	-	-	0.9	-	-	-	-	13.10	-	-	-	-	TSTB	TSTB
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.62	DRY	DRY	DRY	DRY	4.10	DRY	DRY	DRY	DRY	3.25	14.79
Aug-07	EC(dS/m)	1.7	TSTB	1.00	-	-	-	0.9	-	TSTB	-	-	8.30	-	-	1.00	-	-	-
	SWL (m)	4.52	2.69	14.36	DRY	DRY	DRY	7.31	DRY	8.61	DRY	DRY	3.60	DRY	DRY	7.53	DRY	DRY	DRY
Sep-07	EC(dS/m)	TSTB	TSTB	-	-	-	-	0.9	-	TSTB	-	-	8.70	-	-	1.00	-	-	-
	SWL (m)	5.85	2.75	17.61	DRY	DRY	DRY	7.33	DRY	8.68	DRY	DRY	3.35	DRY	DRY	4.86	DRY	DRY	DRY
Oct-07	EC(dS/m)	-	-	-	-	-	-	TSTB	-	-	-	-	8.80	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.69	DRY	DRY	DRY	DRY	3.87	DRY	DRY	DRY	DRY	DRY	DRY
Nov-07	EC(dS/m)	-	-	-	-	-	-	TSTB	-	-	-	-	13.10	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.74	DRY	DRY	DRY	DRY	3.83	DRY	DRY	DRY	DRY	DRY	DRY
Dec-07	EC(dS/m)	-	-	-	-	-	-	TSTB	-	-	-	-	13.70	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.28	DRY	DRY	DRY	DRY	4.34	DRY	DRY	DRY	DRY	DRY	DRY
Jan-08	EC(dS/m)	-	-	-	-	-	-	TSTB	-	TSTB	-	-	13.50	-	-	-	-	TSTB	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.79	DRY	8.80	DRY	DRY	4.17	DRY	DRY	DRY	DRY	3.29	DRY
Feb-08	EC(dS/m)	-	-	-	-	-	-	DRY	-	-	-	-	7.90	-	-	0.90	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	3.06	DRY	DRY	3.16	DRY	DRY	DRY
Mar-08	EC(dS/m)	-	-	-	-	-	-	0.5	-	-	-	-	7.20	-	-	0.90	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.44	-	DRY	DRY	DRY	3.14	-	DRY	3.44	DRY	DRY	DRY
Apr-08	EC(dS/m)	-	-	-	-	-	-	DRY	-	-	-	-	7.60	-	-	0.90	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	-	DRY	DRY	DRY	3.20	-	DRY	4.00	DRY	DRY	DRY
May-08	EC(dS/m)	-	-	-	-	-	-	DRY	-	-	-	-	7.70	-	-	0.90	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	-	DRY	DRY	DRY	3.45	-	DRY	4.70	DRY	DRY	DRY
Jun-08	EC(dS/m)	-	-	-	-	-	-	DRY	-	-	-	-	7.70	-	-	0.90	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	-	DRY	DRY	DRY	3.65	-	DRY	5.05	DRY	DRY	DRY
Jul-08	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	7.65	-	-	1.10	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	-	DRY	DRY	DRY	3.04	-	DRY	5.00	DRY	DRY	DRY
Aug-08	EC(dS/m)	-	-	-	-	-	-	7.9	-	-	-	-	7.50	--	-	0.85	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	6.25	-	DRY	DRY	DRY	3.51	-	DRY	5.00	DRY	DRY	DRY

TSTB – Too shallow to bail

Dubbo City Council Salinity Network site number (Figure 10)		DCC18	DCC19	DCC20	DCC21	DCC42	DCC44	DCC45	DCC49	DCC53	DCC58	DCC59	DCC62	DCC64	DCC87	DCC111	DCC115	DCC116	DCC124
Sampling date	**Drilled depth (m)**	**15**	**3**	**15**	**15**	**2**	**6**	**9**	**15**	**9**	**15**	**3**	**9**	**3**	**6**	**6**	**9**	**3.5**	**15**
Sep-08	EC(dS/m)	-	-	-	-	-	-	0.9	-	-	-	-	7.90	-	-	-	0.2	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	6.56	-	DRY	DRY	DRY	3.83	-	DRY	DRY	6.2	DRY	DRY
Oct-08	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	7.65	-	-	1.10	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	-	DRY	DRY	DRY	3.05	-	DRY	5.01	DRY	DRY	DRY
Nov-08	EC(dS/m)	-	-	-	-	-	-	0.7	-	-	-	-	10.00	-	-	-	0.2	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.4	-	DRY	DRY	DRY	3.28	-	DRY	DRY	6.08	DRY	DRY
Dec-08	EC(dS/m)	-	-	-	-	-	-	1.0	-	-	-	-	9.60	-	-	-	0.5	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.47	-	DRY	DRY	DRY	3.62	-	DRY	DRY	7.32	DRY	DRY
Jan-09	EC(dS/m)	-	-	-	-	-	-	-	New	-	-	-	9.20	New	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	bore	DRY	DRY	DRY	3.60	bore	DRY	DRY	DRY	DRY	DRY
Feb-09	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	9.30	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	3.55	DRY	DRY	DRY	DRY	DRY	DRY
Mar-09	EC(dS/m)	-	-	-	-	-	-	1.01	TSTB	TSTB	-	-	8.63	TSTB	-	1.16	-	-	TSTB
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	6.6	11.38	8.70	DRY	DRY	3.53	2.45	DRY	4.15	DRY	DRY	14.74
Apr-09	EC(dS/m)	-	-	-	-	-	-	1.14	-	-	-	-	8.41	-	-	1.16	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.41	DRY	DRY	DRY	DRY	3.62	DRY	DRY	4.15	DRY	DRY	DRY
May-09	EC(dS/m)	-	-	TSTB	-	-	-	-	-	-	-	-	8.84	-	-	1.15	-	-	-
	SWL (m)	DRY	DRY	14.61	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	3.75	DRY	DRY	4.35	DRY	DRY	DRY
Jun-09	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	8.60	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	3.81	DRY	DRY	DRY	DRY	DRY	DRY
Jul-09	EC(dS/m)	-	-	TSTB	-	-	-	0.96	-	-	-	-	8.87	-	1.99	1.02	-	-	-
	SWL (m)	DRY	DRY	14.70	DRY	DRY	DRY	7.35	DRY	DRY	DRY	DRY	4.00	DRY	4.88	4.56	DRY	DRY	DRY
Aug-09	EC(dS/m)	-	-	TSTB	-	-	-	1.08	-	TSTB	-	-	9.72	-	2.47	1.19	-	-	-
	SWL (m)	DRY	DRY	14.78	DRY	DRY	DRY	7.96	DRY	8.72	DRY	DRY	4.08	DRY	5.13	4.70	DRY	DRY	DRY
Sep-09	EC(dS/m)	-	-	-	-	-	-	1.23	-	-	-	-	9.54	-	2.69	1.26	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.15	DRY	DRY	DRY	DRY	4.24	DRY	5.37	4.86	DRY	DRY	DRY
Oct-09	EC(dS/m)	-	-	TSTB	-	-	-	TSTB	-	-	-	-	9.94	-	2.41	1.11	0.52	-	-
	SWL (m)	DRY	DRY	14.77	DRY	DRY	DRY	8.79	DRY	DRY	DRY	DRY	4.15	DRY	4.64	4.81	7.38	DRY	DRY
Nov-09	EC(dS/m)	-	-	TSTB	-	-	-	1.5	-	-	-	-	9.67	-	-	1.53	-	-	-
	SWL (m)	DRY	DRY	14.78	DRY	DRY	DRY	8.52	DRY	DRY	DRY	DRY	4.10	DRY	DRY	5.01	DRY	DRY	DRY

TSTB – Too shallow to bail

Dubbo City Council Salinity Network site number (Figure 10)		DCC18	DCC19	DCC20	DCC21	DCC42	DCC44	DCC45	DCC49	DCC53	DCC58	DCC59	DCC62	DCC64	DCC87	DCC111	DCC115	DCC116	DCC124
Sampling date	**Drilled depth (m)**	**15**	**3**	**15**	**15**	**2**	**6**	**9**	**15**	**9**	**15**	**3**	**9**	**3**	**6**	**6**	**9**	**3.5**	**15**
Dec-09	EC(dS/m)	-	-	TSTB	-	-	-	1.33	-	-	-	-	8.91	-	2.09	1.40	-	-	-
	SWL (m)	DRY	DRY	14.68	DRY	DRY	DRY	7.83	DRY	DRY	DRY	DRY	3.98	DRY	4.53	4.69	DRY	DRY	DRY
Jan-10	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	8.85	-	2.69	TSTB	-	TSTB	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	3.36	DRY	4.83	5.17	DRY	3.41	DRY
Feb-10	EC(dS/m)	-	-	-	-	-	-	TSTB	1.34	-	-	1.14	6.75	1.47	2.36	1.06	-	0.4	TSTB
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.74	10.47	DRY	DRY	2.28	2.16	2.20	4.49	5.24	-	2.33	14.75
Mar-10	EC(dS/m)	-	-	-	-	-	-	-	1.68	-	-	-	7.21	-	2.58	TSTB	0.4	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	10.89	DRY	DRY	DRY	2.64	DRY	4.67	5.78	7.47	DRY	DRY
Apr-10	EC(dS/m)	-	TSTB	-	-	-	-	TSTB	-	-	-	-	6.59	-	3.07	TSTB	-	0.31	-
	SWL (m)	DRY	2.87	DRY	DRY	DRY	DRY	8.95	DRY	DRY	DRY	DRY	2.92	DRY	4.92	5.58	-	1.43	DRY
May-10	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	6.43	-	3.19	-	DRY	0.51	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	3.07	DRY	4.86	DRY	DRY	1.57	DRY
Jun-10	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	6.30	-	2.62	-	-	0.47	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	3.00	DRY	5.07	DRY	-	0.44	DRY
Jul-10	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	6.04	-	2.49	TSTB	-	0.62	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.81	DRY	4.84	5.79	-	0.59	DRY
Aug-10	EC(dS/m)	-	-	-	-	-	-	0.87	-	-	-	1.29	4.84	0.80	1.79	TSTB	-	0.78	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.55	DRY	DRY	DRY	0.84	1.00	1.05	3.65	5.82	-	0.74	DRY
Sep-10	EC(dS/m)	-	-	-	-	-	-	0.75	-	-	-	1.42	4.97	0.68	1.70	-	-	0.67	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.36	DRY	DRY	DRY	1.1	1.12	0.92	3.60	DRY	-	1.03	DRY
Oct-10	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	TSTB	4.21	-	-	1.10	-	0.32	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.82	1.85	DRY	DRY	5.29	-	2.45	DRY
Nov-10	EC(dS/m)	-	-	-	-	-	-	0.38	-	-	-	0.98	4.59	0.34	0.85	0.55	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	3.68	DRY	DRY	DRY	1.96	1.49	0.46	1.80	2.65	-	-	DRY
Dec-10	EC(dS/m)	-	-	-	-	-	-	0.56	-	-	-	0.49	4.07	0.60	1.24	0.70	-	0.74	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	5.09	DRY	DRY	DRY	0.98	1.49	1.23	3.25	2.92	-	1.84	DRY
Jan-11	EC(dS/m)	-	-	-	-	-	-	0.75	-	-	-	-	3.54	0.86	1.63	0.85	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	6.5	DRY	DRY	DRY	DRY	1.50	2.00	4.70	3.20	-	DRY	DRY
Feb-11	EC(dS/m)	-	-	-	-	-	-	1.06	-	-	-	-	3.48	TSTB	TSTB	0.69	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.21	DRY	DRY	DRY	DRY	2.15	2.89	5.48	3.90	DRY	DRY	DRY

TSTB – Too shallow to bail

Dubbo City Council Salinity Network site number (Figure 10)		DCC18	DCC19	DCC20	DCC21	DCC42	DCC44	DCC45	DCC49	DCC53	DCC58	DCC59	DCC62	DCC64	DCC87	DCC111	DCC115	DCC116	DCC124
Sampling date	**Drilled depth (m)**	**15**	**3**	**15**	**15**	**2**	**6**	**9**	**15**	**9**	**15**	**3**	**9**	**3**	**6**	**6**	**9**	**3.5**	**15**
Mar-11	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	3.29	-	-	0.74	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.95	DRY	DRY	4.20	DRY	DRY	DRY
Apr-11	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	3.11	-	-	1.08	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.51	DRY	DRY	5.59	DRY	DRY	DRY
May-11	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	2.86	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.38	DRY	DRY	DRY	DRY	DRY	DRY
Jun-11	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	3.01	-	-	TSTB	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.58	DRY	DRY	5.82	DRY	DRY	DRY
Jul-11	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	3.56	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.80	DRY	DRY	DRY	DRY	DRY	DRY
Aug-11	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	4.33	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	3.04	DRY	DRY	DRY	DRY	DRY	DRY
Sep-11	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	4.30	-	-	TSTB	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	3.10	DRY	DRY	5.80	DRY	DRY	DRY
Oct-11	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	3.94	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.84	DRY	DRY	DRY	DRY	DRY	DRY
Nov-11	EC(dS/m)	-	TSTB	-	-	-	-	-	-	6.25	-	-	3.71	0.23	0.72	-	-	2.47	-
	SWL (m)	DRY	2.93	DRY	DRY	DRY	DRY	DRY	DRY	8.60	DRY	DRY	2.04	1.47	4.60	DRY	DRY	1.23	DRY
Dec-11	EC(dS/m)	-	-	-	-	-	-	1.14	-	-	-	0.28	4.25	4.28	-	-	-	1.56	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.44	DRY	DRY	DRY	1.82	1.84	2.50	DRY	DRY	DRY	0.95	DRY
Jan-12	EC(dS/m)	-	-	-	-	-	-	1.22	-	-	-	TSTB	4.52	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.48	DRY	DRY	DRY	2.62	1.91	DRY	DRY	DRY	DRY	DRY	DRY
Feb-12	EC(dS/m)	-	-	-	-	-	-	1.31	-	-	-	0.26	4.93	0.26	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.4	DRY	DRY	DRY	0.59	0.65	1.00	DRY	DRY	-	-	DRY
Mar-12	EC(dS/m)	1.43	TSTB	-	-	-	-	1.88	-	-	-	-	5.15	0.89	-	-	-	-	-
	SWL (m)	3.73	2.82	DRY	DRY	DRY	DRY	8.03	DRY	DRY	DRY	DRY	1.90	2.23	DRY	DRY	-	-	DRY
Apr-12	EC(dS/m)	2.01	-	-	-	-	-	2.14	-	-	-	-	5.04	-	-	-	-	-	-
	SWL (m)	4.25	DRY	DRY	DRY	DRY	DRY	8.62	DRY	DRY	DRY	DRY	1.52	DRY	DRY	DRY	-	-	DRY
May-12	EC(dS/m)	2.24	-	-	-	-	-	-	-	-	-	-	4.84	-	-	-	-	-	-
	SWL (m)	4.83	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	1.37	DRY	DRY	DRY	-	-	DRY

TSTB – Too shallow to bail

Dubbo City Council Salinity Network site number (Figure 10)		DCC18	DCC19	DCC20	DCC21	DCC42	DCC44	DCC45	DCC49	DCC53	DCC58	DCC59	DCC62	DCC64	DCC87	DCC111	DCC115	DCC116	DCC124
Sampling date	**Drilled depth (m)**	**15**	**3**	**15**	**15**	**2**	**6**	**9**	**15**	**9**	**15**	**3**	**9**	**3**	**6**	**6**	**9**	**3.5**	**15**
Jun-12	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	0.1	4.90	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	0.7	2.50	DRY	DRY	DRY	-	-	DRY
Jul-12	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	0.89	5.21	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	1.47	2.94	DRY	DRY	DRY	-	-	DRY
Aug-12	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	0.5	5.03	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	1.07	2.70	DRY	DRY	DRY	-	-	DRY
Sep-12	EC(dS/m)	-	-	-	-	-	-	1.04	-	TSTB	-	0.67	5.10	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.5	DRY	8.73	DRY	1.09	2.70	DRY	DRY	DRY	-	-	DRY
Oct-12	EC(dS/m)	-	-	-	-	-	-	-	-	TSTB	-	-	5.00	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	8.80	DRY	DRY	2.65	DRY	DRY	DRY	-	-	DRY
Nov-12	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	4.70	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.35	DRY	DRY	DRY	-	-	DRY
Dec-12	EC(dS/m)	-	-	-	-	-	-	-	-	TSTB	-	-	4.90	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	8.89	DRY	DRY	2.53	DRY	DRY	DRY	-	-	-
Jan-13	EC(dS/m)	-	-	-	-	-	-	1.31	-	-	-	-	4.31	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.53	DRY	DRY	DRY	DRY	2.80	DRY	DRY	DRY	-	-	-
Feb-13	EC(dS/m)	-	-	-	-	-	-	-	-	TSTB	-	-	5.47	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	8.71	DRY	DRY	2.94	DRY	DRY	DRY	-	DRY	-
Mar-13	EC(dS/m)	-	-	-	-	-	-	-	-	TSTB	-	-	6.20	-	-	-	-	0.54	TSTB
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	8.89	DRY	DRY	2.80	DRY	DRY	DRY	-	1.58	14.75
Apr-13	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	6.01	-	-	-	-	0.44	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	6.74	DRY	DRY	DRY	-	1.63	-
May-13	EC(dS/m)	1.12	-	-	-	-	-	-	-	-	-	-	5.43	-	-	-	-	-	-
	SWL (m)	2.42	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.55	DRY	DRY	DRY	-	DRY	-
Jun-13	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	6.20	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.85	DRY	DRY	DRY	-	DRY	DRY
Jul-13	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	5.57	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.50	DRY	DRY	DRY	-	DRY	DRY
Aug-13	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	0.25	5.30	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	0.54	2.60	DRY	DRY	DRY	-	-	DRY

TSTB – Too shallow to bail

Dubbo City Council Salinity Network site number (Figure 10)		DCC18	DCC19	DCC20	DCC21	DCC42	DCC44	DCC45	DCC49	DCC53	DCC58	DCC59	DCC62	DCC64	DCC87	DCC111	DCC115	DCC116	DCC124
Sampling date	**Drilled depth (m)**	**15**	**3**	**15**	**15**	**2**	**6**	**9**	**15**	**9**	**15**	**3**	**9**	**3**	**6**	**6**	**9**	**3.5**	**15**
Sep-13	EC(dS/m)	-	-	-	-	-	-	TSTB	-	-	-	0.43	4.87	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.68	DRY	DRY	DRY	0.79	2.56	DRY	DRY	DRY	-	-	DRY
Oct-13	EC(dS/m)	-	-	-	-	-	-	TSTB	-	-	-	0.43	4.87	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	8.68	DRY	DRY	DRY	0.79	2.56	DRY	DRY	DRY	-	-	DRY
Nov-13	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	0.98	4.85	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	1.57	2.50	DRY	DRY	DRY	-	-	DRY
Dec-13	EC(dS/m)	-	-	-	-	-	-	1.05	-	-	-	0.67	4.76	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	7.98	DRY	DRY	DRY	1.47	2.31	DRY	DRY	DRY	-	-	DRY
Jan-14	EC(dS/m)	-	-	-	-	-	-	1.24	-	-	-	-	6.15	-	-	TSTB	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	5.60	DRY	DRY	DRY	DRY	2.60	DRY	DRY	5.30	-	-	DRY
Feb-14	EC(dS/m)	-	-	-	-	-	-	1.09	-	-	-	-	5.82	-	-	1.17	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	5.42	DRY	DRY	DRY	DRY	2.50	DRY	DRY	5.18	-	-	DRY
Mar-14	EC(dS/m)	-	-	-	-	-	-	1.25	-	-	-	-	6.04	-	-	1.22	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	6.08	DRY	DRY	DRY	DRY	2.61	DRY	DRY	5.00	-	-	DRY
Apr-14	EC(dS/m)	-	-	-	-	-	-	1.11	-	-	-	-	6.00	-	-	1.11	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	6.24	DRY	DRY	DRY	DRY	2.71	DRY	DRY	5.09	-	-	DRY
May-14	EC(dS/m)	1.02	-	-	-	-	-	0.94	-	-	-	-	5.62	-	-	-	-	-	-
	SWL (m)	2.59	DRY	DRY	DRY	DRY	DRY	5.98	DRY	DRY	DRY	DRY	2.60	DRY	DRY	DRY	-	-	DRY
Jun-14	EC(dS/m)	1.14	-	-	-	-	-	0.99	-	-	-	-	5.80	-	-	-	-	-	-
	SWL (m)	2.78	DRY	DRY	DRY	DRY	DRY	6.03	DRY	DRY	DRY	DRY	2.65	DRY	DRY	DRY	-	-	DRY
Jul-14	EC(dS/m)	1.25	-	-	-	-	-	1.03	-	-	-	-	5.64	-	-	-	-	-	-
	SWL (m)	2.91	DRY	DRY	DRY	DRY	DRY	6.20	DRY	DRY	DRY	DRY	2.51	DRY	DRY	DRY	-	-	DRY
Aug-14	EC(dS/m)	1.09	-	-	-	-	-	1.19	-	-	-	-	5.24	-	-	-	-	-	-
	SWL (m)	4.21	DRY	DRY	DRY	DRY	DRY	6.89	DRY	DRY	DRY	DRY	2.58	DRY	DRY	DRY	-	-	DRY
Sep-14	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SWL (m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oct-14	EC(dS/m)	-	-	-	-	-	-	-	-	-	-	-	4.63	-	-	-	-	-	-
	SWL (m)	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	DRY	2.70	DRY	DRY	DRY	-	-	DRY
Nov-14	EC(dS/m)	1.57	TSTB	-	-	-	-	1.35	-	TSTB	-	0.73	4.81	0.49	-	-	-	-	-
	SWL (m)	4.87	2.85	DRY	DRY	DRY	DRY	7.95	DRY	8.84	DRY	1.41	2.45	1.84	DRY	DRY	-	-	DRY

TSTB – Too shallow to bail

Dubbo City Council Salinity Network site number (Figure 10)		DCC18	DCC19	DCC20	DCC21	DCC42	DCC44	DCC45	DCC49	DCC53	DCC58	DCC59	DCC62	DCC64	DCC87	DCC111	DCC115	DCC116	DCC124
Sampling date	**Drilled depth (m)**	**15**	**3**	**15**	**15**	**2**	**6**	**9**	**15**	**9**	**15**	**3**	**9**	**3**	**6**	**6**	**9**	**3.5**	**15**
Dec-14	EC(dS/m)	1.70	TSTB	-	-	-	-	1.34	-	1.87	-	0.60	4.89	0.54	-	-	-	-	-
	SWL (m)	4.51	2.80	DRY	DRY	DRY	DRY	7.90	DRY	8.54	DRY	1.36	2.34	1.73	DRY	DRY	-	-	DRY

TSTB – Too shallow to bail

Appendix 5. Initial site investigation characteristics

Location (Figure 6)	Vegetation	Slope (%)	Bare areas	Indicators of salinity	Surface rocks	Trees (within 50m)
A2	Windmill khaki week, love grass, paspalum and red grass	1% W	Nil	Nil	Nil	Nil
A3	Windmill khaki week, love grass, paspalum and red grass	1% W	Nil	Nil	Nil	Nil
A6	Windmill khaki week, love grass, paspalum and red grass	1% W	Nil	Nil	Nil	Nil
A7	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
A8	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
A9	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
A10	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
A16	Paspalum, red grass and shepherds purse	0-1% S	Nil	Nil	Nil	Nil
A17	Paspalum, red grass and shepherds purse	0-1% S	Nil	Nil	Nil	Nil
B1	Windmill, khaki week, love grass, paspalum and red grass	0-1% W	Nil	Nil	Few	Nil
B2	Windmill, khaki week, love grass, paspalum and red grass	0-1% W	Nil	Nil	Few	Nil
B3	Windmill, khaki week, love grass, paspalum and red grass	0-1% W	Nil	Nil	Few	Nil
B6	Fleabane, shepherds purse, khaki weed, paspalum, red grass	0-2% S	Tracks/ Nil	Nil	River gravel	Nil
B7	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
B8	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
B9	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
B10	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
B11	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
B12	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
B13	Windmill grass, paspalum, khaki weeds	0-1% S	Stockpiles to the west , area under development	Nil	Nil	Nil
B14	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
B15	Paspalum, red grass	0-1% S	Stockpiles	Nil	Nil	White cedar tree
B16	Paspalum, red grass, shepherds purse	0-1% S	Nil	Nil	Nil	Nil
C1	Windmill grass, khaki weed, love grass, paspalum, red grass	0-3% E	Nil	Nil	Surface cobbles	Nil
C2	Windmill grass, khaki weed, love grass, paspalum, red grass	0-2% W	Nil	Nil	Surface cobbles	Nil
C3	Windmill khaki week, love grass, paspalum and red grass	1% W	Nil	Nil	Nil	Nil
C4	Windmill khaki week, love grass, paspalum and red grass	1% W	Nil	Nil	River gravels	Nil
C5	Red grass, shepherds purse, khaki weed	1% S	Nil	Nil	Trace surface rocks	Nil
C6	Fleabane, shepherds purse, khaki weed, paspalum, red grass	2% S	Tracks/ Nil	Nil	Nil	Nil

C7	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
C8	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
C9	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
C10	Windmill, fleabane, red grass and paspalum	2% S	Tracks	Nil	Nil	Nil
C11	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
C12	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
C13	Windmill grass, paspalum, khaki weeds	0-1% S	Stockpiles to the west , area under development	Nil	Nil	Nil
C14	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
C15	Paspalum, red grass, shepherds purse	0-1% S	Nil	Nil	Nil	Nil
C16	Paspalum, red grass, shepherds purse	0-1% S	Nil	Nil	Nil	Nil
C17	Paspalum, red grass, shepherds purse	0-1% S	Nil	Nil	Nil	Nil
D1	Shepherds purse, khaki weed	0-1% S	Nil	Nil	Surface cobbles	Nil
D2	Windmill grass, khaki weed, love grass, paspalum	3% E	Nil	Nil	Surface cobbles	Nil
D3	Windmill grass, khaki weed, love grass, paspalum	3% E	Nil	Nil	Surface cobbles	Nil
D4	Windmill grass, khaki weed, love grass, paspalum	2% E	Nil	Nil	Surface cobbles	Nil
D5	Khaki weed, paspalum	2% E	Some bare areas	Nil	Surface cobbles	Nil
D6	Fleabane, shepherds purse, khaki weed, paspalum, red grass	2% S	Some bare areas/ tracks	Nil	Surface cobbles	Nil
D7	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
D8	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
D9	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
D10	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
D11	Windmill, fleabane, red grass and paspalum	2% S	Tracks/ Nil	Nil	Nil	Nil
D12	Khaki weed, red grass	2% S	Tracks	Nil	Nil	Pepper trees
D13	Khaki weed	2% S	Tracks	Nil	Nil	Pepper trees
D14	Windmill, fleabane, red grass and paspalum	0-1% S	Tracks/ Nil	Nil	Nil	Nil
D15	Paspalum, red grass, shepherds purse	0-1% S	Nil	Nil	Nil	Nil
D16	Paspalum, red grass, shepherds purse	0-1% S	Nil	Nil	Nil	Nil
D17	Paspalum, red grass, shepherds purse, khaki weed	0-1% S	Nil	Nil	Nil	Nil
E1	Windmill grass, khaki weed, love grass, paspalum	3% S	Nil	Nil	Surface cobbles	Eucalypt, white cedder
E2	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
E3	Shepherds purse, red grass, sheep's burr	0-1% E	Nil	Nil	Nil	Nil

E4	Shepherds purse, red grass, sheep's burr, red grass	0-1% E	Nil	Nil	Nil	Nil
E5	Shepherds purse, red grass, sheep's burr, khaki weed	0-1% E	Nil	Nil	Surface cobbles	Nil
E6	Sparse vegetation	0-1% E	Gate way, stock traverse	Nil	River gravel	Nil
E7	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
E8	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
E9	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
E10	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
E11	Paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
E12	Paspalum, red grass, shepherds purse, pepper cress, cat heads	0-1% S	Tracks	Nil	Nil	White cedar
E13	Near tree lot	0-1% S	Nil	Nil	Nil	Cedar trees
E14	Sparse vegetation	0-1% S	Nil	Bare areas due to fill	Nil	Nil
E15	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
E16	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
E17	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
F1	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
F2	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
F3	Shepherds purse, red grass, sheep's burr, Khaki weed,	0-1% E	Nil	Nil	Surface cobbles	Nil
F4	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
F5	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
F6	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Nil	Nil	Nil
F7	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Nil	Nil	Nil
F8	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Nil	Nil	Nil
F9	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Nil	Nil	Nil
F10	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Nil	Nil	Nil

F11	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
F12	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Tracks	Nil	Nil
F13	Near tree lot	0-1% S	Nil	Nil	Nil	Cedar trees
F14	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
F15	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
F16	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
F17	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% SE	Nil	Nil	Nil	Nil
G1	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
G2	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
G3	Shepherds purse, red grass, sheep's burr, khaki weed	0-1% E	Nil	Nil	Surface cobbles	Nil
G4	Shepherds purse, red grass, sheeps burr	0-1% S	Nil	Nil	Nil	Nil
G5	Shepherds purse, red grass, sheeps burr	0-1% S	Nil	Nil	Nil	Nil
G6	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Nil	Nil	Nil
G7	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Nil	Nil	Nil
G8	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Nil	Nil	Nil
G9	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Nil	Nil	Nil
G10	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat head	0-1% S	Nil	Nil	Nil	Nil
G11	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
G12	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress, cat heads	0-1% S	Nil	Tracks	Nil	Nil
G13	Near tree lot	0-1% S	Nil	Nil	Nil	Cedar trees
G14	Sparse vegetation	0-1% S	Nil	Bare areas due to fill	Nil	Nil
G15	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
G16	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
G17	Paspalum, red grass, shepherds purse, pepper grass	0-1% S	Nil	Nil	Nil	Nil

H1	Shepherds purse, red grass, sheep's Burr	0-1% S	Nil	Nil	Nil	Nil
H2	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
H3	Shepherds purse, red grass, sheep's burr, khaki weed	0-1% E	Nil	Nil	Surface cobbles	Nil
H4	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	casuarina
H5	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	casuarina
H6	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
H7	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
H8	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
H9	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
H10	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
H11	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
H12	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Tracks	Nil	Nil	Nil
H13	Trace vegetation	0-1% S	Bare areas due to fill	Nil	Nil	Nil
H14	Trace vegetation	0-1% S	Bare areas due to fill	Nil	Nil	Nil
H15	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
H16	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
H17	Paspalum, red grass, shepherds purse, peppercress	0-1% S	Nil	Nil	Nil	Nil
I1	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Eucalypt
I2	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
I3	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
I4	Shepherds purse, red grass, sheep's burr	0-1% SE	Nil	Nil	Nil	Nil
I5	Shepherds purse, red grass, sheep's burr	0-1% W	Nil	Nil	Nil	Nil
I6	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
I7	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
I8	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil

I9	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
I10	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
I11	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
I12	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
I13	Trace vegetation	0-1% S	Bare areas due to fill	Nil	Nil	Nil
I14	Trace vegetation	0-1% S	Bare areas due to fill	Nil	Nil	Nil
I15	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
I16	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
I17	Paspalum, red grass, shepherds purse, peppercress	0-1% S	Nil	Nil	Nil	Nil
J1	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
J2	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
J3	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
J4	Shepherds purse, red grass, sheep's burr	0-1% SE	Nil	Nil	Nil	Nil
J5	Shepherds purse, red grass, sheep's burr	0-1% SE	Nil	Nil	Nil	Eucalypt
J6	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
J7	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
J8	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
J9	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
J10	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
J11	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
J12	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
J13	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
J14	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil

J15	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
J16	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
J17	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K1	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
K2	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
K3	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
K4	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
K5	Shepherds purse, red grass, sheep's burr	0-1% SE	Nil	Nil	Nil	Nil
K6	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K7	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K8	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K9	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K10	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K11	Paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K12	Paspalum, red grass, shepherds purse, pepper cress	0-1% S	Tracks	Nil	Nil	Nil
K13	Paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K14	Paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K15	Paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K16	Paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
K17	Paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
L1	Red grass, couch, short windmill, browns love, clover	2-3% SW	Minor	Nil	Basalt cobbles	Eucalypt
L2	Red grass, couch, short windmill, browns love, clover	2-3% SW	Minor	Nil	Basalt cobbles	Nil
L3	Red grass, couch, short windmill, browns love, clover	0-1% SW	Minor	Nil	Basalt cobbles	Nil
L4	Shepherds purse, red grass, sheep's burr	0-1% S	Nil	Nil	Nil	Nil
L5	Shepherds purse, red grass, sheep's burr	0-1% SE	Nil	Nil	Nil	Nil
L6	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil

L7	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
L8	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
L9	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
L10	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
L11	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
L12	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
L13	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
L14	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
L15	Shepherds purse, red grass, sheep's burr	0-1% SE	Nil	Nil	Nil	Nil
L16	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
L17	Khaki weed, cat head, paspalum, red grass, shepherds purse, pepper cress	0-1% S	Nil	Nil	Nil	Nil
M1	Red grass, couch, short windmill, browns love, clover	0-1% SW	Minor	Nil	Basalt cobbles	Eucalypt
M2	Red grass, couch, short windmill, browns love, clover	0-1% SW	Minor	Nil	Basalt cobbles	Nil
M3	Red grass, couch, short windmill, browns love, clover	0-1% SW	Minor	Nil	Basalt cobbles	Nil
M4	Red grass, couch, short windmill, browns love, clover	0-1% SW	Minor	Nil	Basalt cobbles	Nil
M5	Red grass, couch, short windmill, browns love, clover	0-1% SW	Minor	Nil	Basalt cobbles	Nil
M6	Red grass, couch, short windmill, browns love, clover	0-6% S	Minor	Nil	Basalt cobbles	Nil
M7	Red grass, couch, short windmill, browns love, clover	0-6% W	Minor	Nil	Basalt cobbles	Nil
M8	Red grass, couch, short windmill, browns love, clover	0-6% W	Minor	Nil	Basalt cobbles	Nil
M9	Red grass, couch, short windmill, browns love, clover, paspalum	0-1% SW	Minor	Nil	Nil	Nil
M10	Red grass, couch, short windmill, browns love, clover, paspalum	0-1% SW	Minor	Nil	Nil	Nil
M11	Red grass, couch, short windmill, browns love, clover, paspalum	0-1% SW	Minor	Nil	Nil	Nil
M12	Red grass, couch, short windmill, browns love, clover, paspalum	Flat	Soil stockpiles	Nil	River gravel	Nil
M13	Red grass, couch, short windmill, browns love, clover, paspalum	3% S	Minor	Nil	Surface cobbles	Nil
M14	Red grass, couch, short windmill, browns love, clover, paspalum	3% S	Minor	Nil	Surface cobbles	Nil
M15	Red grass, couch, short windmill, browns love, clover, paspalum	5% E	Minor	Nil	Nil	Nil

M16	Red grass, couch, short windmill, browns love, clover, paspalum	3% S	Nil	Nil	Surface cobbles	Nil
M17	Red grass, couch, short windmill, browns love, clover, paspalum	Flat	Nil	Nil	Surface cobbles	Nil
N1	Red grass, couch, short windmill, browns love, clover, paspalum	2-3% SW	Minor	Nil	Basalt cobbles	Eucalypt
N2	Red grass, couch, short windmill, browns love, clover, paspalum	3% S	Minor	Nil	Basalt cobbles	Nil
N3	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	0-1% SW	Minor	Nil	Basalt cobbles	Nil
N4	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	0-1% SW	Minor	Nil	Basalt cobbles	Nil
N5	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	0-1% SW	Minor	Nil	Few small cobbles	Nil
N6	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	4% W	Minor	Nil	Trace surface cobbles	Nil
N7	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	6% W	Minor	Nil	Basalt cobbles	Nil
N8	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	0-4% SW	Minor	Nil	Basalt cobbles	Nil
N9	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	2% SW	Minor	Nil	Surface cobbles	Nil
N10	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	1% S	Minor	Nil	Nil	Nil
N11	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	1% S	Nil	Nil	Nil	Nil
N12	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	Flat	Soil stockpiles	Nil	River gravels	Nil
N13	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	3% S	Nil	Nil	Surface cobbles	Nil
N14	Red grass, couch, short windmill, browns love, clover, paspalum	3% S	Nil	Nil	Surface cobbles	Nil
N15	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel	Flat	Nil	Nil	Surface cobbles	Nil
N16	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel	Flat	Nil	Nil	Surface cobbles	Nil
N17	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel	Flat	Nil	Nil	Surface cobbles	Nil
O1	Red grass, couch, short windmill, browns love, clover,	2-3% SW	Minor	Nil	Lot of basalt and small cobbles	Eucalypt
O2	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel	2-3% SW	Minor	Nil	Lot of basalt and small cobbles	Nil
O3	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel	2-3% SW	Minor	Nil	Lot of basalt and small cobbles	Nil

O4	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel	2-4% SW	Nil	Nil	Lot of basalt and small cobbles	Nil
O5	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel	2-4% SW	Nil	Nil	Lot of basalt and small cobbles	Nil
O6	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel	5% W	Nil	Nil	Surface cobbles	Nil
O7	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel	0-8% S	Nil	Nil	Rock outcrop and surface cobbles	Nil
O8	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel	0-8% S	Nil	Nil	Rock outcrop and surface cobbles	Nil
O9	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	2% SW	Nil	Nil	Surface cobbles	Nil
O10	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	1% SW	Nil	Nil	Nil	Nil
O11	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	1% SW	Nil	Nil	Nil	Nil
O12	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	Flat	Soil stockpiles	Nil	River gravels	Nil
O13	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	Flat	Soil stockpiles	Nil	River gravels	Nil
O14	Red grass, couch, short windmill, browns love, clover, paspalum	3% S	Nil	Nil	Surface cobbles	Nil
O15	Red grass, couch, short windmill, browns love, clover, paspalum	Flat	Nil	Nil	Surface cobbles	Nil
O16	Red grass, couch, short windmill, browns love, clover, paspalum	Flat	Nil	Nil	Surface cobbles	Nil
O17	Red grass, couch, short windmill, browns love, clover, paspalum	Flat	Nil	Nil	Surface cobbles	Nil
P1	Red grass, couch, short windmill, browns love, clover	2-3% SW	Minor	Nil	Basalt cobbles	Eucalypt
P2	Red grass, couch, short windmill, browns love, clover, saffron thistle	2-3% SW	Minor	Nil	Basalt cobbles	Nil
P3	Patterson's curse, cat head, amaranth, windmill grass	2-3% SW	Minor	Nil	Basalt cobbles	Nil
P4	Patterson's curse, cat head, amaranth, windmill grass	2-3% SW	Minor	Nil	Basalt cobbles	Nil
P5	Patterson's curse, cat head, amaranth, windmill grass	5-6% SW	Minor	Nil	Basalt cobbles	Nil
P6	Patterson's curse, cat head, amaranth, windmill grass	4% W	Minor	Nil	Surface cobbles	Nil
P7	Patterson's curse, cat head, amaranth, windmill grass	Flat	Minor	Nil	Surface cobbles	Nil
P8	Patterson's curse, cat head, amaranth, windmill grass	4% S	Minor	Nil	Rock outcrop	Nil
P9	Patterson's curse, cat head, amaranth, windmill grass	2% SW	Nil	Nil	Rock outcrop	Nil
P10	Patterson's curse, cat head, amaranth, windmill grass, paspalum	1% S	Nil	Nil	Nil	Nil
P11	Patterson's curse, cat head, amaranth, windmill grass, paspalum	1% S	Nil	Nil	Nil	Nil
P12	Patterson's curse, cat head, amaranth, windmill grass, paspalum	Flat	Soil stockpiles	Nil	River gravels	Nil

P13	Patterson's curse, cat head, amaranth, windmill grass, paspalum, clover	3% S	Soil stockpiles	Nil	Surface cobbles	Nil
P14	Red grass, couch, short windmill, browns love, clover, paspalum	3% S	Minor	Nil	Surface cobbles	Nil
P15	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel, Galvanised burr	Flat	Nil	Nil	Surface cobbles	Nil
P16	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel, Galvanised burr	Flat	Nil	Nil	Surface cobbles	Nil
P17	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel, Galvanised burr	Flat	Nil	Nil	Surface cobbles	Nil
Q1	Red grass, couch, short windmill, browns love, clover	2-3% SW	Minor	Nil	Basalt cobbles	Eucalypt
Q2	Red grass, couch, short windmill, browns love, clover	2-3% SW	Minor	Nil	Basalt cobbles	Eucalypt
Q3	Pattersons's curse, cat head, amaranth, windmill grass	2-4% SW	Minor	Nil	Basalt cobbles	Nil
Q4	Pattersons's curse, cat head, amaranth, windmill grass	2-3% SW	Minor	Nil	Basalt cobbles	Nil
Q5	Red grass, couch, short windmill, browns love, clover	1-2% SW	Minor	Nil	Basalt cobbles	NIl
Q6	Red grass, couch, short windmill, browns love, clover	1% E	Minor	Nil	Basalt cobbles	Nil
Q7	Red grass, couch, short windmill, browns love, clover	2-3% SW	Minor	Nil	Basalt cobbles	Nil
Q8	Red grass, couch, short windmill, browns love, clover	1% SE	Minor	Nil	Basalt cobbles	Nil
Q9	Red grass, couch, short windmill, browns love, clover, paspalum	2% SE	Minor	Nil	Surface cobbles	Nil
Q10	Red grass, couch, short windmill, browns love, clover, paspalum	2% SE	Nil	Nil	Surface cobbles	Nil
Q11	Red grass, couch, short windmill, browns love, clover, paspalum	1% S	Minor	Nil	Surface cobbles	Nil
Q12	Red grass, couch, short windmill, browns love, clover, paspalum	3% S	Minor	Nil	Surface cobbles	Nil
Q13	Red grass, couch, short windmill, browns love, clover, paspalum, Shepherds purse	3% S	Minor	Nil	Surface cobbles	Nil
Q14	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel, Galvanised burr	Flat	Minor	Nil	Surface cobbles	Nil
Q15	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel, Galvanised burr	Flat	Minor	Nil	Surface cobbles	Nil
Q16	Red grass, couch, short windmill, browns love, clover, paspalum, amaranth, sheep sorrel, Galvanised burr	Flat	Minor	Nil	Surface cobbles	Nil
Q17	Red grass, couch, short windmill, browns love, clover, paspalum, clover, wild sage	Flat	Minor	Nil	Surface cobbles	Nil

Appendix 5. Field and laboratory sheets

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 8/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	1	**GPS:**	55H 653 824mE 6428 257mN

Surface description

Slope:	1%	Aspect:	West
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt float		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass		
% surface cover	90%. Bare areas due to stock compaction		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 350 350	Dark brown silty sand with increasing basalt cobbles End of hole, refusal on basalt cobbles		D				
Notes: Nil							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 8/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	2	**GPS:**	55H 653 959mE 66428 255N

Surface description

Slope:	2%	Aspect:	East
Morphological type:	Upper-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt float		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass		
% surface cover	95%		
Salinity:	Bare areas due to stock compaction		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500 500	Dark brown silty sand with increasing basalt cobbles End of hole, refusal on basalt cobbles		D				
Notes: Nil							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 8/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	3	**GPS:**	55H 654 100mE 6428 231mN

Surface description

Slope:	1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt float		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass		
% surface cover	100%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark red silty gravel with basalt cobbles		D				
300 to 800	Light grey silty sand with extremely weathered rock		D				
800	End of hole, refusal on weathered rock						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole: 4		**GPS:** 55H 654 207mE 6428 183mN	

Surface description

Slope:	1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass		
% surface cover	70%		
Salinity:	Bare areas due to soil nearby soil and refuse stockpiles		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500	Dark brown silty clay loam		M				
500 to 1300	Dark grey silty clay		M				
1300 to 1600	Dark grey sandy clay		M				
1600 to 1800	Light grey gravelly clay with basalt cobbles		D				
1800	End of hole, refusal on basalt cobbles						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/5/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole: 5		**GPS:** 55H 654 357mE 6428 183mN	

Surface description

Slope:	1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass		
% surface cover	98% due to vegetation shading		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Brown silty clay loam		M				
200 to 500	Dark brown silty clay		M				
500 to 1600	Dark brown lean clay with trace gravel		D				
			D				
1600 to 2000	Dark brown sandy clay						
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	6	**GPS:**	55H 654 476mE 6428 142mN

Surface description

Slope:	1%	Aspect:	West
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass, couch, clover		
% surface cover	100%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 600	Dark brown, silty clay loam		M				
600 to 1700	Dark brown silty clay with trace gravel		D				
1700 to 3000	Dark brown light medium clay with trace gravel		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole: 7		**GPS:** 55H 654 591mE 6428 128mN	

Surface description

Slope:	1%	Aspect:	North
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass, couch, clover		
% surface cover	100%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 400	Dark brown silty clay loam		M				
400 to 1100	Light reddish brown silty clay with trace gravel		D				
1100 to 2000	Dark red light medium clay with trace gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	8	**GPS:**	55H 654 740mE 6428 111mN

Surface description

Slope:	1%	Aspect:	North
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Surface rock		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass, couch, clover		
% surface cover	100%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 450	Dark brown sandy clay loam	X X	M M				
450 to 1400	Dark red silty clay	X X	M M				
1400 to 2800	Dark brown sandy clay with trace ironstone nodules	X X X	M M M				
2800 to 4800	Light grey sandy clay	X X	M M				
4800 to 8800	White silty sand with extremely weathered rock	X X X	D D D				
8800	End of hole, refusal on weathered rock						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 8/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	9	**GPS:**	55H 653 802mE 6428 128mN

Surface description

Slope:	1%	Aspect:	North west
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High- soil stockpiles to the east		
Erosion:	Nil		
Coarse fragments:	Basalt float		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass, couch, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown silty sand loam		D				
300 to 1200	Brown sandy clay		D				
1200 to 2000	Light yellow silty clay with trace gravel		D				
2000 to 2700	Light yellowish brown silty sand with moderate weathered rock and trace clay		D				
2700 to 3000	White silty sand, extremely weathered rock		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 8/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	10	**GPS:**	55H 653 927mE 6428 122mN

Surface description

Slope:	2%	Aspect:	East
Morphological type:	Upper-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Surface float		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Dark brown silty sand with basalt cobbles		D				
200	End of hole, refusal on basalt cobbles						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	11	**GPS:**	55H 654 084mE 6428 079mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass, couch, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brownish red, silty clay loam		M				
300 to 600	Dark brown silty clay trace cobbles		D				
600 to 2100	Light grey silty gravel, with moderate weathered rock		D				
2100	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole: 12		**GPS:** 55H 654 211mE 6428 064mN	

Surface description

Slope:	1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass, couch, clover		
% surface cover	100%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500	Dark red silty clay loam		M				
500 to 900	Light brown silty gravel with trace river gravel		D				
900 to 1600	Light orange silty sand with moderate weathered rock and trace river gravel		D				
1600 to 3000	Dark red silty sand with trace clay		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	13	**GPS:**	55H 654 340mE 6428 026mN

Surface description

Slope:	1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Shepherds purse, red grass, sheeps burr		
% surface cover	100%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown red silty clay loam		M				
300 to 700	Dark red sandy clay with trace gravel		D				
700 to 1600	Orange silty gravel with trace river gravel		D				
1600 to 2600	Light grey silty gravel with weathered rock and trace clay		D				
2600-3000	Dark grey clayey gravel		M				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	14	**GPS:**	55H 654 211mE 642 8064mN

Surface description

Slope:	1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Shepherds purse, red grass, sheeps burr		
% surface cover	100%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500	Dark red silty clay loam		M				
500 to 900	Light brown silty gravel with trace river gravel		D				
900 to 1600	Light orange silty sand with moderate weathered rock and trace river gravel		D				
1600 to 3000	Dark red silty sand with trace clay		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	14	**GPS:**	55H 654 464mE 6428 0224mN

Surface description

Slope:	1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Shepherds purse, red grass, sheeps burr, couch, short windmill, browns love and clover		
% surface cover	95%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown silty clay loam		M				
300 to 600	Reddish brown silty clay		D				
600 to 3000	Light brown light clay with increasing gravel content		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	15	**GPS:**	55H 654 571mE 6427 994mN

Surface description

Slope:	1%	Aspect:	West
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Trace		
Surface cover:	Shepherds purse, red grass, sheeps burr, couch, short windmill, browns love and clover		
% surface cover	95%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 400	Dark brown silty clay loam		M				
400 to 1200	Dark reddish brown silty clay with fine gravel		D				
1200 to 3000	Dark reddish brown light clay with increasing gravel content		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	16	**GPS:**	55H 654 211mE 642 8064mN

Surface description

Slope:	0-2%	Aspect:	West
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Surface rocks		
Surface cover:	Shepherds purse, red grass, sheeps burr, couch, short windmill, browns love and clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown sandy clay loam		M				
300 to 600	Dark red sandy clay with cobbles		D				
600 to 1300	Dark red silty clay		D				
1300 to 1500	Light brown light clay with increasing gravel		D				
1500	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 8/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	17	**GPS:**	55H 653 923mE 6427 994mN

Surface description

Slope:	0-2%	Aspect:	East
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Surface rocks		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass, couch, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown silty sand loam		M				
300 to 600	Dark grey silty gravel with trace clay		D				
600 to 2000	Light grey silty sand with moderate weathered rock		D				
2000 to 3000	White silty sand, extremely weathered rock		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	18	**GPS:**	55H 654 063mE 6427 968mN

Surface description

Slope:	0-1%	Aspect:	East
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Trace cobbles		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass, couch, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 350	Dark brownish red silty clay loam		M				
350 to 1400	Brown light clay with trace gravel		D				
1400 to 2000	Light grey silty sand with moderate weathered rock		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	19	**GPS:**	55H 654 183mE 6427 939mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, khaki weed, love grass, paspalum, red grass, couch, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Dark red brown silty clay loam		M				
200 to 700	Dark reddish brown silty clay with trace gravel		M				
700 to 2000	Light orange silty sand with trace weathered rock and river gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	20	**GPS:**	55H 654 380mE 6427 926mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Couch, windmill grass, clover, barley grass		
% surface cover	80%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Black silty clay loam		M				
300 to 500	Dark brown sandy clay		M				
500 to 1200	Brown silty clay		D				
1200 to 3500	Grey brown silty clay with trace gravel and mottles						
3500 to 5800	Grey silty clay with trace river gravel						
5800 to 8500	Whitish grey silty loam (extremely weathered rock) with trace white mottles and gravel						
8500 to 12000	White silty loam (extremely weathered rock)						
12000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	21	**GPS:**	55H 654 436mE 6427 892mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Shepherds purse, red grass, sheeps burr		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500	Dark brown silty clay loam		M				
500 to 1000	Dark red silty sand with trace gravel		D				
1000 to 2000	Dark red light clay with trace gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	22	**GPS:**	55H 654 548mE 6427 871mN

Surface description

Slope:	0-1%	Aspect:	West
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Surface float		
Surface cover:	Shepherds purse, red grass, sheeps burr		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown silty clay loam		M				
300 to 500	Dark red silty clay		M				
500 to 1400	Dark red light clay with trace gravel		D				
1400 to 2000	White silty sand with trace weathered rock		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	23	**GPS:**	55H 654 706mE 6427 851mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Upper-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Large cobbles		
Surface cover:	Shepherds purse, red grass, sheeps burr		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 400	Dark brown silty clay loam		M				
400 to 1000	Dark brown gravelly clay with moderate cobbles		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	24	**GPS:**	55H 653 746mE 6427 875mN

Surface description

Slope:	0-1%	Aspect:	South east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Red grass, couch, short windmill, browns love, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brownish red silty clay loam		M				
300 to 900	Dark brown light clay with trace cobbles		M				
900 to 2000	Dark brownish red light clay with trace cobbles		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	25	**GPS:**	55H 653 886mE 6427 856mN

Surface description

Slope:	0-1%	Aspect:	South east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Red grass, couch, short windmill, browns love, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown silty clay loam		M				
300 to 800	Dark brown silty clay		M				
800 to 2300	Dark brownish red light clay with trace gravel		D				
2300 to 3000	Dark brown light clay with trace basalt cobbles		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	26	**GPS:**	55H 654 040mE 6427 818mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Paspalum, red grass, shepherds purse, khaki weed, peppercress		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500	Dark brownish red silty clay loam		M				
500 to 2000	Dark red light clay with trace gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	27	**GPS:**	55H 654 163mE 6427 788mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Paspalum, red grass, shepherds purse, khaki weed, peppercress		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Dark reddish brown silty clay loam		M				
200 to 400	Dark brown silty clay with trace river gravel		M				
400 to 800	Med brown lean clay		D				
800 to 1400	Brownish red light clay with trace river gravel		D				
1400 to 2000	Dark brown light clay with trace river gravel		M				
2000 to 2200	Dark grey light clay with moderate river gravel		D				
2200	End of hole, drill refusal						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	28	**GPS:**	55H 654 163mE 6427 788mN

Surface description

Slope:	0-1%	Aspect:	South east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Paspalum, red grass, shepherds purse, khaki weed, peppercress		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500	Dark red brown silty clay loam		M				
500 to 1000	Light brown sandy gravel		D				
1000 to 1500	Light brown silty gravel with moderate river gravel		D				
1500 to 2000	Dark reddish brown silty sand with weathered rock		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	29	**GPS:**	55H 654 417mE 6427 748mN

Surface description

Slope:	0-1%	Aspect:	North
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Paspalum, red grass, shepherds purse, khaki weed, peppercress		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500	Dark brown sandy clay loam		M				
500 to 900	Dark red sitly clay with trace gravel		D				
900 to 1800	Light red light clay with increasing gravel		D				
1800 to 2000	Light reddish brown silty sand with cobbles		D				
2000	End of hole, drill refusal						
Notes:							

Salinity assessment

Client: c/- Geolyse			**Job no:** 5737	**Date:**	24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW				
Borehole:	30	**GPS:**	55H 654 534mE 6427 730mN		

Surface description

Slope:	0-3%	Aspect:	West
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Paspalum, red grass, shepherds purse, khaki weed, peppercress		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Dark brown silty clay loam		M				
200 to 800	Dark brown red sandy clay with trace cobbles		D				
800 to 1400	Light brown grey silty sand with trace gravel		D				
1400 to 3000	White silty sand with trace gravel		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse			**Job no:** 5737	**Date:**	24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW				
Borehole:	31	**GPS:**	55H 654 679mE 6427 705mN		

Surface description

Slope:	0-2%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Paspalum, red grass, shepherds purse, khaki weed, peppercress		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Dark brown red silty clay loam		M				
200 to 300	Dark brown gravelly clay with basalt cobbles		D				
300	End of hole, drill refusal						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	32	**GPS:**	55H 653 679mE 6427 705mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Dark brown red silty clay loam		M				
200 to 600	Dark brown red silty clay		D				
600 to 3000	Dark reddish brown light clay with trace gravel		D				
3000	End of hole, drill refusal						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	34	**GPS:**	55H 653 009mE 6427 672N

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	95%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Dark brown red silty clay loam		M				
200 to 900	Dark brown silty clay		M				
900 to 2000	Dark red light clay with trace gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	35	**GPS:**	55H 654 143mE 6427 641N

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	95%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown red silty clay loam		M				
300 to 500	Dark red silty clay		D				
500 to 1100	Dark reddish brown light clay with trace gravel		D				
1100 to 2000	Light brown light clay with trace gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	36	**GPS:**	55H 654 260mE 6427 610N

Surface description

Slope:	0-1%	Aspect:	South east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	95%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark reddish brown red silty clay loam		M				
300 to 400	Dark red silty clay		M				
400 to 2500	Dark reddish brown light clay with trace gravel		D				
2500 to 3000	Dark brown light clay with increasing gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	37	**GPS:**	55H 654 403mE 6427 596N

Surface description

Slope:	0-1%	Aspect:	North
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Short windmill grass, paspalum, red grass, couch, short windmill, browns love clover		
% surface cover	95%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown sandy clay loam		M				
300 to 600	Light brown silty clay		D				
600 to 1400	Light brown light clay with trace gravel		D				
1400 to 2000	Light grey light clay with increasing gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	38	**GPS:**	55H 654 518mE 6427 558mN

Surface description

Slope:	0-4%	Aspect:	West
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Short windmill grass, paspalum, red grass, couch, short windmill, browns love clover		
% surface cover	80%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 250	Brown silty clay loam		M				
250 to 800	Dark reddish brown silty clay		D				
800 to 2000	White silty sand (weathered rock) with trace		D				
1400 to 2000	Light grey light clay with increasing gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	39	**GPS:**	55H 654 673mE 6427 564mN

Surface description

Slope:	0-5%	Aspect:	South
Morphological type:	Upper-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles and subcrop		
Surface cover:	Short windmill grass, paspalum, red grass, couch, short windmill, browns love clover		
% surface cover	80%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 450	Dark reddish brown silty clay loam		M				
450 to 600	Dark red gravelly clay with increasing basalt cobbles		D				
600	End of hole, drill refusal						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	40	**GPS:**	55H 653 705mE 6427 574mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Dark brown silty clay loam		M				
200 to 800	Dark brown sandy clay		M				
800 to 2000	Dark brownish red light clay with trace gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	41	**GPS:**	55H 653 837mE 6427 550mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark reddish brown silty clay loam		M				
300 to 600	Dark brown sandy clay		M				
600 to 2800	Dark brownish red light clay with trace gravel		D				
2800	End of hole, drill refusal						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	42	**GPS:**	55H 653 975mE 6427 527mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 350	Dark reddish brown silty clay loam		M				
350 to 1200	Dark brown light clay with trace gravel		D				
1200 to 2500	Dark reddish brown light clay with trace gravel		D				
2500 to 3000	Light greyish brown light clay with increasing gravel		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	43	**GPS:**	55H 654 121mE 6427 497mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark reddish brown silty clay loam		M				
300 to 1000	Light brown silty clay with trace gravel		D				
1000 to 2000	Light brown light clay with trace gravel		D				
2000	End of hole		D				
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	45	**GPS:**	55H 654 379mE 6427 454mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown sandy clay loam		M				
300 to 1200	Dark red silty clay with trace gravel		M				
1200 to 2300	Dark brown light clay with trace gravel		D				
2300 to 3000	Dark grey/ brown light clay with increasing gravel		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	46	**GPS:**	55H 654 489mE 6427 429mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt float		
Surface cover:	Paspalum, red grass, shepherds purse, khaki weed, peppercress		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Brown silty clay loam		M				
300 to 1000	Reddish brown silty clay with trace gravel		M				
1000 to 1700	Reddish brown light clay with trace gravel		D				
1700 to 3000	Light brown silty sand		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	47	**GPS:**	55H 654 635mE 6427 422mN

Surface description

Slope:	0-2%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt float		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 450	Brown silty clay loam		M				
450 to 800	Light brown silty sand with trace gravel		D				
800 to 2400	Light brownish red light clay with trace gravel		D				
2400 to 3000	Light grey brown silty clay		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	48	**GPS:**	55H 653 673mE 6427 4201mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown silty clay loam		M				
300 to 2000	Dark brown light clay with trace gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	49	**GPS:**	55H 653 792mE 6427 365mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 600	Dark brown/red silty clay loam		M				
600 to 800	Dark grey silty clay		D				
800 to 2000	Dark grey light clay with trace gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	50	**GPS:**	55H 653 958mE 6427 346mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 400	Dark brown/red silty clay loam		M				
400 to 600	Dark brown silty clay		M				
600 to 2400	Dark brownish red light clay with trace gravel		D				
2400 to 3000	Dark grey light clay with trace gravel		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	51	**GPS:**	55H 654 091mE 6427 309mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Windmill grass, fleabane, red grass, paspalum		
% surface cover	70%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300 300 to 2000 2000	Dark brown silty clay loam Brownish red light clay with fine gravel End of hole		M M				
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	52	**GPS:**	55H 654 209mE 6427 299mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Oxalis, Paterson's curse, capeweed, wattle, wild sage, rye grass		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Dark red silty clay loam		M				
200 to 600	Dark red silty clay		M				
600 to 1400	Dark reddish brown light clay with fine gravel		D				
1400 to 3000	Dark grey light clay with increasing gravel		M				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	54	**GPS:**	55H 654 463mE 6427 246mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Paspalum, red grass, shepherds purse, khaki weed, peppercress		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Dark brown sandy clay loam		M				
300 to 1200	Dark red silty clay with trace gravel		M				
1200 to 1700	Brown light clay with increasing gravel		M				
1700	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	55	**GPS:**	55H 654 600mE 6427 238mN

Surface description

Slope:	0-2%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Paspalum, red grass, shepherds purse, khaki weed, peppercress		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500	Dark brown silty clay loam		M				
500 to 900	Dark brownish red silty clay with trace gravel		M				
900 to 2100	Dark brown light clay with trace gravel		M				
2100 to 2900	Light brown light clay with trace gravel and increasing basalt cobbles		M				
2900	End of hole, drill refusal						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	57	**GPS:**	55H 653 781mE 6427 210mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Lower-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Paspalum, red grass, shepherds purse		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 400	Dark red brown silty clay loam		M				
400 to 600	Dark brown silty clay		D				
600 to 1700	Dark brown red light clay with trace gravel		D				
1700 to 3000	Dark grey light clay with increasing river gravel and basalt cobbles		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	58	**GPS:**	55H 653 936mE 6427 191mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Paspalum, red grass, shepherds purse		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 400	Dark red brown silty clay loam		M				
400 to 600	Medium brown silty clay		M				
600 to 2000	Brownish red light clay with trace gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	60	**GPS:**	55H 654 197mE 6427 142mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Paspalum, red grass, shepherds purse		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 600	Brown silty clay loam		M				
600 to 2000	Dark red light clay with increasing gravel		M				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	61	**GPS:**	55H 654 320mE 6427 114mN

Surface description

Slope:	0-1%	Aspect:	East
Morphological type:	Lower-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Paspalum, red grass, shepherds purse		
% surface cover	85%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Brown silty clay loam		M				
300 to 500	Dark red light clay with increasing gravel		D				
500 to 2500	Dark red silty clay with trace gravel		D				
2500 to 2800	Dark reddish brown light clay with increasing basalt cobbles		D				
2800	End of hole, drill refusal						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	62	**GPS:**	55H 654 425mE 6427 087mN

Surface description

Slope:	0-1%	Aspect:	NW
Morphological type:	Lower-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Clover, couch, barley grass, daisy		
% surface cover	80%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Black silty clay loam		M				
300 to 2500	Brown silty clay with trace gravel		D				
2500 to 3600	Dark red clayey gravel with basalt cobbles and extremely weathered alluvial		D				
3600	End of hole, drill refusal		D				
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	63	**GPS:**	55H 654 589mE 6427 071mN

Surface description

Slope:	0-1%	Aspect:	North east
Morphological type:	Lower-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Short windmill, pasplaum, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500	Dark brown sandy clay loam		M				
500 to 1200	Dark red silty clay with trace gravel		D				
1200 to 1600	Dark brown silty gravel with increasing gravel		D				
1600	End of hole, drill refusal						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	64	**GPS:**	55H 654 559mE 6426 948mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Lower-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Short windmill, pasplaum, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 450	Dark brown sandy clay loam		D				
450 to 1000	Dark grey silty clay with trace gravel		D				
1000 to 2000	Dark brown/ grey silty gravel with increasing gravel		D				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	65	**GPS:**	55H 654 418mE 6426 965mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Lower-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Short windmill, pasplaum, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Brown sandy clay loam		M				
200 to 500	Dark brown silty clay		D				
500 to 2000	Dark grey silty clay with trace gravel		D				
2000 to 2500	Dark grey brown light clay with trace basalt cobbles		D				
2500	End of hole, drill refusal						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	66	**GPS:**	55H 654 296mE 6426 988mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Lower-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Short windmill, pasplaum, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 350	Brown sandy clay loam		M				
350 to 500	Brown sandy clay		M				
500 to 1300	Brown silty clay with trace gravel		M				
1300 to 2000	Dark brown silty gravel with increasing basalt cobbles		M				
2000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 24/04/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	67	**GPS:**	55H 654 191mE 6427 028mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Lower-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Basalt cobbles		
Surface cover:	Short windmill, pasplaum, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 200	Brown silty clay loam		M				
200 to 700	Dark red sandy clay		M				
700 to 2000	Light brown silty clay with trace gravel		D				
2000 to 2500	Light brown light clay with fine gravel		D				
2500 to 3000	Light brownish red silty sand with trace gravel		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	68	**GPS:**	55H 654 050mE 6427 028mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Short windmill, pasplaum, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 500	Brown silty clay loam		M				
500 to 900	Light grey sandy silt		D				
900 to 2000	Light brown light clay with trace gravel		D				
3000	End of hole						
Notes:							

Salinity assessment

Client: c/- Geolyse		**Job no:** 5737	**Date:** 7/05/2015
Address:	Lot 399 DP1199356 & Lot 503 DP1152321 Hennessy Road, Dubbo NSW		
Borehole:	69	**GPS:**	55H 653 880mE 6427 046mN

Surface description

Slope:	0-1%	Aspect:	South
Morphological type:	Mid-slope		
Land-use:	Grazing		
Disturbance:	High		
Erosion:	Nil		
Coarse fragments:	Nil		
Surface cover:	Short windmill, pasplaum, clover		
% surface cover	90%		
Salinity:	Nil		

Sub-surface description

Sample method: EVH		Logged by: DL					
Depth (mm)	Soil description (texture, colour, coarse fragments, mottles, roots, structure)	Sample	M/D	pH (1:5 water)	EC (dS/m)	ECe	Emerson aggregate test
0 to 300	Brown silty clay loam		M				
300 to 800	Light grey sandy silt		M				
800 to 2500	Light brown light clay with trace gravel		D				
2500 to 3000	Dark grey light clay with increasing gravel		D				
3000	End of hole						
Notes:							

Appendix 7. Reference methods for soil testing

Reference Methods:

Colour: Munsell (2000) In 'Munsell Soil Colour Charts' (Gretag Macbeth: NY)

Field texture: McDonald RC, Isbell RF, Speight JG, Walker, Hopkins MS (1990) Australian Soil and Land Survey Field Handbook pp.115-124 (Inkata Press: Melbourne)

PH: AS1289.4.3.1-1997 Method of testing soil for engineering purposes – Soil Chemical Tests-Determination of the pH value of a soil – Electrometric method

Salinity: Rayment GE and Higginson FR (1992) Australian Laboratory Handbook of Soil and Water Chemical Methods (Method 3A1, pp.15-16) (Inkata Press Melbourne) Electrical conductivity of saturated extract is based on conversions of EC (1:5) and soil texture class, to give a more accurate assessment of soil salinity hazard (Salavich PG and Peterson GH (1993) Estimating the electrical conductivity of soil paste extracts from 1:5 soil water suspensions and texture. Australian Journal of Soil Research 31, 3-81)

Appendix 8. ALS laboratory report ES1520581 and chain of custody form

Eulomogo Creek in the Subject Site

ECOLOGICAL ASSESSMENT: SUBDIVISION OF LOT 399 DP 1199356 AND LOT 503 DP1152321, BOUNDARY ROAD, DUBBO, NSW.

DUBBO CITY COUNCIL LOCAL GOVERNMENT AREA

MAY 2015

Report Prepared by

OzArk Environmental & Heritage Management Pty Ltd

For

Geolyse Pty Ltd

On behalf of

MAAS Group Properties Pty Ltd

Environmental and Heritage Management P/L

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DOCUMENT CONTROLS

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	Phil Cameron		
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EXECUTIVE SUMMARY

OzArk Environmental & Heritage Management (OzArk) was commissioned by Geolyse Pty Ltd on behalf of MAAS Group Properties (MAAS) to undertake ecological assessment of Lot399 DP1199356 and Lot503 DP1152321 (the 'Subject Site'). It is proposed to subdivide this 60 hectare lot of semi-rural land located in Dubbo NSW, into a low density housing development named "Keswick Estate - Hill View."

This investigation has been completed to fulfil the requirements of Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), to take into account all matters affecting or likely to affect the environment as a result of the proposal.

Field assessment of the Subject Site was undertaken by Phillip Cameron (Principle Ecologist of Ozark) on Thursday 16 April 2015.

The Subject Site is completely cleared, ploughed and disturbed with few isolated trees. Despite continuous grazing and a history of ploughing in the Subject Site, native grasses in most cases prevail. Vegetation present is characterised by *Biometric* community ID CW130 'Derived tussock grasslands of the central western plains and lower slopes of NSW (Benson 250)'. Prior to grazing pressures (**Figure 4-2**), the subject site would have been derived from three TSC listed EECs (**Figures 4-3** and **4-4**), being:

- *Biometric* community ID CW144 Inland Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion (Benson 82)
- *Biometric* community ID CW213 White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
- *Biometric* community ID CW138 Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)

Eulomogo Creek forms part of the FM Act listing for the '*aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River*.' The creek is in poor condition however provides connectivity to the Macquarie River. This creek will not be directly impacted by the activity.

No threatened species, populations or terrestrial endangered ecological communities were recorded in the Subject Site. However, as noted above, all vegetation in the Subject Site is likely to have been derived from one of three EECs listed under the TSC Act. Thus, in consistency with the TSC Act, the 'precautionary principle' has been adopted and an Assessment of Significance has been completed for each to characterise the potential impacts.

On the basis of regional records, reports and the presence of suitable habitat, 15 threatened items listed in the schedules of the TSC Act and / or EPBC Act were assessed as likely to occur or have habitat in the Subject Site and be affected by the Proposal (**Table 4-7**). Assessments of

significance were conducted for these species (**Appendix 5**). Having given consideration to the ecology within the Subject Site, it is apparent that the Proposal is:

- unlikely to significantly affect any of the listed threatened species, fauna populations or communities.
- unlikely to augment or significantly contribute to any of the National or State listed Key Threatening Processes, if the appropriate safeguards regarding the control of potential vertebrate pests are effectively applied.
- unlikely to significantly affect any Ramsar wetland or any CAMBA, ROKAMBA or JAMBA listed species;
- unlikely to significantly affect local hydrology.
- consistent with ESD principles with regard to fauna, would not adversely affect the local biodiversity and no issue of inter-generational or value added matters are relevant in this instance.

The proposed activity should not be considered to constitute a significant impact and, as such, no Species Impact Statement (SIS) is warranted. No Koala Habitat Management Plan pursuant to SEPP 44 should be required.

CONTENTS

FIGURES

TABLES

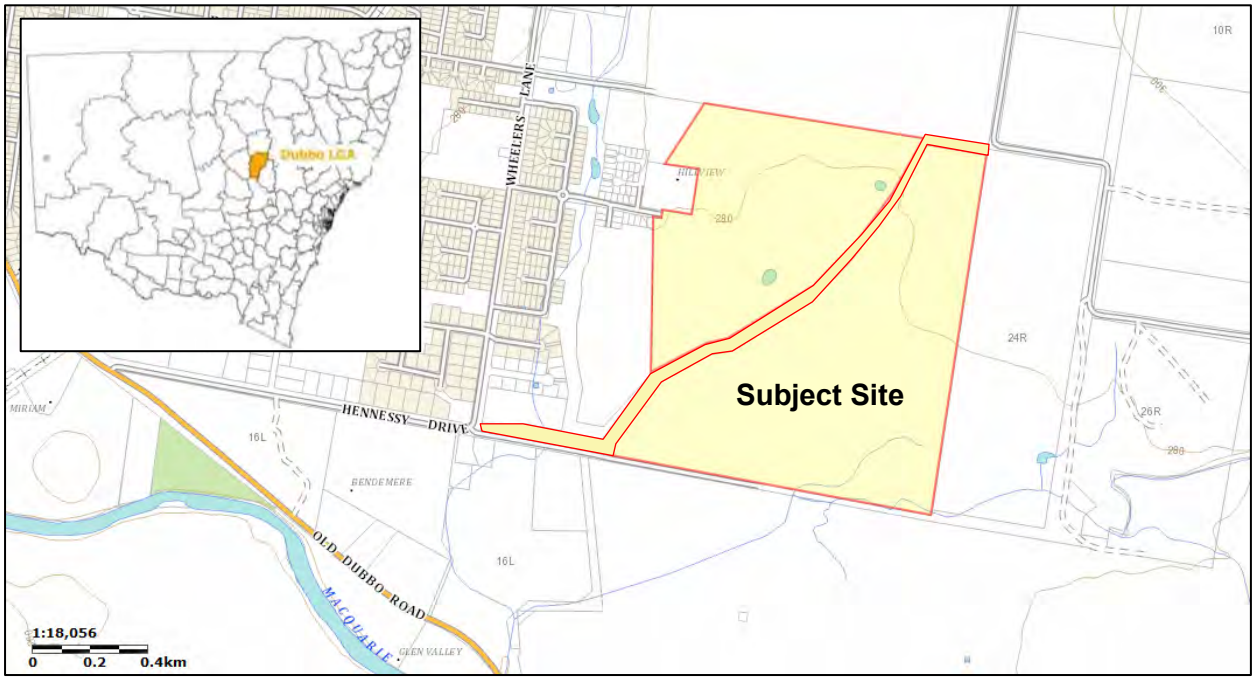
1 INTRODUCTION

1.1 THE PROJECT

OzArk Environmental & Heritage Management (OzArk) was commissioned by Geolyse Pty Ltd on behalf of MAAS Group Properties (MAAS) to undertake ecological assessment of Lot399 DP1199356 and Lot503 DP1152321 (the 'Subject Site'). It is proposed to subdivide this 60 hectare lot of semi-rural land located in Dubbo NSW, into a low density housing development named "Keswick Estate - Hill View."

This investigation has been completed to fulfil the requirements of Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act), to take into account all matters affecting or likely to affect the environment as a result of the proposal.

Figure 1-1: Location Map and Subject Site.



1.2 LOCATION

The Subject Site is located in Dubbo in Central West NSW. Specifically the Subject Site is located on Lot399 DP1199356 and Lot503 DP1152321 (a drainage corridor) bordered by Boundary Road to the north and Hennesy Road to the south.

1.1 LEGISLATIVE CONTEXT

1.1.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the state, providing a framework for the overall environmental planning and

assessment of development proposals. Under the EP&A Act there are three distinctive processes, which are:

- Part 3.1 (Previously Part 3A) 'State Significant Infrastructure', which regulates specific types of 'Infrastructure' and requires an Environmental Assessment report to be prepared and submitted to the Department of Planning and Infrastructure for the Minister's approval;
- Part 4, which regulates 'development' requires a development application to be accompanied by an Environmental Impact Statement 'prepared by or on behalf of the applicant in the form prescribed by the regulations.'
- Part 5, which regulates 'activities' and requires a REF for determination by a state self-determining authority.

The proposal is to be undertaken by MASS, under Part 4 of the Act. This ecological assessment and report will support a Development Application to Dubbo City Council for Approval.

1.1.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance. Matters of national environmental significance relevant to biodiversity are:

- Wetlands of international importance.
- Nationally threatened species and ecological communities.
- Migratory species.
- Commonwealth marine areas.

Significance of impacts is determined in accordance with the *Significance impact guidelines 1.1–matters of national environmental significance* (Department of Environment, Water, Heritage and the Arts, 2006).

Where a proposal is likely to have a significant impact on a matter of national environmental significance, the proposal is referred to the Commonwealth Environment Minister via the Department of the Environment (DoE). The Minister then determines whether the proposal is a 'controlled action'. If a proposal is declared a controlled action, an assessment of the action is carried out and the Minister makes a decision to approve, approve with conditions, or not approve the proposed action. Further information on the referral and approval process is available at *Assessment and approval process - EPBC Act*. A requirement for biodiversity offsetting is triggered in controlled actions.

1.1.3 Other Relevant legislation, Plans and Policies

A summary of applicable environmental legislation have been provided in **Table 1-1**.

Table 1-1: Environmental considerations.

Environmental considerations	Comment
An area reserved or dedicated under the National Parks and Wildlife Act 1974?	No
Is the proposal located within land reserved or dedicated within the meaning of the Crown Lands Act 1989 for preservation of other environmental protection purposes?	No
A World Heritage Area?	No
Environmental Protection Zones in environmental planning instruments?	No
Lands protected under SEPP 14 – Coastal Wetlands?	No
Lands protected under SEPP 26 – Littoral Rainforests?	No
Lands protected under SEPP 71 – Coastal Protection?	No
Lands protected under SEPP 44 – Koala Protection?	No
Lands protected under SEPP - Sydney's drinking water?	No
Land identified as wilderness under the Wilderness Act 1987 or declared as wilderness under the National Parks and Wildlife Act 1974?	No
Aquatic reserves dedicated under the Fisheries Management Act 1994?	No
Wetland areas dedicated under the Ramsar Wetlands Convention?	No
Land subject to a conservation agreement under the National Parks and Wildlife Act 1974?	No
Land identified as State Forest under the Forestry Act 1916?	No
Western Lands Lease	No
Freehold or Crown Land. If Crown Land, what type?	Freehold
Land within a mining subsidence district?	No
Acid sulphate area?	No
Protected riparian habitat?	No
Critical habitat NSW?	No
Critical habitat nationally?	No

Table 1–2 summarises relevant ecological approvals or licenses required from State or National bodies prior to undertaking the works.

Table 1-2: Summary of other relevant legislation, licensing and approval required.

Act	Authority	Requirements
NSW Threatened Species Conservation Act 1995 (TSC Act)	Office of Environment & Heritage (OEH)	This act aims to conserve biological diversity, promote ecologically sustainable development, prevent extinctions and promote recovery of threatened entities, protect critical habitat, assess the impacts of actions on, and encourage the conservation of, threatened entities. An assessment of the potential impacts of the Proposal on threatened species, populations, ecological communities and critical habitat listed on the TSC Act must be undertaken in

Act	Authority	Requirements
		accordance with section 5A of the EP&A Act (7-part test).Where a significant impact is likely to occur a Species Impact Statement (SIS) must be prepared for projects assessed under Part 4 and Part 5 of the EP&A Act. The content of a SIS is outlined in Sections 110–112 of the Threatened Species Conservation Act 1995 (TSC Act) and includes requesting Director-General's requirements.
Native Vegetation Act 1997 (NV Act)	OEH	The Native Vegetation Act 2003 (NV Act) regulates the clearing of native vegetation on all land in NSW. The NV Act requires development approval from the Central West Local Land Services for the clearing of any native vegetation. Currently, it is illegal to remove or damage vegetation, without a permit, from within 40 metres of the banks of nominated waterways in NSW (Category B Riparian Land, State Protected Land or SPL). As this project will be assessed under Part 4 of the EP&A Act, the NVA Act applies.
Noxious Weeds Act 1993 (NW Act)	NSW Department of Primary Industries (NSW DPI)	The Noxious Weeds Act 1993 (NW Act) guides the management of declared noxious weeds within Local Government Areas (LGAs) and provides for a coordinated approach to the removal and control of scheduled noxious weeds across the State. Individual land holders and managers are required under the NW Act to control noxious weeds declared for their area according that have been proclaimed under the NW Act. A list of declared noxious weeds for the Dubbo LGAs is provided in **Appendix 1**. In addition to the NW Act, an effort to gain control of weeds in Australia led to the development of a National Weeds Strategy. The strategy was first developed in 1997 and further refined in 2007 by the Commonwealth of Australia and issued under the authority of the National Resource Management Ministerial Council. Detailed management procedures have been outlined under the strategy and published for the control of 21 of the 32 recognised Weeds of National Significance (WoNS). WoNS are recognised as having potential to cause a significant impact upon natural values including: threats to human health and safety; threats to pastoral and agricultural industries; threats to water quality and supply; threats to indigenous flora; and threats to biodiversity and cultural values. A list of WoNS known or predicted to occur in the Subject Site has been provided in the Appendices.
Fisheries Management Act 1994 (FM Act)	DPI and OEH	The objective of the Fisheries Management Act 1994 Act (FM Act) is to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. The developer will need to obtain a 'whole of project permit' to engage in a dredging (trenching) and reclamation activity (section 199, Part 7, Div 3 of the FM Act 1994) for the purpose of rehabilitation within the banks of the Eulomogo Creek in Subject Site. Under the 'integrated development' provisions of the *NSW Environmental Planning and Assessment Act 1979*. The developer will need to seek approval from DPI for a permit to temporarily or permanently block fish passage (section 219, of the FM Act 1994). If required, allow eight weeks to obtain this permit.
NSW National Parks and Wildlife Act 1974 (NP&W Act)	OEH	The NP&W Act aims to conserve nature, habitat, ecosystems, ecosystem processes and biological diversity at the community, species and genetic levels. Under this Act all native fauna is protected, threatened or otherwise. Schedule 13 of the act lists protected plants which shall not be harmed or picked on any land either on or off National Park estate. With regard to threatened species a person must not:

Act	Authority	Requirements
		a) harm any animal that is of, or is part of, a threatened species, an endangered population or an endangered ecological community, or b) use any substance, animal, firearm, explosive, net, trap, hunting device or instrument or means whatever for the purpose of harming any such animal.
Water Management 2000 (WM Act)	NSW Office of Water (NoW)	The WM Act provides for the protection of river and lakeside land in NSW and aims to provide for the sustainable management of the water sources throughout NSW. All controlled development on or under waterfront land is regulated by the Act. The Act aims to minimise impacts on waterfront land and water courses and requires buffer zone, called the riparian corridor, between the waterfront and the adjacent development. NoW administers the WM Act and is required to assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 metres of the highest bank of the river, lake or estuary. The Subject Site borders Eulomogo Creek and may require a permit under WM Act. A water access licence may be required under the WM Act prior to commencement of works if water is to be sourced from a creek or a river (for water trucks etcetera). Allow a minimum of 28 days prior to the commencement of the works.
Water Act 1912	NoW	There are still some provisions in the Water Act 1912 that are yet to be incorporated into the WM Act. Under Part 8 of the Act, approval is required for a “controlled work”. A “controlled work” is defined as an earthwork, embankment or levee or any work proposed to be constructed, on land that form part of a bank of a river or is within a designated floodplain and that is declared by order of the Ministerial Corporation published in the Gazette to be a controlled work. The subdivision will occur on the edges of the Macquarie River floodplain. Under Part 4 of the EPA Act, the developer may be required to submit a Controlled Works Application to NoW. Seek further advice from this department.
Rural Fires Act 1997	Rural Fire Service	The Rural Fires Act, 1997 (RF Act) requires public authorities and owners/occupiers of land to take all practicable steps to prevent the occurrence of bushfires and to minimise the danger of the spread of bushfires on or from that land. In accordance with the Rural Fire Services guidelines, Planning for Bushfire Protection (RFS 2006), a bushfire risk assessment must be undertaken and appropriate mitigation measures devised for Class 1, 2 or 3 buildings located on Bushfire Prone Land, as defined by Local Council or Rural Fire Service Bush Fire Prone Land Maps. Under the specifications of the Act, Dubbo City Council will ensure the works take all precautions against causing fire and must comply with the provisions and regulations of the Act.
Waste Avoidance and Resource Recovery Act 2001	NSW Environment Protection Authority (EPA)	The purpose of this Act is to minimise the consumption of resources and to control the management and disposal of any waste materials through waste avoidance, re-use and recycling in accordance with the principles of Ecologically Sustainable Development. Dubbo City Council are therefore required to consider the waste management hierarchy referred to in the Act.

Act	Authority	Requirements
Protection of the Environment Operations Act 1997 (POEO Act)	NSW Environment Protection Authority (EPA)	Environmental protection licenses (EPLs) are issued under the POEO Act for various scheduled developments and activities.
SEPP44 – Koala Habitat Protection	NSW Planning & Environment	This Policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline: • by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and • by encouraging the identification of areas of core koala habitat, and • by encouraging the inclusion of areas of core koala habitat in environment protection zones. SEPP 44 aims to identify areas of potential and core Koala Habitat. These are described as follows: • Core Koala Habitat is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females, and recent and historical records of a population. • Potential Koala Habitat is defined as areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. SEPP 44 does not apply to the Dubbo Local Government area, however Koala habitat still requires consideration.
ISEPP – Infrastructure SEPP	NSW Planning & Environment	State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State. As the proposal is for a subdivision and is to be carried out by a private developer it can be assessed under Part 4 of the EP&A Act. Development consent is required from Council.
Local Environment Plan	Dubbo City Council	The Subject Site is zoned as R2 (Low density residential) with the small strip of land dividing the lots as RE1 (Public Recreation). The application of ISEPP does not override the need to consider zoning controls under a LEP.
National Wildlife Corridors Plan	DoE	Works have been assessed against the types of biodiversity links (wildlife corridors) defined in of the National Wildlife Corridors Plan. Mitigation and redesign in sensitive ecological areas would be recommended to avoid large scale clearing. Offsets and rehabilitation will be consistent with this plan.

Biodiversity offsetting policies

Biodiversity offsets may be required as a condition of approval or a concurrence under the NSW EP&A Act or the EPBC Act. Both State and National levels of government aim to 'maintain, enhance or improve biodiversity', through the developer.

Following consultation with DCC, offsetting is required by Council.

DCC are currently developing offsetting policies. To ensure offsetting is consistent with Councils requirements this chapter was written taking into consideration their feedback to date.

Offsets would demonstrate an 'improve or maintain' outcome. Offsets are best directed at improving the habitat for all threatened species and connectivity to remnants. Plants used for revegetation would be consistent with those locally occurring in the Subject Site and would improve Eulomogo Creek bank stability, address erosion and assist in managing salinity.

DCC Offsetting Objectives

To meet offsetting requirements the offsetting package would:

- improve creek structural stability, and the condition and extent of native vegetation suitable for listing as a NSW EEC (Box-gum Woodland and Inland Grey Box Woodland). The Water Management Act 2000 Guidelines for controlled activities (2008) would be used as a guide for works within the proposed waterway the end result.
- maintain or improve the extent, distribution and condition of the existing native vegetation in the offset area.
- support the recovery of priority fauna populations, and threatened species, populations and communities.

DCC Offsetting Principles

The following principles would be considered when developing biodiversity offsets:

1. Offsets will be used as a last resort, after consideration of alternatives to avoid and/or mitigate impacts.
2. Offset areas be kept within the Dubbo Local Government Area (either wholly or in part – as a contiguous area of native vegetation).
3. Council stipulate the offset area will be publically accessible.
4. Offsets must be of the same vegetation type and be at least the size, equivalent biodiversity value and configuration of the vegetation lost through development and be additional to existing native vegetation areas.
5. Offsetting must achieve biodiversity benefits in perpetuity and be registered on title.
6. Offset conditions must be monitored, enforceable, clearly mapped, recorded and publicly available.
7. An offset area, once designated, cannot be used for offsetting of subsequent developments in future.

1.2 STUDY AIMS

The purpose of this Biodiversity Assessment to determine the terrestrial biodiversity values of the Subject Site and the ecological constraints of the proposal. The scope and aims of this report are to:

Determine biodiversity values of the Subject Site including identifying protected and threatened flora and fauna species, populations and ecological communities and their habitats.

Identify the ecological constraints of the proposal.

- Identify the impacts of the proposed activity on flora and fauna species, populations, ecological communities and critical habitat.
- Address the requirements of the relevant legislation including the EP&A Act, the TSC Act and the EPBC Act.
- Assess the significance of the impact of the proposed activities on species, ecological communities and populations listed under the TSC Act and EPBC Act.
- Propose environmental management measures to minimise, mitigate and if necessary offset impacts.

2 METHODOLOGY

The flora and fauna assessment has been completed in accordance with Section 5a of the EP&A Act and the EPBC Act for threatened species populations and ecological communities potentially affected by the proposal.

The methodology employed for this report consisted of:

- A desktop and literature review of ecological databases and literature sources as direct references for the survey undertaken.
- A field survey of the Subject Site.

2.1 PERSONNEL

2.1.1 Field assessment

Field assessment of the Subject Site was undertaken by Phillip Cameron (Principle Ecologist of Ozark) on Thursday 16 April 2015.

2.1.2 Reporting

Reporting components were completed by:

- Main Authors: Heidi Kolkert
- Reviewer: Phillip Cameron
- Editor: Jane Book

2.1.3 Licensing and qualifications

OzArk operates under NSW Department of Primary Industries (DPI) Ethics Approval No 11/5475 and NSW Scientific Research License 101087. Key details of scientific personnel from OzArk EHM are provided in **Table 2–1**.

Table 2-1: Summary of OzArk qualifications.

Name	Position	CV Details
Heidi Kolkert	Senior Ecologist	• PhD in progress (current). University of New England. • BSc (Hons). Reproduction and Endocrinology. University of Tasmania. • BA-BSc. Major Zoology and Geography. University of Tasmania. • Over 13 years of wildlife related experience. 8 years with OzArk. • OEH BioBanking accredited assessor number 0127. • Listed on OzArk scientific license and NSW DPI ethics approval. • WHS White Card • Practicing member of the NSW Ecological Consulting Association • Practicing member of the Environment Institute of Australia and New Zealand (EIANZ). • Australian Bird and Bat Banding Scheme (C Class banding license) • Member of; Ecological Society of Australia, Australasian Bat Society,

Name	Position	CV Details
		Australian Mammal Society, Royal Zoological Society, Birdlife Australia, Bat Conservation International, Citizens for Wildlife Corridors (Armidale) • Apply First Aid (Red Cross) and Remote Area First Aid (St John) - all current.
Phil Cameron	Principal Ecologist Senior Project Manager	• BSc. Major in Biology. Macquarie University. • Ass Dip App Sci. University of Queensland. • Certified Environmental Practitioner (EIANZ). • Lean Six Sigma Certificate (Sydney Uni) • OEH BioBanking and Bio-certification Assessor: accreditation number 0117 • OEH Scientific License: 101087. • NSW DPI Ethics Approval 11/5475. • Practicing member of the NSW Ecological Consulting Association. • Practicing member of the Environment Institute of Australia and New Zealand (EIANZ) Member. • National Railtrack Safety Induction (ARTC and John Holland Inductions). • WHS White Card and Blue Card. • Apply First Aid (Parasol) ID: 6007221.
Rowan Murphy	Environmental Scientist	• Bachelor of Environmental Science/Bachelor of Law, University of New England. • Listed on scientific license and NSW DPI ethics approval. • WHS White Card and Blue Card. • National Railtrack Safety Induction (ARTC and John Holland Inductions). • Associate member of the NSW Ecological Consulting Association. • Practicing member of the Environment Institute of Australia and New Zealand (EIANZ) Member • Cert 4 in 4WD training (Nationally recognised training). • Roads and Maritime Worker on Foot training.
Jane Book	Environmental Scientist	• Masters of Environmental and Business Management (Newcastle Uni) • Graduate Certificate in Environmental and Business Management • Bachelor of Applied Science (Hons) • Member Royal Zoological Society, National Trust, NSW Ecological Consulting Association

2.2 DATABASE SEARCHES AND LITERATURE REVIEWS

Preliminary assessments drew on a number of information sources including previous preliminary reporting and information held on government databases and archives. Data gathered during preliminary assessments was used to assist in identifying distributions, suitable habitats and known records of threatened species so that field investigations could more efficiently focus survey effort. Preliminary assessment utilised a number of information sources as follows:

- Aerial Photograph Interpretation (API) of the landscape and previous vegetation maps.
- Literature reviews to determine vegetation and species habitat(s) within the proposed Subject Site and environs.

- Review of flora and fauna records contained in the OEH Threatened Species Database, EPBC Protected Matters Search and DPI Records Viewer.
- NSW Wildlife Atlas/Bionet GIS data request and website search.
- Australia Museum records.
- Royal Botanical Gardens (Plantnet NSW Flora Online).
- NSW Atlas of Living Australia records.
- Birds Australia Atlas.

2.3 PREDICTIVE MODEL FOR THREATENED SPECIES DETECTION

The concepts of the modelling formed the basis of the methodology designed for the current assessment. These reflect the predominant patterns of threatened species distribution as elicited from prior survey work.

Remnant patch size is the primary factor appearing to determine the location of threatened plants and animals in the region and to a lesser degree in disturbed habitats proximity to a permanent water supply. Predictive modelling for EECs in the locality is fairly straight forward as it can be summarised as likely to be any native vegetation left in the valley floor and on the undulating hills which is suitable for cropping or grazing agriculture.

An assessment of likelihood of occurrence was made for threatened species of flora, fauna, populations, ecological communities and migratory species identified from the database searches identified in **Section 2.2**. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the field survey and professional judgement. The terms for likelihood of occurrence are defined below:

- “Yes” = the species was or has been observed on the site.
- “Likely” = a medium to high probability that a species uses the site.
- “Potential” = suitable habitat for a species occurs on the site, but there is insufficient information to the species as likely to occur, or unlikely to occur.
- “Unlikely” = a very low to low probability that a species uses the site.
- “No” = habitat on-site and in the vicinity is unsuitable for the species.

The background searches detailed in **Section 2.2 (Appendix 2)** enabled a predictive model of threatened flora and fauna occurrence to be developed for the Subject Site (**Section 4.1.5**).

The ecology and habitat requirements of threatened species, populations, and endangered ecological communities and the likelihood of those occurring within the Project Area are detailed in **Appendix 3**.

2.4 FIELD SURVEY

2.4.1 General survey methodology

The survey methods employed during the field investigations in the Subject Site were based on relevant recovery and threat abatement plans and the following documents:

- Threatened Species Survey And Assessment: Guidelines for Developments and Activities- Working Draft (DEC 2004).
- Field Survey Methods (DECCW 2009).
- Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the EPBC Act (DEWHA 2010a).
- Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the EPBC Act (DEWHA 2010b).
- Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals as threatened under the EPBC Act. (DEWHA 2010c).
- Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the EPBC Act (DEWHA 2010d).

2.4.2 Floristic survey methods

Seven vegetation plots were undertaken according the Biobanking Methodology for the purpose mapping vegetation quality, condition and assigning vegetation to a *Biometric* community. Plot details are as follows:

- Plot 1 (GDAz55 6540118E 6427567N).
- Plot 2 (GDAz55 654335E 6427696N).
- Plot 3 (GDAz55 654060E 6428165N).
- Plot 4 (GDAz55 654725, 6427899).
- Plot 5 (GDAz55 654741E 6427821N).
- Plot 6 (GDAz55 654469E 6426914N).
- Plot 7 (GDAz55 653814, 6427059).

Additional survey of the Subject Site followed the "Random Meander Technique" described by Cropper (1993). Special consideration was given to locating rare or threatened plants identified in database searches and literature review as having the potential to occur (**Appendix 2**).

Plant Identification

Plant identification followed nomenclature in Harden 1990–2002, Cunningham et al. 1992, Royal Botanic Gardens (RBG 2014a), and PlantNet NSW Flora Online (RBG 2014b). The national conservation significance of flora was determined by referencing *Rare or Threatened*

Australian Plants (ROTAP) (Briggs and Leigh 2006) and the Schedules associated with the TSC Act or the EPBC Act.

2.4.3 Fauna survey methods and habitat assessment

Identification of the species present, and their diversity, can indicate the type of habitat that is present within the Subject Site. Habitat present also dictates which threatened species, although extant, may utilise the area. The likely impacts of development can be addressed through this process.

A general habitat assessment was carried out to assess habitat features such as the presence of hollow bearing trees, logs and the potential for suitable habitat to provide breeding, nesting, feeding and roosting resources for native species.

Opportunistic fauna observations and targeted searches were carried out during the field survey to identify cryptic species in the Subject Site. Fauna identification was achieved via:

- Identification of scats, diggings, tracks and other traces.
- Direct observation: ie bird watching.
- Ground, leaf litter and other refuge searches.
- Searches for indirect evidence of mammals (vocalisation, tracks, scats, burrows etc.).
- Targeted assessment – Pink-tailed Worm Lizard

Fauna species identification

All fauna was readily identified through the use of available standard references (Strahan, R. [ed.] 1983 Groves *et al.* 2005).

2.4.4 Hollow bearing trees

Habitat values of trees assessed in the Subject Site were considered for their potential to provide habitat for the regions hollow dependant threatened fauna (**Table 2–2**).

Table 2-2: Habitat value and constraints of trees.

No.	Habitat value and constraint for removal.
3	High habitat value and highest level of constraint: ie tree is a threatened species, provides known breeding/roosting habitat for a threatened species or possesses unique or rare habitat values within the landscape (such as large hollows suitable for forest owls). Occasionally 3 is used where one tree possesses several large tree hollows suitable for breeding owls.
2	Moderate habitat value and medium level of constraint: ie tree has potential to provide breeding or roosting habitat for a threatened species but is located in an environment where this is unlikely, but not out of the question. Tree may also possess hollows or other habitat values that are limited in the local environment such as moderate sized hollows or moderate volumes of decorating bark etc.
1	Low habitat value and low level of constraint: ie tree is very unlikely to provide breeding or roosting sites for threatened species and it possesses common habitat elements for the environment such as a tree without hollows that provides nectar/insects as a resource.
0	No constraint.

2.5 SURVEY EFFORT

The Subject Site was assessed in entirety by vehicle and on foot. All trees with hollows inside the Subject Site were manually assessed.

Where ground debris or rocks were present they were overturned to search for frogs and reptiles in these areas. A targeted Pink-tailed Worm-Lizard search was undertaken in the area mapped as former White Box Woodland (**Figure 4-1**) characterised by basalt outcrops and suitable surface rocks. Approximately 300 rocks were overturned in this area as per EPBC Act survey guidelines for this species.

All trees, native planted or non-native were assessed for evidence of Koala use.

2.6 LIMITATIONS

Not all animals and plants can be fully accounted for within any given Subject Site. The presence of threatened species is not static. It changes over time, often in response to longer term natural forces that can, at any time, be dramatically influenced by man-made disturbance. In order to overcome some of these limitations, database searches were conducted for threatened species, populations and ecological communities known to occur within the region as well as consultation with landowners. As such, the 'precautionary approach' for species occurrence has been adopted where required.

The western portion of the Subject Site (west of fence line near vegetation Plot 1) was not ecologically assessed due to active machinery and the construction of houses. Furthermore trees removed to allow for the placement of two major stockpiles were also not ecologically assessed. One stockpile, consisting of soil, spoil construction concrete waste is located south of Vegetation Plot 1 near the old nursery (about 100x20m wide) and the other east of vegetation plot 3 (100x10m wide). It has not been ascertained whether a previous DA approved the removal of vegetation and the storage of this construction material.

The above-mentioned constraints are not considered to compromise the scientific rigour of the field assessment

This report is based upon data acquired from recent and current surveys, however, it should be recognised that the data gathered is indicative of the environmental conditions of the site at the time the report was prepared.

3 EXISTING ENVIRONMENT

3.1 LANDSCAPE CONTEXT

The majority of land incorporated in the Subject Site and locality is subject to continued or historical agricultural practices, infrastructure provision and low density rural housing, and as such would be expected to exhibit a wide range of land-use associated disturbance levels. Satellite imagery of the Subject Site (**Figure 3-1**) appears to demonstrate moderate levels of broad scale disturbance associated with agricultural land clearance for grazing and cropping. Further afield large tracts of remnant vegetation and conservation networks occur.

Figure 3-1: Aerial view of Subject Site.

3.3 TOPOGRAPHY AND GEOLOGY

Low hills with long slopes characterise the locality. The Subject Area is located on the undulating plain above the Macquarie River floodplain at approximately 280m Australian Height Datum (AHD) in the north to 270m AHD in the south of the property.

3.4 VEGETATION

Grey Box (*Eucalyptus microcarpa*), Yellow Box (*E. melliodora*) and Rough-barked Apple (*Angophora floribunda*) occur on valley floors, while River Red Gum (*E. camaldulensis*) lines the Macquarie River and River Oak (*Casuarina cunninghamiana*) the tributaries. Fuzzy Box (*E. conica*) is also known to occur along footslopes and alluvial areas near the Macquarie River.

3.5 GROUND WATER DEPENDENT COMMUNITIES

Areas mapped in the Subject Site are considered as having a moderate potential for groundwater interaction.

3.6 MITCHELL LANDSCAPES AND SOIL OF THE SUBJECT SITE

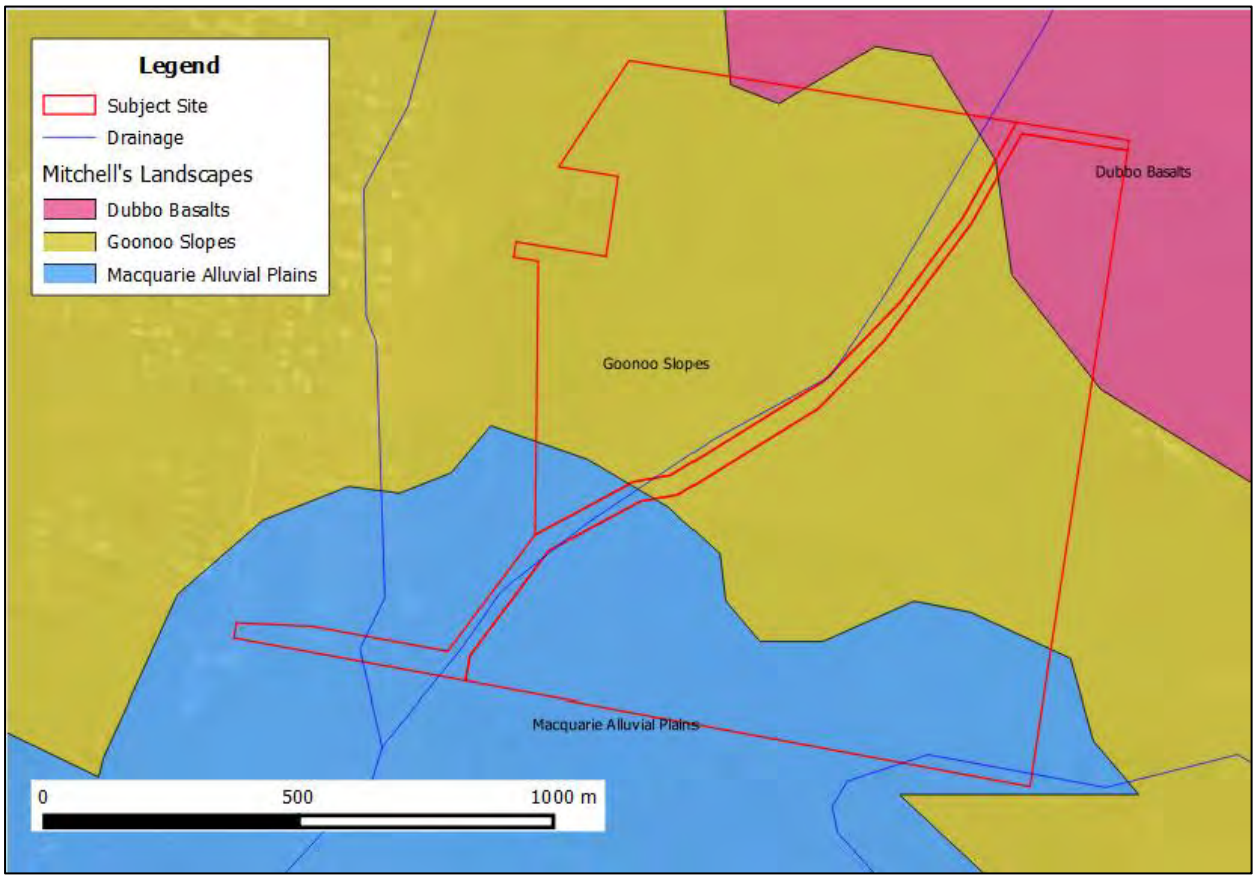
Mitchells Landscapes classification of the landscape upon which the Subject Site falls predominately within "Goonoo Slopes" (**Figure 3-2**) which are characterised by: Extensive undulating to stepped low hills with long slopes on sub-horizontal Triassic/Jurassic quartz sandstone, conglomerates, siltstone, shale and some coal. Stony yellow earths with sandstone outcrop on ridgelines to yellow harsh texture-contrast soils in shallow valleys (Mitchell 2002).

The northern tip of the "Subject Site" is within Dubbo Basalts, with the southern portion falls within the "Macquarie Alluvial Plans."

3.7 HYDROLOGY OF THE SUBJECT SITE

The Subject Site is within the Talbragar Valley sub region of the Central West Catchment Management Area (CMA) situated within the larger Brigalow Belt South Bioregion (BBSB) (Thackway and Cresswel 2000). Eulomogo Creek intercepts the south-eastern portion of the Subject Site. Two small dams also exist on the northern portion of the Subject Site. All surface water drains south into adjoining agricultural / disturbed land and into the Macquarie River approximately 1.2 kilometres to the south.

Figure 3-2: Mitchell's Landscapes in the Subject Site



3.8 LAND-USE

The Subject Site is characterised as highly disturbed footslopes associated with the Macquarie River floodplain. After European occupation it was cleared, grazed and ploughed regularly in seasonally favourable conditions. Ploughing ceased on the property approximately 10 years ago, likewise, grazing also ceased one year prior. It is uncertain whether soils in the Subject Site have been 'pasture improved' apart from Lucerne being actively sown. Additionally, council has constructed drainage channels within the property. Apart from isolated trees there are no relatively undisturbed vegetated areas in the Subject Site

3.9 BIODIVERSITY LINKS (WILDLIFE CONNECTIVITY CORRIDORS)

Biodiversity link nomenclature used in this section follows *OEH Biodiversity Certification Assessment Methodology* (2011: 23, **Table 3-1**).

Fauna wildlife corridors are usually associated with waterways, wetlands and riverine environments or specific continuous habitats (for example escarpments, woodlands).

The Subject Site is situated central to several protected forests and reserves including Beni State Conservation Area, Cobbora State Forest, Goonoo National Park, Goonoo State Conservation Area (SCA), Yarindury State Forest. Regionally the habitat surrounding within the

Subject Site is likely to provide a movement pathway or stepping stone habitat between these reserves and the Macquarie River.

Goonoo SCA is recognised as an Important Bird Area (IBA) by Birdlife International (http://www.birdlife.org/worldwide/index.html). It is the core conservation area of the Mallee Fowl, Ground Cuckoo-shrike, Gilberts Whistler, Chestnut-rumped Heathwren, Spotted Quail-Thrush, Glossy Black Cockatoo and one of only two known populations of Eastern Pygmy Possum on public land in the region. Goonoo is also a regional stronghold of the vulnerable Greater Long-eared Bat (Ellis & Turbill, 2002).

Consequently, Goonoo SCA is considered a significant environmental feature of the Central West, and arguably one of the more significant environmental features of inland NSW. It provides connectivity for migrating birds between the semi-arid lands to the west and hinterland (and coast) to the east.

Table 3-1: Biodiversity links.

Connectivity value class	**BCAM (2012) Defining criteria**	**Comment**
State Biodiversity Link	An area identified as being part of a state biodiversity corridor and in a plan approved by the Director General OR A riparian buffer 40 metres either side of a major river	No areas are identified as being part of a state biodiversity corridor and in a plan approved by the Director General. The Macquarie River is situated within 1.2 km from the Subject Site.
Regional Biodiversity Link	An area identified as being part of a regional biodiversity corridor and in a plan approved by the Director General OR A riparian buffer 30 metres either side of a minor river or major creek	No areas are identified as being part of a regional biodiversity corridor and in a plan approved by the Director General The Subject Site traverses riparian areas of minor creeks.
Local Biodiversity Link	Links areas of native vegetation in moderate to good condition greater than 30 hectares AND Width of vegetation in moderate to good condition is greater than 30 metres AND/OR A riparian buffer 20 metres either side of a minor creek or 10 metres either side of minor watercourse	
Nil	None of the above	

4 RESULTS

4.1 DATABASE AND LITERATURE RESULTS

Appendix 1 provides a complete list of database searches and lists of threatened flora, fauna and ecological communities identified through the background searches and annotated with the potential to be recorded in the Subject Site. A map displaying threatened flora and fauna records for the Subject Site can be seen on **Figure 4-1**.

4.1.1 NSW OEH Listed items

A search of the NSW OEH Threatened Species Profiles using Central West CMA Talbragar Valley subregion predicts 98 listed items as having potential to be present in the Subject Site.

Table 4-1: NSW OEH Listed items predicted to occur in the Central West CMA Talbragar Valley subregion.

NSW OEH Threatened Species	Known	Predicted	Grand Total
Animal > Amphibians		1	1
Animal > Bats	3	1	4
Animal > Birds	29	9	38
Animal > Marsupials	4	2	6
Animal > Reptiles		1	1
Community > Threatened Ecological Communities	3		3
Plant > Epiphytes and Climbers	1		1
Plant > Herbs and Forbs	2	1	3
Plant > Orchids	1		1
Plant > Shrubs	6		6
Threat > Disease		3	3
Threat > Habitat Loss/Change		9	9
Threat > Other Threat		1	1
Threat > Pest Animal		14	14
Threat > Weed		7	7
Grand Total	**49**	**49**	**98**

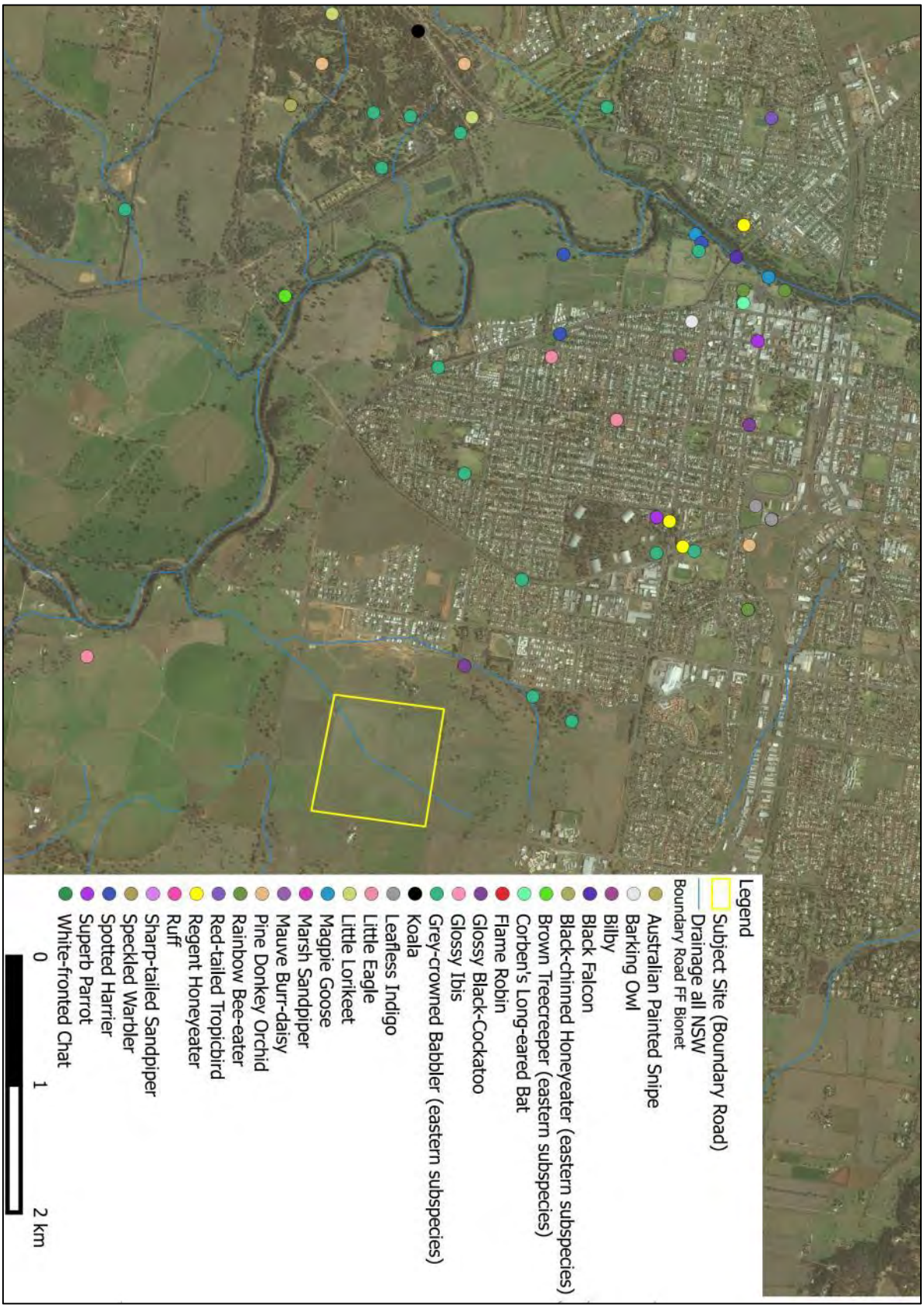
4.1.2 Threatened species and endangered populations within 10 kilometres of the Subject Site

A total of 81 records of 30 threatened species have been previously recorded within a ten kilometre radius of the Subject Site (Bionet: search date 26 March 2015) (**Table 4-2**). As can be seen from **Figure 4-1**, many of these records are around the urban environs of Dubbo.

Table 4-2: Threatened species, extinct and endangered populations within 10 kilometres of the Subject Site.

Row Labels	Number of records
Australian Painted Snipe Rostratula australis	**2**
Barking Owl Ninox connivens	**5**
Bilby Macrotis lagotis	**1**
Black Falcon Falco subniger	**1**
Black-chinned Honeyeater (eastern subspecies) Melithreptus gularis gularis	**1**
Brown Treecreeper (eastern subspecies) Climacteris picumnus victoriae	**1**
Commersonia procumbens	3
Corben's Long-eared Bat Nyctophilus corbeni	**1**
Flame Robin Petroica phoenicea	**1**
Glossy Black-Cockatoo Calyptorhynchus lathami	**2**
Glossy Ibis Plegadis falcinellus	**1**
Grey-crowned Babbler (eastern subspecies) Pomatostomus temporalis temporalis	**16**
Homoranthus darwinioides	1
Koala Phascolarctos cinereus	**1**
Leafless Indigo Indigofera efoliata	**8**
Little Eagle Hieraaetus morphnoides	**4**
Little Lorikeet Glossopsitta pusilla	**2**
Magpie Goose Anseranas semipalmata	**2**
Marsh Sandpiper Tringa stagnatilis	**1**
Mauve Burr-daisy Calotis glandulosa	**2**
Pine Donkey Orchid Diuris tricolor	**3**
Rainbow Bee-eater Merops ornatus	**5**
Red-tailed Tropicbird Phaethon rubricauda	**1**
Regent Honeyeater Anthochaera phrygia	**7**
Ruff Philomachus pugnax	**1**
Sharp-tailed Sandpiper Calidris acuminata	**1**
Speckled Warbler Chthonicola sagittata	**1**
Spotted Harrier Circus assimilis	**3**
Superb Parrot Polytelis swainsonii	**2**
White-fronted Chat Epthianura albifrons	**1**
Grand Total	**81**

Figure 4-1: OEH Bionet records of threatened flora and fauna within 10km of the Subject Site (Data Source: NSW OEH 26 March 2015).



4.1.3 EPBC Protected Matters Report

The DoE Protected Maters report predicts the following protected matters that may or are likely to occur in the Subject Site.

- 5 EECs.
- 14 Listed threatened species.
- 10 migratory species.
- 11 Marine species
- 6 Commonwealth Lands

The Regent Honeyeater, Superb Parrot, South-eastern Long-eared Bat, White-throated Needletail and Rufous Fantail are known to occur or have habitat in the Subject Site.

4.1.4 Local context (Biodiversity impact assessments)

Many ecological surveys have taken place in proximity to the Subject Site. The largest and most relevant ecological survey was undertaken by OzArk (2013) as part of the approval process for the Dubbo Zirconium Project. Other relevant surveys include:

- Tree Assessment: Lot G DP417757, 411 Macquarie Street Dubbo, NSW. Report to Geolyse (OzArk 2014).
- Ecological Assessment: Keswick Stage 5 Residential subdivision (52.5 ha) (OzArk 2013).
- Ecological Assessment: LH Ford Bridge. Report to Dubbo City Council OzArk (2013).
- Biodiversity Assessment for the Dubbo Zirconium Project. Report to Alkane Resources (OzArk 2013).
- Ecological Assessment: Dubbo to Wellington 66kv Powerline Upgrade. Report to Essential Energy. August 2012 (OzArk 2012);
- Ecological Assessment: Proposed recycled water reticulation scheme in three areas within the village of Wongarbon. Report to Dubbo City Council (OzArk 2010).
- Ecological Assessment: Golden Highway/Boothenba Road realignment and intersection improvements. Report to the Roads and Traffic Authority (OzArk 2010)
- *Dubbo Bird List*. Prepared by the Dubbo Field Naturalist Society (Hosking et al. 2010);
- *Status of Vertebrate Fauna And Their Habitat In The Central West Catchment* (Goldney, Kerle and Fleming 2007);
- Ecological Overview of Three Reserves: Jones Creek Reserve, Cumboogle Flora Reserve and Wongarbon Tank Reserve. Dubbo Local Government Area, NSW (OzArk 2009);
- Ecological and Archaeological Assessment: Proposed Wongarbon Sewerage Scheme (WSS) including the Wongarbon Sewerage Treatment Plant (STP) and the associated reticulation scheme within the village of Wongarbon. Report to Dubbo City Council (OzArk (2006).
- Ecological and Archaeological Assessment: 2.4 km Road Rehabilitation and Minor Alignment Shift, c. 16 km Southeast of Dubbo, NSW. Report to Dubbo City Council. (OzArk 2005).

- *Community Data Search And Biodiversity Survey Of The Brigalow Belt South Bioregion Stage 1* (NSW NPWS 2002); and
- *Report On Preliminary Fauna Survey Of The Pilliga And Goonoo Forests.* November 1999 to January 2000 (NSW NPWS 2000).

The research indicates that woodlands dominated by Fuzzy Box (*Eucalyptus conica*) Inland Grey Box (*E. microcarpa*) and White Box (*E. albens*) dominate the Dubbo LGA. These woodlands are all listed as Endangered Ecological Communities (EECs) or Threatened Ecological Communities (TECs) under the TSC Act and/or the EPBC Act. Threatened species such as the Black-chinned Honeyeater, Brown Treecreeper, Diamond Firetail, Grey-crowned Babbler, Speckled Warbler, Little Eagle are commonly recorded in these remnant woodlands in Dubbo. To a lesser extent the Hooded Robin and Varied Sittella are known to occur. Migratory species (EPBC Act) known to occur in the area include the Swift Parrot, Superb Parrot and Rainbow Bee-eater. Although Koalas have been recorded in the locality, they are not a common sighting and it is suggested that riparian areas such as the Macquarie River provide a highway for Koalas to move to more suitable habitat and climatic conditions. The Barking Owl is also known to occur along the Macquarie River. Due to the ease in identifying microbats from echolocation recordings, several species of threatened microbat are also known from the area. These include the Yellow-bellied Sheath-tailed Bat, Greater long-eared Bat, Little Pied Bat and Large-eared Pied Bat.

4.1.5 Predictive model for threatened species detection

As a result of the background searches and literature review, 91 protected matters listed in the schedules of the FM and/and TSC or/and EPBC Act have been previously identified as having habitat present or occurring in the locality.

Of these, 45 protected matters are considered to have potential to occur in the Subject Site (**Table 4-3**). Further details regarding these species can be found in **Appendix 3**.

Table 4-3: Protected matters with potential to occur in the Subject Site

	Common Name	Scientific Name	TSC Act	EPBC Act Status	Potential to occur in Subject Site
1	Ausfeld's Wattle	*Acacia ausfeldii*	V		Potential
2	Barking Owl	*Ninox connivens*	V		Likely
3	Black Falcon	*Falco subniger*	V		Potential
4	Black-breasted Buzzard	*Hamirostra melanosternon*	V		Potential
5	Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V		Potential
6	Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V		Likely
7	Cattle Egret	*Ardea ibis*		M	Potential
8	Diamond Firetail	*Stagonopleura guttata*	V		Likely
9	Flame Robin	*Petroica phoenicea*	V		Potential

	Common Name	Scientific Name	TSC Act	EPBC Act Status	Potential to occur in Subject Site
10	Fork-tailed Swift	*Apus pacificus*		M	Potential
11	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	*Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions*	EEC		Yes
12	Glossy Black-cockatoo	*Calyptorhynchus lathami*	V		Potential
13	Great Egret,			M	Potential
14	Greater Long-eared Bat	*Nyctophilus timoriensis/corbeni (South-eastern form)*	V	E	Potential
15	Grey Falcon	*Falco hypoleucos*	E		Potential
16	Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V		Yes
17	Homoranthus darwinioides	*Homoranthus darwinioides*	V	V	Potential
18	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions/Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of		EEC	E	Yes
19	Koala	*Phascolarctos cinereus*	V		Potential
20	Little Eagle	*Hieraaetus morphnoides*	V		Potential
21	Little Lorikeet	*Glossopsitta pusilla*	V		Potential
22	Little Pied Bat	*Chalinolobus picatus*	V		Potential
23	Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	V		Potential
24	Masked Owl	*Tyto novaehollandiae*	V		Potential
25	Painted Honeyeater	*Grantiella picta*	V		Potential
26	Pine Donkey Orchid	*Diuris tricolor*	V		Likely
27	Rainbow Bee-eater	*Merops ornatus*		M	Potential
28	Regent Honeyeater	*Anthochaera phrygia*	CE	E	Likely
29	Rufous Fantail			M	Potential
30	Satin Flycatcher			M	Potential
31	Scant Pomaderris	*Pomaderris queenslandica*	E		Potential
32	Scarlet Robin	*Petroica boodang*	V		Potential
33	Speckled Warbler	*Pyrrholaemus saggitatus*	V		Yes
34	Spotted Harrier	*Circus assimilis*	V		Potential
35	Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	Potential
36	Square-tailed Kite	*Lophoictinia isura*	V		Potential
37	Superb Parrot	*Polytelis swainsonii*	V	V	Likely
38	Swift Parrot	*Lathamus discolor*	E	E	Potential
39	Turquoise Parrot	*Neophema pulchella*	V		Potential
40	Varied Sittella	*Daphoenositta chrysoptera*	V		Likely
41	White Box-Yellow Box-Blakely's Red Gum Grassy		EEC	CE TEC	Yes
42	White-throated Needletail	*Hirundapus caudacutus*		Listed	Potential
43	Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V		Potential
44		*Tylophora linearis*	V	E	Potential
45	Aquatic Ecological Community in the		EEC		Yes

	Common Name	Scientific Name	TSC Act	EPBC Act Status	Potential to occur in Subject Site
	Natural Drainage System of the Lowland Catchment of the Lachlan River EEC (NSW FM Act).		(TSC Act)		

E- Endangered. **V- Vulnerable**
EP- Endangered Population. **M- Migratory or Marine (EPBC Act)**
EEC- Endangered Ecological Community. **CE- Critically Endangered**
CEEC- Critically Endangered Ecological Community **TEC – Threatened Ecological Community**

4.2 FIELD SURVEY RESULTS

4.2.1 Vegetation communities and habitat

The Subject Site is completely cleared, ploughed and disturbed with few isolated trees. Despite continuous grazing and a history of ploughing, native grasses in most cases prevail in the Subject Site. Vegetation present is characterised by *Biometric* community ID CW130 '*Derived tussock grasslands of the central western plains and lower slopes of NSW (Benson 250)*'. Prior to grazing pressures (**Figure 4-2**), the subject site would have been derived from three TSC listed EECs (**Figures 4-3** and **4-4**), being:

- *Biometric* community ID CW144 Inland Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion (Benson 82)
- *Biometric* community ID CW213 White Box - White Cypress Pine - Inland Grey Box woodland on the western slopes of NSW (Benson 267)
- *Biometric* community ID CW138 Fuzzy Box - Inland Grey Box on alluvial brown loam soils of the NSW South Western Slopes Bioregion and southern BBS Bioregion (Benson 201)

The long-term viability of *Biometric* community ID CW130 in recovering to a pre-European state has been compromised by routine agricultural activities and stockpiling. Ploughing and grazing impedes the recruitment of trees and shrubs, and reduces groundcover diversity and abundance, particularly native grasses and forbs. Reduced groundcovers on erodible soils increase water erosion, which is evident in the degree of erosion on the banks of Eulomogo Creek. However like most surrounding areas, all have the potential to recover.

Eulomogo Creek forms part of the FM Act listing for the '*aquatic ecological community in the natural drainage system of the lowland catchment of the Lachlan River.'* The creek is in poor condition however provides connectivity to the Macquarie River.

Threatened and endangered ecological communities

No threatened or endangered ecological communities were recorded in the Subject Site. However, as noted above, all vegetation in the Subject Site is likely to have been derived from one of three EECs listed under the TSC Act. Thus, in consistency with the TSC Act, the

'precautionary principle' has been adopted and an Assessment of Significance has been completed for each to characterise the potential impacts.

Figure 4-2: Vegetation plots and grazing pressures mapped in the Subject Site.

Figure 4-3: Areas formally EEC in the Subject Site.

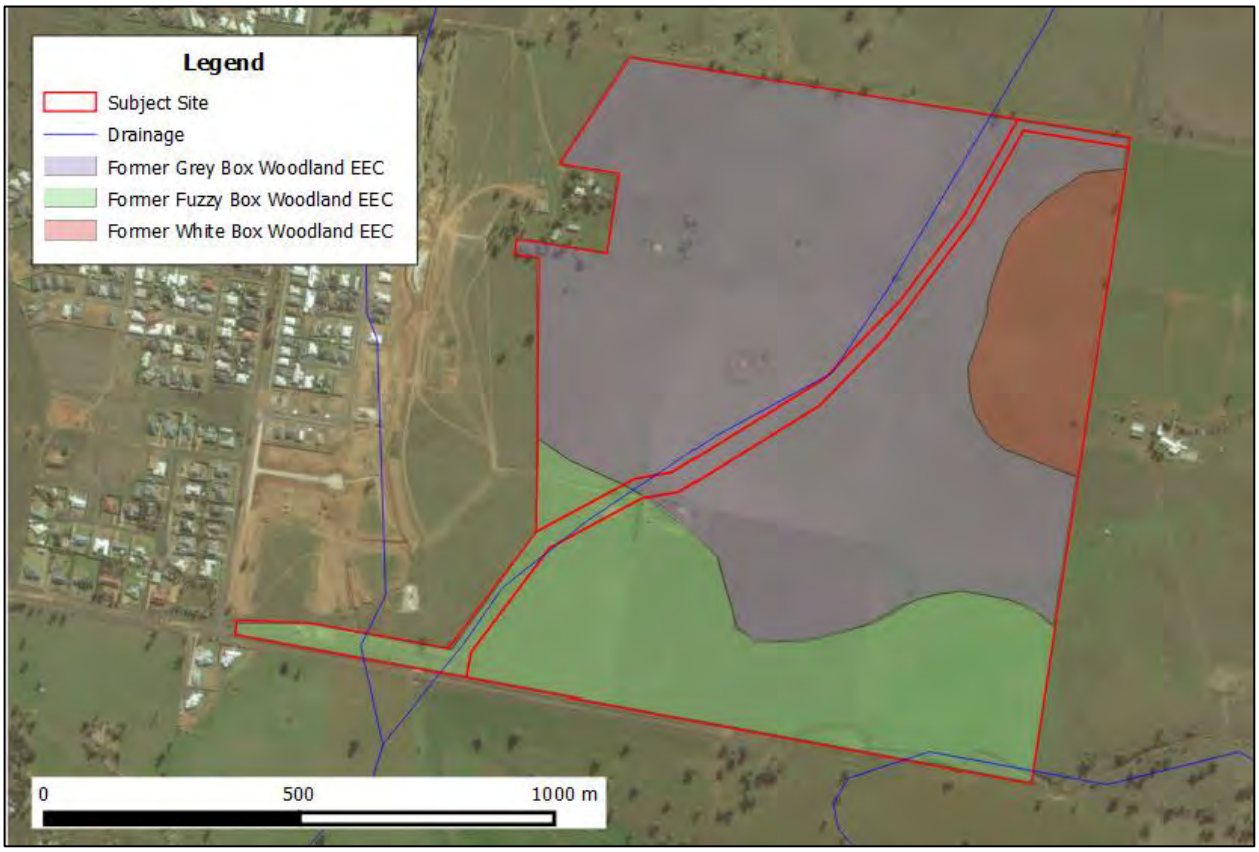
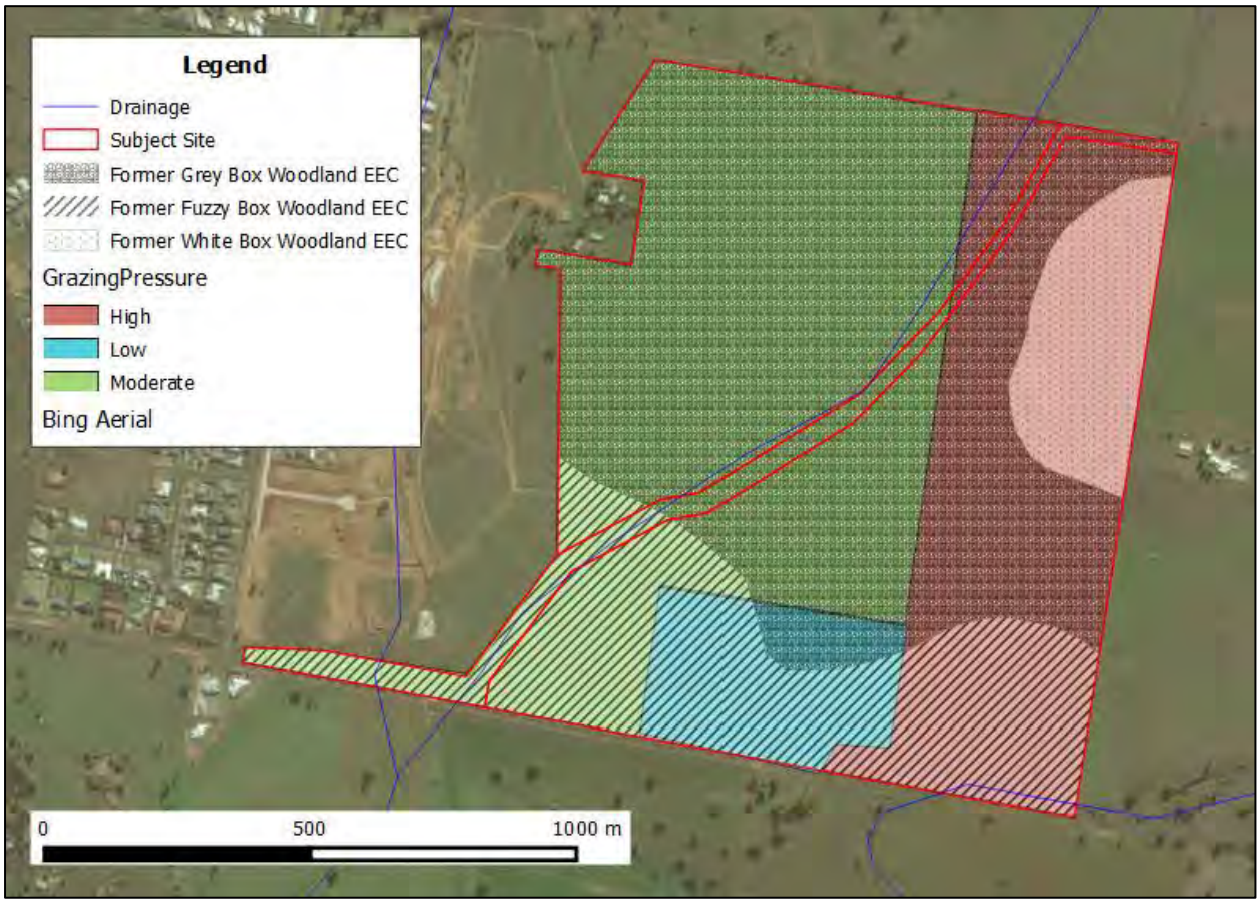


Figure 4-4: Grazing pressures overlaid on areas formally considered EECs in the Subject Site.



4.2.2 Flora species

76 species of vascular flora was recorded during the assessment (**Table 4-4** and **4-5**). All plots recorded a high incidence of non-native plant species, indicative the disturbed nature of the ground surface. No plots recorded a native upper stratum, also suggestive of historic clearing and recent ploughing and grazing. Flora species were noted and enabled the vegetation community of the Subject Site to be aligned to a *Biometric* vegetation community.

Table 4-4: Summary of native species recorded by plot.

Plot number		*1*	*2*	*3*	*4*	*5*	*6*	*7*
TOTAL species / plot		*30*	*27*	*27*	*25*	*28*	*41*	*29*
Total species	*76*							
Native Plant Species	44	16	14	12	13	18	19	21
Non-native sp.	46	14	13	15	12	10	22	8
% Native Plant Species	57.89	53.3%	51.9%	44.4%	52.0%	64.3%	46.3%	72.4%
% non-native	60.53	46.7%	48.1%	55.6%	48.0%	35.7%	53.7%	27.6%

Table 4-5: Summary of stratum details by plot.

STRATUM DETAILS	PLOT 1	PLOT 2	PLOT 3	PLOT 4	PLOT 5	PLOT 6	PLOT 7
Native Upper stratum Native Lower stratum	0	0	0	0	0	0	0
Native Mid stratum	0	1	0	0	3	4	1
Native Lower stratum (not grass)	8	6	6	1	4	4	9
Native Lower stratum (grasses)	8	7	6	12	11	8	11
No. of exotic grasses	2	3	4	3	1	6	0

Threatened and endangered flora

No species of listed threatened flora were recorded or considered likely to occur in the Subject Site.

Exotic and noxious flora

Two species of Class 4 'Locally Controlled Weeds' declared in the Local Control Authority area of Dubbo City Council were recorded in the Subject Site. These include; Prickly Pear (*Opuntia stricta*) and African Boxthorn (*Lycium ferocissimum*) - see **Appendix 2** for complete DCC Noxious weed listings. Both species are additionally listed as a Weeds of National Significance (WoNs). Management of these weeds requires coordination among all levels of government, organisations and individuals with weed management responsibilities.

4.2.3 Fauna species

31 species of fauna recorded during the assessment. This includes one mammal, 5 reptile, 2 frog and 23 bird species. The targeted survey for the Pink-tailed work lizard did not reveal any individuals or suitable habitat. As the Subject Site does not contain a trachite deposit (known

Pink-tailed Worm Lizard habitat in the locality) geologically it is not considered to be prime habitat.

Threatened species

No species of threatened fauna were recorded in the Subject Site. The lack of diverse, quality habitat in the Subject Site reduces the potential of many threatened species known for the locality having habitat present in the Subject Site or occurring. However, due to known survey limitations (**Section 2.6**), some threatened species are considered likely to occur or have habitat in the Subject Site based on available habitat and previous records. These are listed in **Section 4.3**.

Endangered populations

No endangered fauna populations considered likely to occur within the Subject Site.

4.2.4 Fauna habitat

General fauna habitat

Fauna habitat in the Subject Site is restricted to derived grassland with the odd isolated eucalypt. Open/disturbed areas favours common generalist species which are capable of utilising open ground for foraging and common disturbance-tolerant species which are ubiquitous in modified habitats.

Isolated trees within the cleared/disturbed areas are known to contribute to the viability of wildlife populations in agricultural mosaic landscapes by maintaining connectivity between larger patches of remnant vegetation (Gibbons 2000).

Koala habitat

State Environmental Planning Policy (SEPP) 44 does not apply to the Dubbo LGA. Potential Koala habitat still requires management under the EPBC Act. The Approved Recovery Plan for the Koala (DECC 2008) provides lists of koala food trees categorised as primary, secondary and supplementary within Koala Management Areas (KMAs). Primary food trees exhibit a level of use that is significantly higher than that of other Eucalyptus species and is independent of tree density. The Dubbo LGA is within KMA 6: Western Slopes. 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.). In the south of this KMA, a population of koalas occurs along the Murrumbidgee River at Narrandera. River Red Gum is listed as primary food source, Yellow Box and White Box are listed as a secondary food source and Red Stringybark is listed as a supplementary food source.

The Subject Site is considered "potential koala habitat". Koalas are known to be a transient species in the locality, specifically along the Macquarie River. The lack of records in the Subject

Site is not considered to represent the absence of koalas, rather that habitat away from the riverine environment is not considered to be core koala habitat. As such, the Subject Site is considered 'potential' Koala habitat (as Koalas will move through cleared paddocks to access suitable habitat) as no resident population or breeding females are considered to occur in the Subject Site.

Critical habitat

There are four declared critical habitats in NSW and three recommendations for critical habitat status in NSW.

Five Commonwealth critical habitats are listed in the EPBC Act.

None of these identified areas of critical habitat are located within the boundaries of the Subject Site.

Aquatic habitat

Aquatic habitat in the Subject Site is poor with a high nutrient loading (**Table 4-5**). Although some aquatic habitat such as grasses, rushes and sedges are present and provide refuge for a variety of species, cattle has impacted the quality and suitability of this habitat. Eulomogo Creek and various dams in the Subject Site provide suitable foraging areas and habitat for water birds, waders and migratory birds as well as habitat for aquatic species such as frogs, turtles and fish. The creek is in poor condition and is unlikely to provide habitat for threatened fish species.

Although emergent aquatic vegetation increases the possibility that threatened birds would breed in this area, the lack of terrestrial vegetation cover and impacts by cattle reduce this potential. Furthermore, the majority of migratory waders do not breed in Australia.

Table 4-6: Summary of water condition and aquatic habitat in Eulomogo Creek.

Nutrient Loading		**Eulomogo Creek**
Filamentous algae		**Yes**
Water weeds (Azola / Salvinia)		**Yes**
Weeds on banks		**Yes**
Cumbungi, reeds, bullrush		**Yes**
Native tree death		No
Bad smells from the water		**Yes**
Surface scum		**Yes**
Stock refusing to drink		No
		High (7/9)
Macro-invertebrate pollution tolerance data		
Rating of water	**Sensitivity**	**Present**
	very sensitive organisms	
	stonefly nymphs	
4 = Excellent	mayfly nymphs	
	freshwater shrimp	

	freshwater crayfish	x
	sensitive organisms	
	dobonsonflys (alderflies)	
	mussels	
	freshwater prawns	
3 or > = Good	freshwater crayfish	x
	dragonfly nymphs	
	damselfly nymphs	
	caddisfly nymphs	
	water mites	
	tolerant organisms	
	beetle (Coleoptera)	x
	true bugs (Hemiptera)	
2 or > = Fair	leech	
	freshwater snail	
	flatworm	
	very tolerant organisms	
	black fly larvae	x
	mosquito larvae	x
1 or > = Poor	fly larvae	x
	non-biting midges (including bloodworms)	x
	freshwater worms	
Overall rating		**Poor**
Habitat Features		
	Habitat Type	Permanent water
	Pool Size	4m wide, 200m long
	Bank Slope	40 to 90 degrees
	Depth (Max Av)	0.5m
	Substrate type	sand and basalt rock
	Downstream connectivity	good / continuous
	Waterway Condition	Poor
	Contributions to cover	NIL
	Submerged physical	NIL
	Submerged biological	NIL
	Emergent reeds / plants	Bull rush, water ribbons (all impacted by cattle)
	Canopy % over water (50m)	20%
	General terrestrial veg cover	Derived Grassland (formerly Fuzzy Box Woodland)
	Temperature (10cm)	21 degrees Celsius

4.2.5 Protected Matters - Migratory and marine species

Background searches revealed the potential presence of several migratory species in the locality. The Fork-tailed Swift and White-throated Needletail are almost exclusively aerial (including foraging) and as such can be recorded over many habitats. The Rainbow Bee-eater is known to have breeding habitat in sandy areas near the Macquarie River in Dubbo and has

potential to occur in the Subject Site. Likewise the Satin Flycatcher, Rufous Fantail (seasonal migrants) are likely to occur and forage in riverine environments including Eulomogo Creek. However, a lack of perching opportunities decreases the likelihood that these species would be recorded in the Subject Site. The Superb Parrot, Regent Honeyeater and Swift Parrot are unlikely to have foraging resources in the Subject Site during the non-breeding period due to a lack of flowering resources. Furthermore a lack of flowering species in the Subject Site, deplete the potential for most winter migrants to occur in the Subject Site.

4.2.6 Key Threatening Processes

Key threatening processes are threatening processes that, in the opinion of the relevant Scientific Committee, adversely affect threatened species populations or ecological communities, or could cause species, populations or ecological communities that are not threatened to become threatened

Of the 36 Key Threatening Processes (KTP) listed in the schedules of the TSC Act, five are currently operating in the Subject Site. These include:

- Competition and grazing by the feral European rabbit (*Oryctolagus cuniculus*).
- Predation by the European red fox (*Vulpes vulpes*).
- Predation by the feral cat (*Felis catus*).
- Removal of dead wood and dead trees.
- Removal of hollow bearing trees.

Of the 20 Key Threatening Processes (KTP) listed in the schedules of the EPBC Act, eight are currently operating in the Subject Site. These include:

- Competition and land degradation by rabbits.
- Land clearance.
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.
- Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases.
- Novel biota and their impact on biodiversity.
- Predation by European red fox.
- Predation by feral cats.
- Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species.

4.3 SUMMARY

On the basis of regional records, reports and the presence of suitable habitat, 15 threatened items listed in the schedules of the TSC Act and / or EPBC Act were assessed as likely to occur or have habitat in the Subject Site and be affected by the Proposal (**Table 4-7**). Assessments of significance were conducted for these species (**Appendix 5**).

Table 4-7: Threatened species known to occur or have potential occur in the Subject Site.

	Common Name	Scientific Name	TSC Act	EPBC Act	Potential to occur in Subject Site	Significance Assessment
1	Barking Owl	*Ninox connivens*	V		Likely hunting grounds	7-Part Test (TSC Act)
2	Black Falcon	*Falco subniger*	V		Potential hunting grounds	7-Part Test (TSC Act)
3	Cattle Egret	*Ardea ibis*		M	Potential to occur	Assessment of Significance (EPBC Act)
4	Fork-tailed Swift	*Apus pacificus*		M	Potential foraging area	Assessment of Significance (EPBC Act)
5	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions		EEC		Precautionary Principle	7-Part Test (TSC Act)
6	Great Egret			M	Potential	Assessment of Significance (EPBC Act)
7	Grey Falcon	*Falco hypoleucos*	E		Potential hunting grounds	7-Part Test (TSC Act)
8	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions		EEC	TEC	Precautionary Principle	7-Part Test (TSC Act)
9	Little Eagle	*Hieraaetus morphnoides*	V		Potential hunting grounds	7-Part Test (TSC Act)
10	Rainbow Bee-eater	*Merops ornatus*		M	Potential breeding habitat and foraging habitat	Assessment of Significance (EPBC Act)
11	Spotted Harrier	*Circus assimilis*	V		Potential hunting grounds	7-Part Test (TSC Act)
12	Square-tailed Kite	*Lophoictinia isura*	V		Potential hunting grounds	7-Part Test (TSC Act)
13	White Box-Yellow Box-Blakely's Red Gum Grassy		EEC	CE TEC	Precautionary Principle	7-Part Test (TSC Act)
14	White-throated Needletail	*Hirundapus caudacutus*		M	Potential foraging area	Assessment of Significance (EPBC Act)
15	Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Lachlan River EEC (NSW FM Act).		EEC		Eulomogo Creek forms part of the listing for this EEC.	7-Part Test (TSC Act)

E - Endangered. **V- Vulnerable**
EEC - Endangered Ecological Community. **CE- Critically Endangered**
CEEC- Critically Endangered Ecological Community **TEC – Threatened Ecological Community**
M- Migratory or Marine (EPBC Act)

5 IMPACTS

5.1 TERRESTRIAL FLORA AND ECOLOGICAL COMMUNITIES

It is anticipated that 200 hectares will be directly activity affected by the activity in the Subject Site. This will impact derived grassland community within a highly disturbed, cleared and ploughed landscape.

5.2 TERRESTRIAL FAUNA AND FAUNA HABITAT

It is unlikely that fauna species would be directly impacted in the Subject Site as a result of the Proposal. Fauna may be impacted by:

- Vegetation removal for the establishment of the residential infrastructure.
- Disturbance associated with machinery (noise, dust vibration).
- Collisions with vehicles.
- Impact to grassy habitat.

The potential loss of cleared and disturbed habitat represents an insignificant loss of habitat for native fauna.

Hollow dependent fauna would not be impacted as no hollow bearing trees will be removed.

Assessments of Significance for those threatened species considered likely to be affected by the Proposal (**Section 6**) determined that the Proposal would have no significant impact. Suitable high quality habitat for threatened species will exist adjacent to the Subject Site and will remain undisturbed.

5.2.1 Wildlife Corridors and Connectivity

Impact to already cleared and disturbed tussock grasslands will not fragment an existing remnant nor affect a wildlife corridor.

5.2.2 Critical habitat

No areas defined as critical habitat in NSW or in the Commonwealth will be affected by the activity.

5.3 KEY THREATENING PROCESSES

A number of Key Threatening Processes (KTP) listed on the schedules of the TSC Act may be exacerbated by the Proposal. These KTP's include:

- Anthropogenic climate change (TSC Act)
- Clearing of native vegetation (TSC Act);

- Invasion of native plant communities by exotic perennial grasses (TSC Act).
- Land clearance (EPBC Act).

The clearing of native vegetation is a major contributor to the loss of biodiversity. In the determination, the NSW Scientific Committee found that 'clearing of any area of native vegetation, including areas less than two hectares in extent, may have significant impacts on biological diversity'.

5.4 INVASIVE SPECIES

Ground disturbing activities may:

- Increase weed invasion. The spread of noxious weeds may occur during construction within the Subject Site given the weedy environments within the larger area.
- Increase opportunities for feral animals. The proposed works may improve habitat conditions for pests that thrive on disturbed and cleared environments. There is some potential for construction workers to leave food scraps and debris that may encourage these animals. It is unlikely that local populations would increase as a result of the activity.
- Introduce pests and pathogens. No known plant pathogens are likely to be introduced into the area during construction work.

5.5 NOISE/VIBRATION

Construction associated with the subdivision is unlikely to affect any native fauna given the disturbed cleared nature of the Subject Site. Within semi-urban areas, noise and vibration is unlikely to increase above background traffic noise.

While impacts are likely, it is anticipated that any sensitive mobile fauna utilising the area would be able to migrate to surrounding areas of similar habitat such as riparian habitat (Macquarie River) or nearby reserves and conservation networks for the duration of the works.

5.6 TRAFFIC IMPACTS

Light and heavy vehicle movements within the Subject Site would be required during the construction of the subdivision infrastructure. The majority of fauna are mobile and will have a chance to disperse to adjacent riparian habitat.

5.7 DUST/EROSION

Construction activities would increase dust levels. However revegetation activities associated within improving the condition of Eulomogo Creek would improve dust and erosion on site.

5.8 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The EPBC Act provides a mechanism for assessing the environmental impact of activities and developments, where 'Matters of National Environmental Significance' (MNES) may be affected by the proposed activities. Impacts to Matters of National Environmental Significance are listed in **Table 5–1**.

Table 5-1: Matters of National Environmental Significance.

Matter of NES	Impact
Any environmental impact on a World Heritage property	No
Any impacts on wetlands of international importance	No. The proposal would not impact on any water quality or flows of the area. Due to the distance from wetland areas it is considered that the works would have no significant impacts.
Any environmental impact on Commonwealth listed threatened species or ecological communities	**Threatened Ecological Communities (TECs) -** No Commonwealth listed TECs are within the Subject Site. **Fauna** – The majority of fauna species are mobile species and in most instances are capable of migrating away from the proposed Subject Site. Noise and vibration associated with the proposal is likely to disturb birds or terrestrial fauna briefly, however none of the migratory species potentially occurring in the locality is likely to have 'important habitat' in the Subject Site. **Flora** - No listed commonwealth flora was considered likely to occur in the Subject Site.
Any environmental impact on Commonwealth listed migratory species	Migratory birds are mobile species and in most instances are capable of migrating away from the proposed Subject Site. The Subject Site represents potential, yet unlikely habitat for many of the identified migratory species.
Does the project affect any national heritage places	No
Does any part of the proposal involve a nuclear action?	No
Any environmental impact on Commonwealth marine area?	No
Any direct or indirect effect on Commonwealth land?	No

6 SIGNIFICANCE ASSESSMENTS

The appropriate management of ecological items is usually determined on the basis of their assessed significance as well as the likely impacts of any Proposal. Significance of a species, population or community is determined by appointed NSW and National Scientific Committees. Cultural and public significance are considerations within the significance determination process. Within the framework of an impact assessment, impacts to listed significant item must be assessed at a State (under the TSC Act) or National (under the EPBC Act) level – even if it is the same species. The following sections identify State or nationally listed threatened (significant) species then determines if impacts are 'significant'.

Significant can be defined as: there is a real chance/greater than 50 per cent chance, that the action (direct or indirect) will cause a viable local population to go extinct.

6.1 AFFECTED SPECIES

It should be noted that in the *Threatened species assessment guidelines: The assessment of significance* (DECC 2007), a species does not have to be considered as part of the assessment of significance if adequate surveys or studies have been carried out that clearly show that the species, population or community:

- does not occur in the Subject Site, or
- will not use on-site habitats on occasion, or
- Will not be influenced by off-site impacts of the proposal.

Otherwise all species likely to occur in the Subject Site (based on general species distribution information) and known to use that type of habitat, would be considered in the rationale that determines the list of threatened species, populations and ecological communities for the assessment of significance.

6.2 SIGNIFICANT COMMUNITIES, POPULATIONS OR SPECIES WITHIN THE SUBJECT SITE

There are 11 fauna species and four EECs identified as being affected by the Proposal (**Table 4-7)**. Consideration of the type and scale of habitat to be removed has resulted in the conclusion that no threatened species would be significantly affected by the Proposal (**Table 6–1**). The preparation of a Species Impact Statement will not be required for the Project.

Appendix 5 provides detailed assessment of affected species and full version of seven-part tests and assessments of significance.

Table 6-1: Summary of the assessment of significance and seven-part tests

TSC Act significance assessments								
Threatened species, or communities	7-Part Test Questions							Likely significant impact?
	a	b	c	d	e	f	g	
Barking Owl	N	X	N	Y	X	Y	Y	**No**
Black Falcon	N	X	N	Y	X	Y	Y	**No**
Little Eagle	N	X	N	Y	X	Y	Y	**No**
Grey Falcon	N	X	N	Y	X	Y	Y	**No**
Spotted Harrier	N	X	N	Y	X	Y	Y	**No**
Square-tailed Kite	N	X	N	Y	X	Y	Y	**No**
White Box-Yellow Box-Blakely's Red Gum Grassy	X	X	Y	Y	X	Y	Y	**No**
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	X	X	Y	Y	X	Y	Y	**No**
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	X	X	Y	Y	X	Y	Y	**No**
Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Lachlan River EEC (NSW FM Act).	X	X	Y	Y	X	Y	Y	**No**

EPBC Act Assessments[2,3,4,5]		
Threatened species, or communities	**Important population**	**Likely significant impact?**
White-throated Needletail	No	No
Rainbow Bee-eater	No	No
Cattle Egret	No	No
Fork-tailed Swift	No	No
Great Egret	No	No

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable, ?= unknown impact.

1. Significance Assessment Questions as set out in the *Threatened Species Conservation Act 1995/ Environmental Planning and Assessment Act 1979.*
   - **a** in the case of a threatened species, whether the action proposed 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,
   - **b** in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,
   - **c** in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
     - (i) 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
     - (ii) 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,
   - **d** in relation to the habitat of a threatened species, population or ecological community:
     - (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and
     - (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
     - (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,
   - **e** whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),
   - **f** whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,
   - **g** whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.
2. Refer to DEWHA 2013 for significant impact criteria.
3. Important Population as determined by the *Environment Protection and Biodiversity Conservation Act 1999*, is one that for a vulnerable species:
   - **a** is likely to be key source populations either for breeding or dispersal
   - **b** is likely to be necessary for maintaining genetic diversity
   - **c** is at or near the limit of the species range.
4. A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:
   - a • a geographically distinct regional population, or collection of local populations, or

b • a population, or collection of local populations, that occurs within a particular bioregion.

5. Population' as defined under the EPBC Act, in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

7 RECOMMENDATIONS

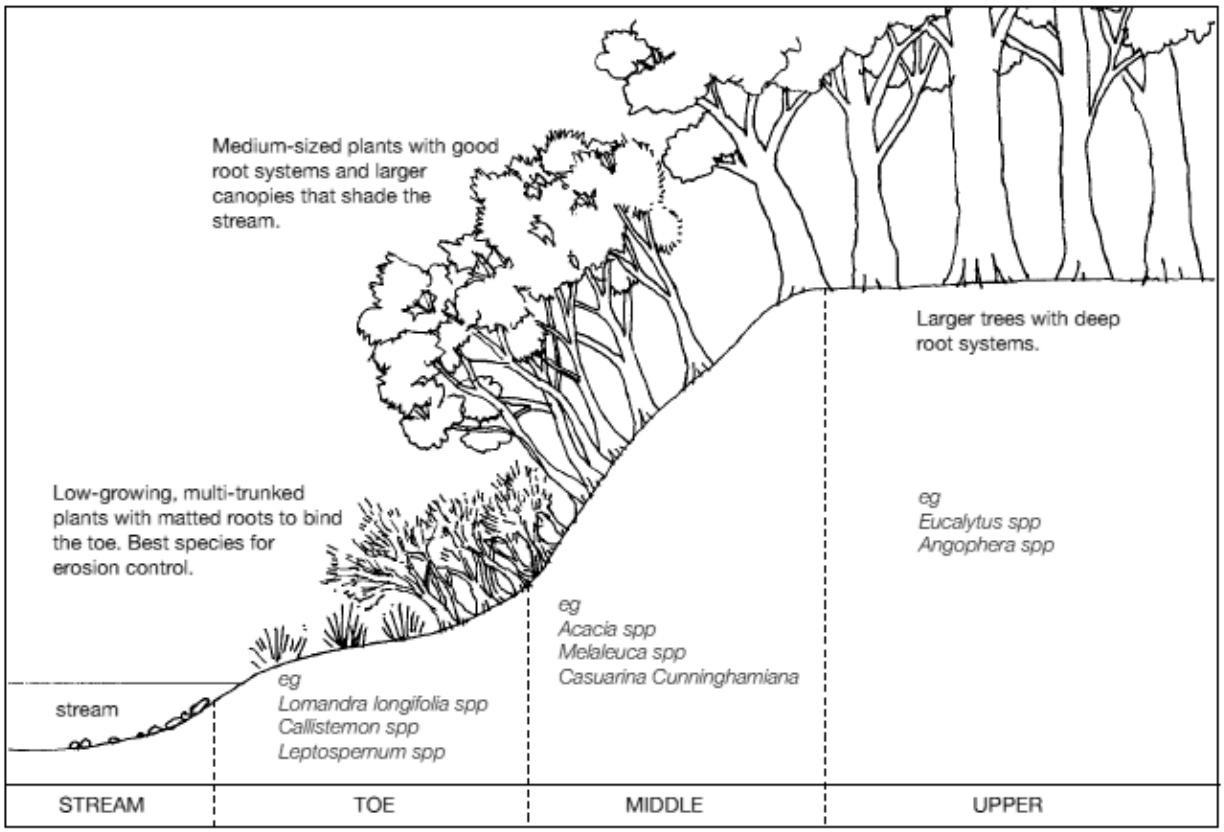
The following mitigation measures have been made in regards to the Proposal.

1. Areas to be cleared in the Subject Site should be clearly marked with high visibility nightline to ensure that approved boundary clearing creep does not occur.
2. Any change in design outside the assessed impact footprint within the Subject Site will require further ecological survey.
3. The Subject Site is not considered 'core' Koala habitat and a SEPP 44 plan of management is not required.
4. All food scraps and rubbish are to be appropriately disposed of in sealed receptacles to prevent foraging habitats for foxes, rats, dogs and cats.
5. An Erosion and Sediment Control Plan (ESCP), shall be prepared for the works and would be in line with Landcom's Managing Urban Stormwater, Soils & Construction Guidelines (The Blue Book) (Landcom 2004).
    - Erosion and sedimentation control measures would be installed around Eulomogo Creek and not be removed until disturbed areas have stabilised.
    - Maintenance and checking of the erosion and sedimentation controls would be undertaken on a regular basis and records kept and provided at any time upon request.
    - Sediment would be cleared from behind barriers on a regular basis and all controls would be managed in order to work effectively at all times.
6. A Dust Management Plan (DMP) should be implemented in-line with the requirements of the Protection of the Environment Operations Act (POEO) 1999 and Conditions of Approval on Development Applications administered by Bathurst Regional Council.
7. Best practice weed management should be in place to prevent the transfer of weed seeds and vegetative materials, including the washdown of vehicles entering or leaving the worksite.
8. Ongoing weed control should be undertaken in the Subject Site.
    - As per the Noxious Weeds Act, Class 4 Noxious Weeds must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.
    - Ensure all seed and seed head is collected and disposed of.
9. Stockpiles in the Project Site in their present state are likely to provide refuge for invasive

species and should be refined and reduced.

10. Under the NV Act, a permit from the Central West Local Land Services is required to clear within 40 metres of Eulomogo Creek. The current project will not impact within 40 metres of this waterway. Should the project need to impact within 40 metres of this waterway (even for rehabilitation / revegetation) then further advice from this department should be sought.
11. Under the FM Act, a permit from DPI is required for any rehabilitation, reclamation or dredging work within the banks of the Eulomogo Creek. Should the project need to impact within 40 metres of this waterway (even for rehabilitation / revegetation) then further advice from this department should be sought.
12. Under the 'integrated development' provisions of the NSW EPA Act, MASS may require approval from DPI for a permit to temporarily or permanently block fish passage (if Eulomogo Creek is to be blocked). The current proposal does not require the creek to be blocked.
13. Under the WM Act MASS will require a controlled activity approval for the Proposal if works are to occur within 40 metres of Eulomogo Creek. Should the project need to impact within 40 metres of this waterway (even for rehabilitation / revegetation) then further advice from this department should be sought.
14. Under the RF Act, as the activity is being assessed under Part 4 of the EPA Act, a Development Application is required which will detail fire risk.
15. Rehabilitation and revegetation efforts should be directed at restoring the Eulomogo Creek riparian zone. This would include maintaining a 40 metre buffer (at least) from the edge of the banks. Connectivity within this riparian zone to the existing Keswick Estate Green Corridor (Macquarie River to Orana Mall) is recommended. Figure 7-1 provides guidance for rehabilitation along the creek and additional information had been provided below for species slection.

Figure 7-1: Proposed cross section showing revegetation of the creek.



Adapted from *Rivercare: Guidelines for Ecological Sustainable Management of Rivers and Riparian Vegetation:* Raine, A.W & Gardiner, J.N, (1995), LWRRDC, Canberra.

- The proposed species list for areas requiring planting is:
    - Upper stratum (on the Upper Creek Bank, see **Figure 7-1**)
        - White Box (Eucalyptus albens) / Yellow Box (Eucalyptus melliodora) / Fuzzy Box (Eucalyptus connnica) at 30 metre spacing.
        - Inland Grey Box (Eucalyptus microcarpa) at 50 metre spacing
        - Mid stratum - (on the Middle Creek Bank, see **Figure 7-1**)
            - Acacia hakeoides, Acacia pycnantha, Acacia decora, Dodonaea viscosa subsp. cuneata, Western Boobialla (Myoporum montanum), Pittosporum angustifolium, Silver Cassia (Senna form taxon 'artemisioides') at 30 metre spacing.
    - Lower stratum (on the Toe Creek Bank, see **Figure 7-1**)
        - Grasses - Austrostipa bigeniculata, Austrodanthonia caespitosa, Kangaroo Grass (Themeda australis), Redleg Grass (Bothriochloa macra), Chloris truncata, Austrostipa scabra, Dicanthium sericeum, Enteropogon acicularis, Panicum effusum.
            - The grass species can be commercially purchased, the remaining species are likely to recover unassisted. The recommended sowing rate is 0.25kg / hectare and the seed supplier will provide instructions on how to prepare the area.
        - Other - Dichopogon strictus, Hydrocotyle laxiflora, Podolepis jaceoides, Vittadinia cuneata, Wahlenbergia luteola, Atriplex semibaccata, Lomandra filiformis subsp. coriacea.
    - Lower stratum (in the Creek bed and walls, see **Figure 7-1**)

- Lomandra filiformis subsp. coriacea, Lomandara longifolia, Carex appressa, Cypress excellatus, Phragmities australis and Juncus spp. The recommended planting rate is one plant per metre square of the final creek bed area of extent and walls of ponds.

8 CONCLUSION

Having given consideration to the ecology within the Subject Site, it is apparent that the Proposal is:

- unlikely to significantly affect any of the listed threatened species, fauna populations or communities.
- unlikely to augment or significantly contribute to any of the National or State listed Key Threatening Processes, if the appropriate safeguards regarding the control of potential vertebrate pests are effectively applied.
- unlikely to significantly affect any Ramsar wetland or any CAMBA or JAMBA listed species;
- unlikely to significantly affect local hydrology.
- consistent with ESD principles with regard to fauna, would not adversely affect the local biodiversity and no issue of inter-generational or value added matters are relevant in this instance.

The proposed activity should not be considered to constitute a significant impact and, as such, no Species Impact Statement (SIS) is warranted. No Koala Habitat Management Plan pursuant to SEPP 44 should be required.

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10 PLATES

	Plate 1: *Biometric* plot 1.
	Plate 2: *Biometric* plot 2.
	Plate 3: *Biometric* plot 3.

	Plate 4: *Biometric* plot 4.
	Plate 5: *Biometric* plot 5.
	Plate 6: *Biometric* plot 6. Showing Eulomogo Creek in the Subject Site.

	Plate 7: Area searched for the Pink-tailed Worm Lizard within potential outcropping habitat.

APPENDIX 1: TERMS AND ABBREVIATIONS

Terminology	Abbreviation	Description
Activity		Has the same meaning as in the EP&A Act, ie the nature of the proposed activity is described in **Section 1.1**. The EP&A Act definition refers to physical 'activity' in relation to land that is specified by a regulation to be a work for the purposes of the Act
Australian Bureau of Meteorology	BOM	
Australian Height Datum	AHD	
Catchment Management Authority	CMA	Thirteen CMAs have been established, the specific functions of CMAs are described in the *Catchment Management Authorities Act 2003*. The CMAs are responsible for managing natural resources at the catchment scale. Key roles include preparing Catchment Action Plans (CAPs) and managing incentive programs to implement the plans. CMA's have now been superseded by Local Land Services (LLS), however the boundaries still apply for ecological database searches.
Core Koala Habitat		State Environmental Planning Policy (SEPP) 44: core koala habitat means an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.
Dubbo City Council	Council	
Ecologically Sustainable Development.	ESD	The EPBC Act sets out the principles of ecologically sustainable development which apply to certain decisions made under the Act. These principles are: • The need to integrate economic, environmental, social and equitable considerations. • The precautionary principle. • The principle of inter-generational equity. • The conservation of biological diversity. and • Improved valuation, pricing and incentive mechanisms.
Endangered Ecological Community	EEC	An ecological community specified in Part 3 of Schedule 1 of the TSC Act or within the schedules of the EPBC Act.
Endangered population		Population specified in Part 2 of Schedule 1 of the TSC Act.
Environmental Impact Statement	EIS	Describes the positive and negative environmental effects of a proposed action and provides potential management measures to ameliorate these impacts.
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).	EPBC Act	Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
Environmental Planning and Assessment Act 1979 (NSW).	EP&A Act	Provides the legislative framework for land use planning and development assessment in NSW.

Terminology	Abbreviation	Description
Fisheries Management Act 1994 (NSW).	FM Act	Administered by the Minister for Primary Industries, except Part 7 (Division 2), which is administered jointly by the Minister for Minister for the Environment and the Minister for Heritage and the Minister Assisting the Minister for Minister for the Environment and the Minister for Heritage.
Ground Water Dependent Ecosystems	GDEs	Groundwater Dependent Ecosystems (GDEs) are ecosystems that are partially or completely dependent on underground water for their existence or health.
Interim Biogeographic Regionalisation for Australia	IBRA	IBRA is a biogeographic regionalisation of Australia developed by the Australian Government's Department of Sustainability, Environment, Water, Population and Communities. It was developed for use as a planning tool, for example for the establishment of a National Reserve System.
Impact Footprint		Areas that will be physically disturbed during the process of implementing the proposal.
Likely		Taken to be a real chance or possibility (NPWS 1996).
Local Environmental Plan	LEP	A type of planning instrument made under Part 3 of the EP&A Act.
Local Government Area	LGA	
Local population		The population that occurs within a given Subject Site, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated (NPWS 1996). In this instance a local population are those that occur within the Subject Site.
Low condition/Moderate to Good Condition (as per BBAM 2008).	Low Condition Moderate to Good Condition	Native woody vegetation is in low condition if: The over-storey per cent foliage cover is <25% of the lower value of the over-storey per cent foliage cover benchmark for that vegetation type AND <50% of groundcover vegetation is indigenous species, or >90% of the area is ploughed or fallow, or 90% of the groundcover vegetation is regrowth but not protected regrowth. Remnant native vegetation and protected regrowth cannot be cleared if it is a vegetation type that is >70% cleared and NOT in low condition (ie Moderate to Good).
Locality		Area within a 50km radius of the Subject Site.
Matters of national environmental significance.	MNES	Refers to the seven matters of national environmental significance as defined by the EPBC Act.
National Parks and Wildlife Act 1974 (NSW)	NPW Act	Under the National Parks and Wildlife Act, the Director-General of the NPWS is responsible for the care, control and management of all national parks, historic sites, nature reserves, reserves, Aboriginal areas and state game reserves. State conservation areas, karst conservation reserves and regional parks are also administered under the Act. The Director-General is also responsible under this legislation for the protection and care of native fauna and flora, and Aboriginal places and objects throughout NSW.

Terminology	Abbreviation	Description
Native Vegetation Act 2003 (NSW)	NV Act	The native vegetation legislation was introduced in 2005. The Native Vegetation Act 2003 (NV Act) and Native Vegetation Regulation 2005 (NV Regulation) has delivered: • the Government's commitment to end broad scale clearing, to protect the health of our land, rivers and wildlife • investment security and increased flexibility for farmers • new powers to local catchment management authorities (CMAs) to make decisions in the best interests of the community.
Noxious Weeds Act 1993 (NSW)	Noxious Weeds Act	An Act to provide for the identification, classification and control of noxious weeds.
NSW Office of Water	NOW	
Office of Environment and Heritage	OEH	Formally known as the Department of the Environment, Climate Change and Water (DECCW).
Potential Koala Habitat		SEPP 44: potential koala habitat means areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.
Regional Environmental Plan	REP	A type of planning instrument made under Part 3 of the EP&A Act.
Regional Vegetation Community	RVC	Regionally, a vegetation map for the Namoi CMA has been produced (ELA 2009a). This mapping product is underpinned by a Regional Vegetation Community (RVC) classification which is linked to the vegetation type classification in the *Biometric* Vegetation Types Database.
Rural Fires Act 1997 (NSW)	RF Act	
State Environmental Planning Policy (Infrastructure) 2007.	Infrastructure SEPP	The Infrastructure SEPP has specific planning and approval provisions for 25 types of infrastructure or facilities such as education, hospitals, roads, railways, emergency services, water supply and electricity generation and transmission. The SEPP assists the NSW Government agencies, local government, other private infrastructure providers and the communities they support by simplifying the planning process and by providing consistent planning provisions across all local government areas in NSW. The SEPP contains planning provisions including: • where the infrastructure facilities are permissible • what infrastructure development can be assessed and approved by a public authority under Part 5 of the Environmental Planning and Assessment (EP&A) Act 1979 • what infrastructure development requires consent under Part 4 of the EP&A Act • what infrastructure development is exempt or complying development.

Terminology	Abbreviation	Description
State Environmental Planning Policy No.44 – Koala Habitat	SEPP 44	This Policy aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline: (a) by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and (b) by encouraging the identification of areas of core koala habitat, and (c) by encouraging the inclusion of areas of core koala habitat in environment protection zones. Applicable for projects determined under Part 4 and 5 of the EP&A Act.
State Environmental Planning Policy	SEPP	A type of planning instrument made under Part 3 of the EP&A Act.
Strahler stream order		Strahler stream order and are used to define stream size based on a hierarchy of tributaries.
Subject Site		The Subject Site is the area that was targeted for ecological assessment and encompasses all aspects of the Proposal.
The Proposal		The proposed activity to be carried out by the Proponent as detailed in **Section 1.1** of this report.
Threatened species		A species specified in Schedule 1 Part 1 (endangered species), Part 4 (presumed extinct) and Schedule 2 (vulnerable species) of the TSC Act, within the schedules of the FM Act or within the Schedules of the EPBC Act.
Threatened Species Conservation Act 1995 (NSW)	TSC Act	The objects of this Act are as follows: (a) to conserve biological diversity and promote ecologically sustainable development, and (b) to prevent the extinction and promote the recovery of threatened species, populations and ecological communities, and (c) to protect the critical habitat of those threatened species, populations and ecological communities that are endangered, and (d) to eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities, and (e) to ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed, and (f) to encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management.

APPENDIX 2: DATABASE SEARCH RESULTS

DESKTOP DATABASE SEARCH RESULTS

A summary of databases searches indicated for TSC and EPBC listed species, ecological communities and populations. Copies of the OEH threatened species database search (TSC Act), NSW DPI records viewer (FM Act) and DoE Protected Matters (EPBC Act) threatened species database searches have been provided in the following table.

Name of database searched	Date of search	Type of search	Comment
DoE Register of Critical Habitat http://www.environment.gov.au/cgi-bin/sprat/public/publicregisterofcriticalhabitat.pl	26.3.15	Subject Site	No critical habitat area registered in the Subject Site.
Department of Sustainability, Environment, Water, Population and Communities (DoE) Protected Matters (EPBC Act) Database. http://www.environment.gov.au/erin/ert/epbc/index.html	25.3.15	Subject Site including 5km buffer	Listed Threatened Ecological Communities: 5 Listed Migratory Species: 14 Listed Threatened Species: 10 Listed Marine Species:11 Commonwealth Lands: 6 Places on the RNE: 13 Invasive Species: 26 Several species listed are known to occur or have habitat in the Subject Site.
Office of Environment and Heritage (OEH) Threatened Species online database: http://www.environment.nsw.gov.au/threatenedspecies/	26.3.15	Combined geographic and habitat search in Central West (Talbragar Valley)	A search of the NSW OEH Threatened Species Profiles using Central West CMA Talbragar Valley subregion predicts 98 listed items as having potential to be present in the Subject Site.
BioNet Atlas of NSW Wildlife 2014. Data License agreement	Report generated on 26/03/2015 11:21 AM.	Licensed Report of all Valid Records of Threatened (listed on TSC Act 1995) ,Commonwealth listed ,CAMBA listed ,JAMBA listed or ROKAMBA listed Entities in selected area [North: -32.21 West: 148.57 East: 148.67 South: -32.31]	Search returned a total of 81 records of 30 species.
Department of Primary Industries Noxious Weeds http://weeds.dpi.nsw.gov.au/WeedDeclarations/Results	26.4.15	Dubbo LGA	109 Noxious Weeds are listed as occurring in the Dubbo LGA. Many have the potential to occur in the Subject Site.
SEPP 44: Koala Habitat Protection http://www.legislation.nsw.gov.au/fragview/inforce/epi%2B5%2B1995%2Bcd%2B0%2BN?	26.3.15	Dubbo LGA	Wellington LGA is not listed in SEPP Schedule 1 of the SEPP. Thus, SEPP 44 does not apply. Koalas are, however, known to occur in the Dubbo LGA and Fuzzy Box are Schedule 2 listed feed tree species. As such, SEPP 44 does not apply, however, koala habitat will be considered.
Office of Environment and Heritage (OEH) Key Threatening Processes. http://www.environment.n	26.3.15		37 KTPs are currently listed under the TSC Act.

Name of database searched	Date of search	Type of search	Comment
sw.gov.au/threatenedspecies/aboutKTPSinNSW.htm			
Department of Sustainability, Environment, Water, Population and Communities (DoE) Key Threatened Processes http://www.environment.gov.au/biodiversity/threatened/ktp.html	26.3.15		19 KTPs are currently listed under the EPBC Act.
Bird Life Australia (Important Bird Areas: IBA) http://www.birdlife.org/datazone/site/search	26.3.15	Subject Site	No IBA is located within the Subject Site. The Subject Site is situated directly south of the Goonoo IBA.
DPI Records Viewer http://www.dpi.nsw.gov.au/fisheries/species-protection/records/viewer	26.3.15	Wellington LGA	Three species of fish have been previously recorded in the Dubbo LGA. Including the: • Freshwater catfish population • Murray Cod • Trout Cod None of these species are likely to occur or have important habitat in the Subject Site. They all are likely to occur in the Macquarie River in Dubbo.
Atlas of Living Australia http://biocache.ala.org.au/explore/your-area	16.9.14	10.0 km of point (-32.274452,148.63289	519 records of 51 species - State Conservation Endangered. No threatened species have been previously recorded in the Subject Site however this does not mean that they do not have habitat in the Subject Site. The Little Eagle, Grey-crowned Babbler and Speckled Warbler are the closest threatened species records.

OEH THREATENED SPECIES DATABASE RESULTS

CMA Sub Region & Profiles Report

18/09/2014

NSW GOVERNMENT Office of Environment & Heritage

CMA Sub-Region Profile ID	Scientific Name	Common Name	Occurrence
Central West - Talbragar Valley			
10056	Anseranas semipalmata	Magpie Goose	Known
10105	Botaurus poiciloptilus	Australasian Bittern	Predicted
10113	Burhinus grallarius	Bush Stone-curlew	Known
10116	Lophochroa leadbeateri	Major Mitchell's Cockatoo	Predicted
10140	Calyptorhynchus lathami	Glossy Black-Cockatoo	Known
10155	Cercartetus nanus	Eastern Pygmy-possum	Predicted
10157	Chalinolobus dwyeri	Large-eared Pied Bat	Predicted
10159	Chalinolobus picatus	Little Pied Bat	Known
10171	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Known
10207	Dasyurus maculatus	Spotted-tailed Quoll	Predicted
10221	Dichanthium setosum	Bluegrass	Predicted
10243	Diuris tricolor	Pine Donkey Orchid	Known
10259	Liopholis whitii	White's Skink	Predicted
10275	Ephippiorhynchus asiaticus	Black-necked Stork	Predicted
10330	Falco hypoleucos	Grey Falcon	Known
10335	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Known
10354	Goodenia macbarronii	Narrow Goodenia	Predicted
10382	Grus rubicunda	Brolga	Predicted
10395	Hamirostra melanosternon	Black-breasted Buzzard	Predicted
10412	Hoplocephalus bitorquatus	Pale-headed Snake	Predicted
10455	Lathamus discolor	Swift Parrot	Predicted
10459	Leipoa ocellata	Malleefowl	Predicted
10479	Limosa limosa	Black-tailed Godwit	Predicted
10495	Lophoictinia isura	Square-tailed Kite	Known
10519	Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Known
10523	Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Known
10555	Neophema pulchella	Turquoise Parrot	Known
10561	Ninox connivens	Barking Owl	Known
10568	Nyctophilus corbeni	Corben's Long-eared Bat	Known
10580	Oxyura australis	Blue-billed Duck	Known
10582	Pachycephala inornata	Gilbert's Whistler	Predicted
10604	Petaurus norfolcensis	Squirrel Glider	Known
10616	Phascolarctos cinereus	Koala	Known
10621	Philotheca ericifolia	Philotheca ericifolia	Known
10645	Polytelis swainsonii	Superb Parrot	Known

Page 1 of 3

CMA Sub-Region			
Profile ID	Scientific Name	Common Name	Occurrence
10656	Pomaderris queenslandica	Scant Pomaderris	Predicted
10660	Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Known
10722	Chthonicola sagittata	Speckled Warbler	Known
10734	Rostratula australis	Australian Painted Snipe	Known
10735	Rulingia procumbens	Rulingia procumbens	Known
10741	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Known
10759	Sminthopsis macroura	Stripe-faced Dunnart	Predicted
10768	Stagonopleura guttata	Diamond Firetail	Known
10771	Stictonetta naevosa	Freckled Duck	Predicted
10783	Swainsona sericea	Silky Swainson-pea	Known
10815	Tylophora linearis	Tylophora linearis	Known
10820	Tyto novaehollandiae	Masked Owl	Predicted
10837	White Box Yellow Box Blakely's Red Gum Woodland	White Box Yellow Box Blakely's Red Gum Woodland	Known
10841	Anthochaera phrygia	Regent Honeyeater	Known
10857	Zieria ingramii	Keith's Zieria	Known
20001	Alteration of habitat following subsidence due to longwall mining	Alteration of habitat following subsidence due to longwall mining	Predicted
20002	Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	Predicted
20003	Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	Predicted
20004	Competition from feral honey bees, Apis mellifera L.	Competition from feral honey bees, Apis mellifera L.	Predicted
20005	Introduction of the Large Earth Bumblebee Bombus terrestris (L.)	Introduction of the Large Earth Bumblebee Bombus terrestris (L.)	Predicted
20006	Bushrock removal	Bushrock removal	Predicted
20007	Loss or degradation (or both) of sites used for hill-topping by butterflies	Loss or degradation (or both) of sites used for hill-topping by butterflies	Predicted
20008	Predation by the Feral Cat Felis catus (Linnaeus, 1758)	Predation by the Feral Cat Felis catus (Linnaeus, 1758)	Predicted
20009	Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Predicted
20010	Invasion of the Yellow Crazy Ant, Anoplolepis gracilipes (Fr. Smith) into NSW	Invasion of the Yellow Crazy Ant, Anoplolepis gracilipes (Fr. Smith) into NSW	Predicted
20011	Removal of dead wood and dead trees	Removal of dead wood and dead trees	Predicted
20012	Herbivory and environmental degradation caused by feral deer	Herbivory and environmental degradation caused by feral deer	Predicted
20014	High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	Predicted
20015	Predation by the European Red Fox Vulpes Vulpes (Linnaeus, 1758)	Predation by the European Red Fox Vulpes Vulpes (Linnaeus, 1758)	Predicted
20016	Predation by Gambusia holbrooki Girard, 1859 (Plague Minnow or Mosquito Fish)	Predation by Gambusia holbrooki Girard, 1859 (Plague Minnow or Mosquito Fish)	Predicted
20017	Competition and habitat degradation by Feral Goats, Capra hircus Linnaeus 1758	Competition and habitat degradation by Feral Goats, Capra hircus Linnaeus 1758	Predicted
20018	Invasion of native plant communities by exotic perennial grasses	Invasion of native plant communities by exotic perennial grasses	Predicted
20020	Predation, habitat degradation, competition and disease transmission by Feral Pigs, Sus scrofa Linnaeus 1758	Predation, habitat degradation, competition and disease transmission by Feral Pigs, Sus scrofa Linnaeus 1758	Predicted
20021	Importation of Red Imported Fire Ants Solenopsis invicta Buren 1972	Importation of Red Imported Fire Ants Solenopsis invicta Buren 1972	Predicted
20023	Clearing of native vegetation	Clearing of native vegetation	Predicted

CMA Sub-Region			
Profile ID	Scientific Name	Common Name	Occurrence
20024	Competition and grazing by the feral European Rabbit, Oryctolagus cuniculus (L.)	Competition and grazing by the feral European Rabbit, Oryctolagus cuniculus (L.)	Predicted
20025	Anthropogenic Climate Change	Anthropogenic Climate Change	Predicted
20026	Infection of native plants by Phytophthora cinnamomi	Infection of native plants by Phytophthora cinnamomi	Predicted
20027	Invasion of native plant communities by Chrysanthemoides monilifera	Invasion of native plant communities by Chrysanthemoides monilifera	Predicted
20043	Invasion and establishment of the Cane Toad (Bufo marinus)	Invasion and establishment of the Cane Toad (Bufo marinus)	Predicted
20044	Invasion, establishment and spread of Lantana (Lantana camara L. sens. Lat)	Invasion, establishment and spread of Lantana (Lantana camara L. sens. Lat)	Predicted
20052	Invasion and establishment of exotic vines and scramblers	Invasion and establishment of exotic vines and scramblers	Predicted
20061	Acacia ausfeldii	Ausfeld's Wattle	Known
20065	Invasion and establishment of Scotch Broom (Cytisus scoparius)	Invasion and establishment of Scotch Broom (Cytisus scoparius)	Predicted
20072	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Known
20079	Loss of Hollow-bearing Trees	Loss of Hollow-bearing Trees	Predicted
20088	Crinia sloanei	Sloane's Froglet	Predicted
20108	Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	Forest eucalypt dieback associated with over-abundant psyllids and Bell Miners	Predicted
20111	Glossopsitta pusilla	Little Lorikeet	Known
20116	Predation and hybridisation by Feral Dogs, Canis lupus familiaris	Predation and hybridisation by Feral Dogs, Canis lupus familiaris	Predicted
20129	Petroica phoenicea	Flame Robin	Known
20131	Hieraaetus morphnoides	Little Eagle	Known
20133	Petroica boodang	Scarlet Robin	Known
20134	Circus assimilis	Spotted Harrier	Known
20135	Daphoenositta chrysoptera	Varied Sittella	Known
20143	Epthianura albifrons	White-fronted Chat	Known
20153	Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif.	Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif.	Predicted
20240	Bothriochloa biloba	Lobed Bluegrass	Known
20265	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants	Predicted
20271	Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners Manorina melanocephala	Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners Manorina melanocephala	Predicted

DoE Protected Matters

Australian Government
Department of the Environment

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: 25/03/15 16:24:54

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Coordinates
Buffer: 5.0Km

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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	14
Listed Migratory Species:	10

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 and the heritage values of a place on the Register of the National Estate.

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.

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:	6
Commonwealth Heritage Places:	None
Listed Marine Species:	11
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.

Place on the RNE:	13
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	26
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

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
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community may 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 likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Endangered	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Fish		
Bidyanus bidyanus Silver Perch, Bidyan [76155]	Critically Endangered	Species or species habitat may occur within area
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Nyctophilus corbeni South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat known 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
Plants		
Androcalva procumbens [87153]	Vulnerable	Species or species habitat likely to 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 may 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		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		

Name	Status	Type of Presence
Fish		
Bidyanus bidyanus Silver Perch, Bidyan [76155]	Critically Endangered	Species or species habitat may occur within area
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Nyctophilus corbeni South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat known 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
Plants		
Androcalva procumbens [87153]	Vulnerable	Species or species habitat likely to 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 may 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		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		

Name	Threatened	Type of Presence
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
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Bank of Australia
Defence - DUBBO - HUTTED CAMP SITE
Defence - DUBBO TRAINING DEPOT

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
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
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor		
Swift Parrot [744]	Endangered	Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat may occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Historic		
Dubbo High School Main Building	NSW	Indicative Place
Dubbo Pioneer Cemetery	NSW	Indicative Place
Dubbo Showground Grandstand	NSW	Indicative Place
Eastonville	NSW	Indicative Place
Salvation Army Citadel (former)	NSW	Indicative Place
Dubbo Courthouse	NSW	Registered
Dundullimal Homestead and Stone Barn	NSW	Registered
Gaol (former) and Residence	NSW	Registered
Lands Board Office Building	NSW	Registered
Police Inspectors Residence	NSW	Registered
Public School	NSW	Registered
RAAF Base Dubbo (former)	NSW	Registered
Talbragar Shire Council Chambers (former)	NSW	Registered

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		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
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
Streptopelia chinensis Spotted Turtle-Dove [780]		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
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
Sus scrofa Pig [6]		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
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within

Name	Status	Type of Presence
		area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Coordinates

-32.27388 148.63869

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 Heritage and Register of National Estate properties, Wetlands of International 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.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

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.

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:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-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.

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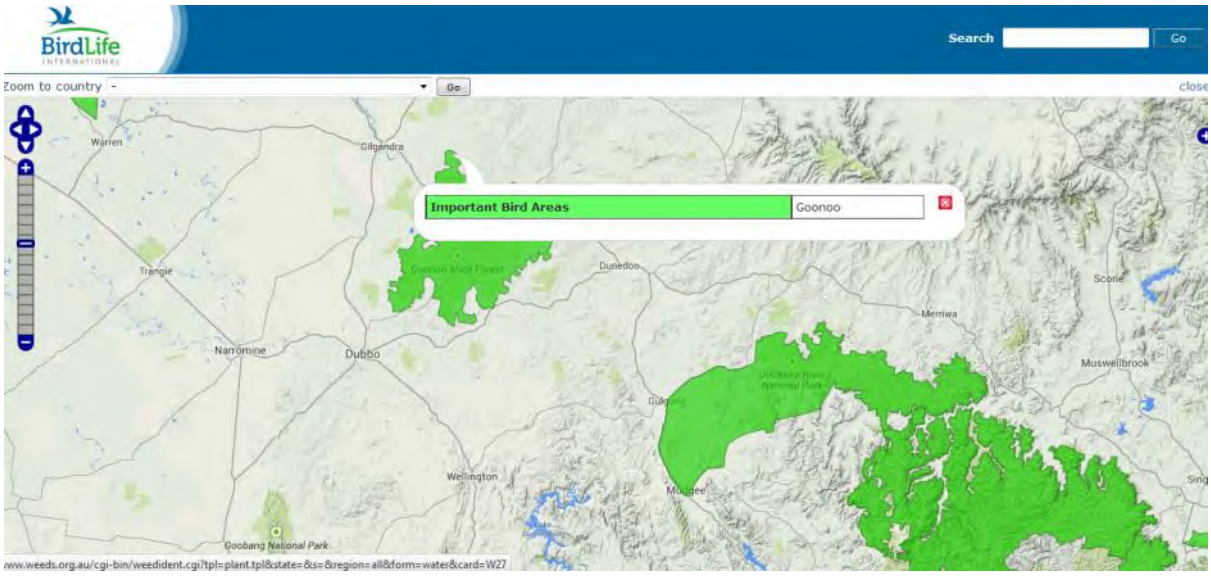
BIRDLIFE INTERNATIONAL-IMPORTANT BIRD AREAS



ATLAS OF LIVING AUSTRALIA

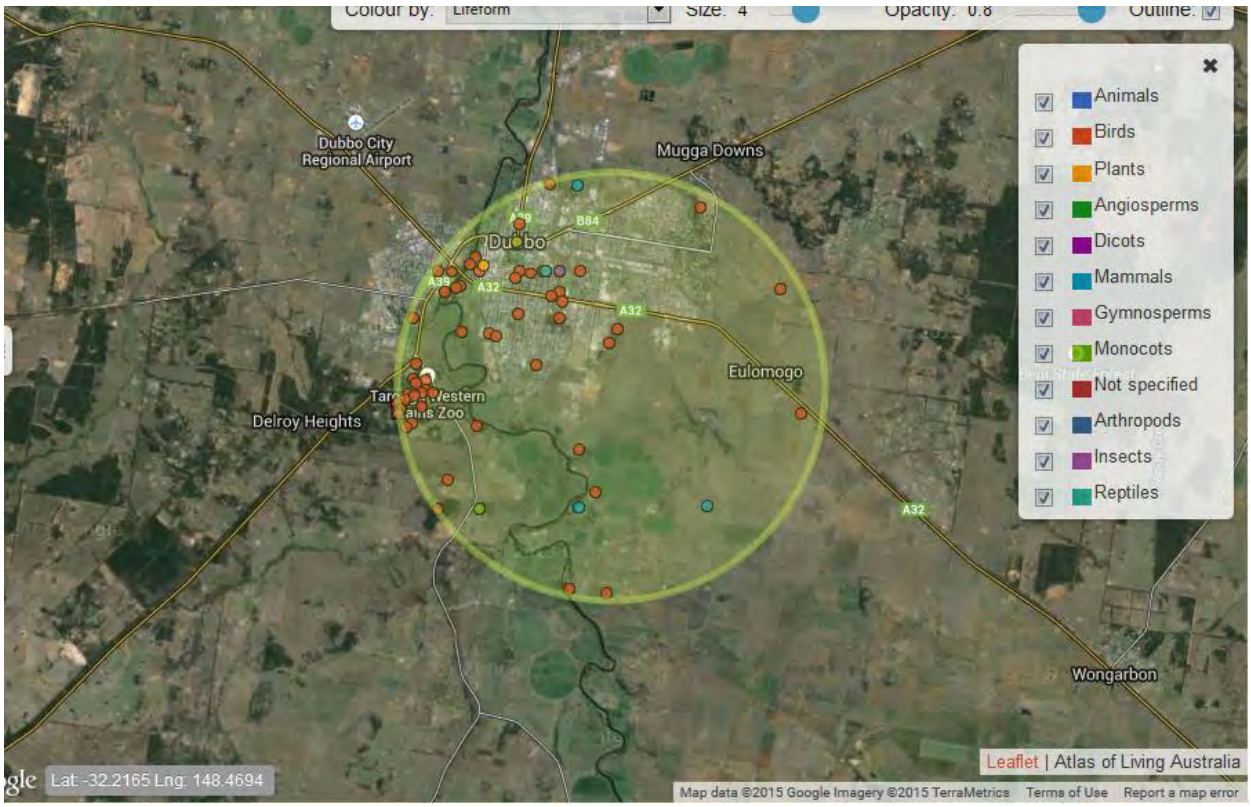
5KM CIRCLE

44 species recorded: 206 results for [all records] - within 5.0 km of point (-32.274452, 148.63289) State Conservation Endangered.

Name of species	Number of records
Australian Painted Snipe Rostratula australis	4
Barking Owl Ninox (Hieracoglaux) connivens	7
Bindjulang Dasyurus maculatus	2
Black Callitris Callitris endlicheri	5
Black-chinned Honeyeater Melithreptus (Eidopsarus) gularis gularis	1
Blue-billed Duck Oxyura australis	3
Brolga Grus (Mathewsia) rubicunda	1
Brown Treecreeper (eastern Subspecies) Climacteris (Climacteris) picumnus victoriae	2
Bush Stone-curlew Burhinus (Burhinus) grallarius	3
Diamond Firetail Stagonopleura (Stagonopleura) guttata	3
Emu # Dromaius novaehollandiae #	4
Flame Robin Petroica (Littlera) phoenicea	1
Glossy Black-cockatoo Calyptorhynchus (Calyptorhynchus) lathami	16
Golden Sun Moth Synemon plana	1
Grey Falcon Falco (Hierofalco) hypoleucos	1
Grey-crowned Babbler Pomatostomus (Pomatostomus) temporalis temporalis	12
Homoranthus Darwinioides Homoranthus darwinioides	1
Ingram's Zieria Zieria ingramii	1
Leafless Indigo Indigofera efoliata	9
Little Eagle Hieraaetus (Hieraaetus) morphnoides	16
Little Lorikeet Glossopsitta pusilla	17
Magpie Goose Anseranas semipalmata	3
Major Mitchell's Cockatoo Lophochroa leadbeateri	3
Malleefowl Leipoa ocellata	11
Mauve Burr-daisy Calotis glandulosa	2
Painted Honeyeater Grantiella picta	3
Pale-headed Snake Hoplocephalus bitorquatus	1
Red-tailed Tropicbird Phaethon rubricauda	1
Regent Honeyeater Anthochaera (Xanthomyza) phrygia	12
River Red Gum # Eucalyptus camaldulensis #	3
Rulingia Procumbens Rulingia procumbens	2
Silky Glycine Glycine canescens	1
Speckled Warbler Chthonicola sagittata	19
Spotted Harrier Circus assimilis	6
Spotted-throat Cowslip Diuris tricolor	3
Square-tailed Kite Lophoictinia isura	3
Stripe-faced Dunnart Sminthopsis macroura	9
Superb Parrot Polytelis swainsonii	4

Swamp Bush-pea # Pultenaea glabra #	**1**
Swift Parrot Lathamus discolor	**2**
Varied Sittella Daphoenositta (Neositta) chrysoptera	**4**
Weeping Myall Acacia pendula	**1**
White-browed Treecreeper Climacteris (Climacterobates) affinis affinis	**1**
White-fronted Chat Epthianura (Epthianura) albifrons	**1**
Grand Total	**206**

Not listed under TSC or EPBC Act in the Dubbo LGA

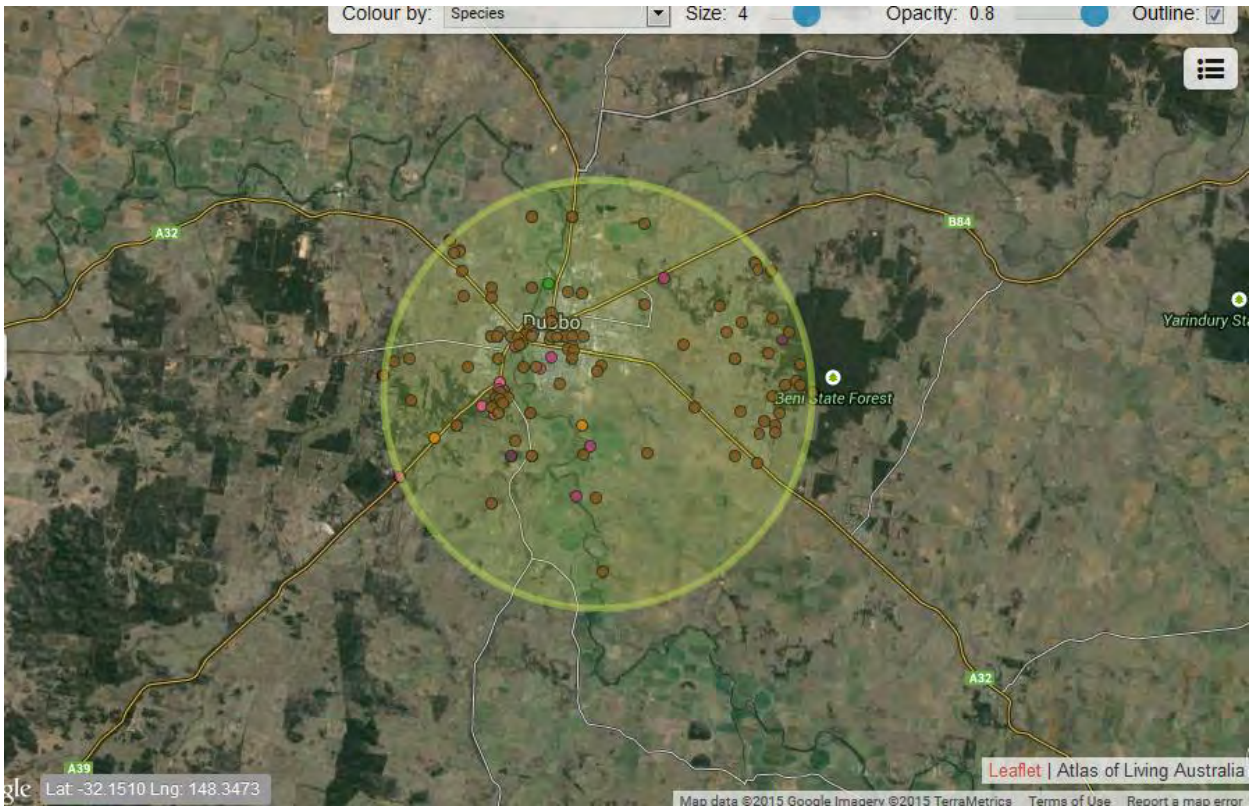


10KM CIRCLE

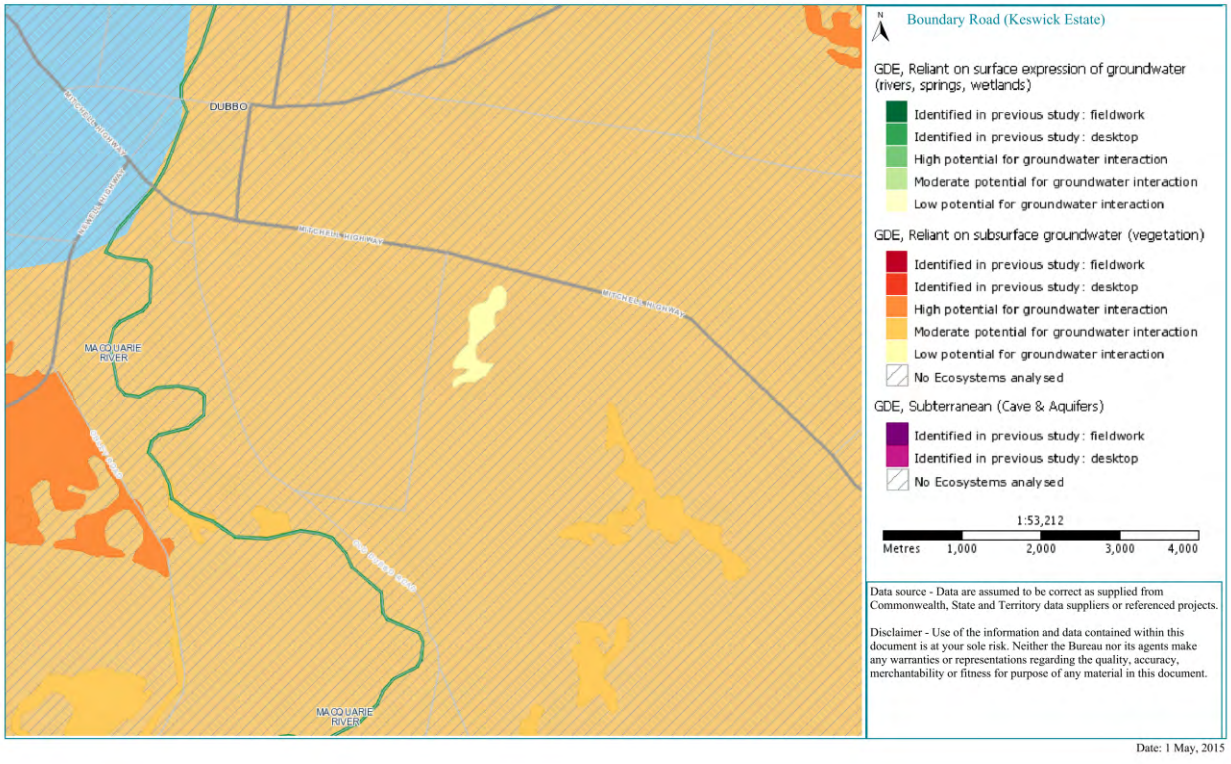
51 species: 519 results for [all records] - within 10.0 km of point (-32.274452, 148.63289) State Conservation Endangered

Name of species	Number of records
Acacia pendula Weeping Myall	2
Anseranas semipalmata Magpie Goose	8
Anthochaera (Xanthomyza) Phrygia Regent Honeyeater	14
Burhinus (Burhinus) grallarius Bush Stone-curlew	4
Calidris (Erolia) ferruginea Curlew Sandpiper	2
Callitris endlicheri Black Callitris	8
Calotis glandulosa Mauve Burr-daisy	2
Calyptorhynchus (Calyptorhynchus) lathami Glossy Black-cockatoo	16
Chalinolobus picatus Little Pied Bat	3

Chthonicola sagittata Speckled Warbler	68
Circus assimilis Spotted Harrier	21
Climacteris (Climacteris) picumnus victoriae Brown Treecreeper (eastern Subspecies)	4
Climacteris (Climacterobates) affinis affinis White-browed Treecreeper	1
Daphoenositta (Neositta) chrysoptera Varied Sittella	20
Dasyurus maculatus Bindjulang	2
Diuris tricolor Spotted-throat Cowslip	8
Dromaius novaehollandiae Emu	18
Epthianura (Epthianura) albifrons White-fronted Chat	14
Eucalyptus camaldulensis River Red Gum	5
Falco (Hierofalco) hypoleucos Grey Falcon	1
Geophaps (Geophaps) scripta Squatter Pigeon	1
Glossopsitta pusilla Little Lorikeet	45
Glycine canescens Silky Glycine	2
Grantiella picta Painted Honeyeater	4
Grus (Mathewsia) rubicunda Brolga	2
Hamirostra melanosternon Black-breasted Buzzard	2
Hieraaetus (Hieraaetus) morphnoides Little Eagle	76
Homoranthus darwinioides Homoranthus Darwinioides	1
Hoplocephalus bitorquatus Pale-headed Snake	1
Indigofera efoliata Leafless Indigo	11
Lathamus discolor Swift Parrot	2
Leipoa ocellata Malleefowl	13
Lophochroa leadbeateri Major Mitchell's Cockatoo	5
Lophoictinia isura Square-tailed Kite	4
Melanodryas (Melanodryas) cucullata cucullata Hooded Robin	1
Melithreptus (Eidopsarus) gularis gularis Black-chinned Honeyeater	1
Neophema (Neophema) pulchella Turquoise Parrot	1
Ninox (Hieracoglaux) connivens Barking Owl	11
Oxyura australis Blue-billed Duck	5
Pachycephala (Timixos) inornata Gilbert's Whistler	5
Petroica (Littlera) phoenicea Flame Robin	10
Phaethon rubricauda Red-tailed Tropicbird	5
Polytelis swainsonii Superb Parrot	7
Pomatostomus (Pomatostomus) temporalis temporalis Grey-crowned Babbler	36
Pultenaea glabra Swamp Bush-pea	1
Rostratula australis Australian Painted Snipe	12
Rulingia procumbens Rulingia Procumbens	3
Sminthopsis macroura Stripe-faced Dunnart	9
Stagonopleura (Stagonopleura) guttata Diamond Firetail	20
Synemon plana Golden Sun Moth	1
Zieria ingramii Ingram's Zieria	1
Grand Total	**519**



ATLAS OF GROUNDWATER DEPENDENT ECOSYSTEMS



DUBBO CITY COUNCIL NOXIOUS WEED LIST

African boxthorn	4	Locally Controlled Weed
Lycium ferocissimum		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
African feather grass	5	Restricted Plant
Pennisetum macrourum		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
African turnip weed - eastern	5	Restricted Plant
Sisymbrium thellungii		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
African turnip weed - western	5	Restricted Plant
Sisymbrium runcinatum		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Alligator weed	2	Regionally Prohibited Weed
Alternanthera philoxeroides		*The plant must be eradicated from the land and that land must be kept free of the plant*
Anchored water hyacinth	1	State Prohibited Weed
Eichhornia azurea		*The plant must be eradicated from the land and that land must be kept free of the plant*
Annual ragweed	5	Restricted Plant
Ambrosia artemisiifolia		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Arrowhead	4	Locally Controlled Weed
Sagittaria montevidensis		*The plant must not be sold, propagated or knowingly distributed*
Artichoke thistle	5	Restricted Plant
Cynara cardunculus		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Asparagus - climbing asparagus fern	4	Locally Controlled Weed
Asparagus plumosus		*The plant must not be sold, propagated or knowingly distributed*
Asparagus - ground asparagus	4	Locally Controlled Weed
Asparagus aethiopicus		*The plant must not be sold, propagated or knowingly distributed*
Asparagus weeds	4	Locally Controlled Weed
Asparagus species		*The plant must not be sold, propagated or knowingly distributed*
Athel pine	5	Restricted Plant
Tamarix aphylla		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Bear-skin fescue	5	Restricted Plant
Festuca gautieri		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Black knapweed	1	State Prohibited Weed
Centaurea nigra		*The plant must be eradicated from the land and that land must be kept free of the plant*
Black willow	2	Regionally Prohibited Weed
Salix nigra		*The plant must be eradicated from the land and that land must be kept free of the plant*
Blackberry	4	Locally Controlled Weed
Rubus fruticosus species aggregate		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*

Blue heliotrope	4	Locally Controlled Weed
Heliotropium amplexicaule		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Boneseed	1	State Prohibited Weed
Chrysanthemoides monilifera subsp. *monilifera*		*The plant must be eradicated from the land and that land must be kept free of the plant*
Bridal creeper	4	Locally Controlled Weed
Asparagus asparagoides		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Bridal veil creeper	1	State Prohibited Weed
Asparagus declinatus		*The plant must be eradicated from the land and that land must be kept free of the plant*
Broomrapes	1	State Prohibited Weed
Orobanche species		*The plant must be eradicated from the land and that land must be kept free of the plant*
Burr ragweed	5	Restricted Plant
Ambrosia confertiflora		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Cabomba	5	Restricted Plant
Cabomba species		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Cape broom	4	Locally Controlled Weed
Genista monspessulana		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Cat's claw creeper	2	Regionally Prohibited Weed
Dolichandra unguis-cati		*The plant must be eradicated from the land and that land must be kept free of the plant*
Cayenne snakeweed	5	Restricted Plant
Stachytarpheta cayennensis		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Chilean needle grass	4	Locally Controlled Weed
Nassella neesiana		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Chinese violet	1	State Prohibited Weed
Asystasia gangetica subsp. *micrantha*		*The plant must be eradicated from the land and that land must be kept free of the plant*
Clockweed	5	Restricted Plant
Gaura parviflora		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Columbus grass	4	Locally Controlled Weed
Sorghum x *almum*		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Coolatai grass	3	Regionally Controlled Weed
Hyparrhenia hirta		*The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed*
Corn sowthistle	5	Restricted Plant
Sonchus arvensis		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Dodder	5	Restricted Plant

Cuscuta species		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Espartillo - broad kernel	5	Restricted Plant
Amelichloa caudata		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Espartillo - narrow kernel	5	Restricted Plant
Amelichloa brachychaeta		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Eurasian water milfoil	1	State Prohibited Weed
Myriophyllum spicatum		*The plant must be eradicated from the land and that land must be kept free of the plant*
European hackberry	4	Locally Controlled Weed
Celtis australis		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Fine-bristled burr grass	5	Restricted Plant
Cenchrus brownii		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Fireweed	4	Locally Controlled Weed
Senecio madagascariensis		*The plant must not be sold, propagated or knowingly distributed*
Flax-leaf broom	4	Locally Controlled Weed
Genista linifolia		*The plant must not be sold, propagated or knowingly distributed*
Fountain grass	5	Restricted Plant
Cenchrus setaceus		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Frogbit	1	State Prohibited Weed
Limnobium laevigatum		*The plant must be eradicated from the land and that land must be kept free of the plant*
Gallon's curse	5	Restricted Plant
Cenchrus biflorus		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Gamba grass	5	Restricted Plant
Andropogon gayanus		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Giant reed	4	Locally Controlled Weed
Arundo donax		*The plant must not be sold, propagated or knowingly distributed*
Glaucous starthistle	5	Restricted Plant
Carthamus leucocaulos		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Golden thistle	5	Restricted Plant
Scolymus hispanicus		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Green cestrum	3	Regionally Controlled Weed
Cestrum parqui		*The plant must be fully and continuously suppressed and destroyed*
Grey sallow	2	Regionally Prohibited Weed
Salix cinerea		*The plant must be eradicated from the land and that land must be kept free of the plant*
Harrisia cactus	4	Locally Controlled Weed
Harrisia species		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Hawkweeds	1	State Prohibited Weed

Hieracium species		*The plant must be eradicated from the land and that land must be kept free of the plant*
Honey locust	3	Regionally Controlled Weed
Gleditsia triacanthos		*The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed*
Horsetails	1	State Prohibited Weed
Equisetum species		*The plant must be eradicated from the land and that land must be kept free of the plant*
Hydrocotyl	1	State Prohibited Weed
Hydrocotyl ranunculoides		*The plant must be eradicated from the land and that land must be kept free of the plant*
Hymenachne	1	State Prohibited Weed
Hymenachne amplexicaulis and hybrids		*The plant must be eradicated from the land and that land must be kept free of the plant*
Johnson grass	4	Locally Controlled Weed
Sorghum halepense		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Karroo thorn	1	State Prohibited Weed
Acacia karroo		*The plant must be eradicated from the land and that land must be kept free of the plant*
Kidney-leaf mud plantain	1	State Prohibited Weed
Heteranthera reniformis		*The plant must be eradicated from the land and that land must be kept free of the plant*
Kochia	1	State Prohibited Weed
Bassia scoparia		*The plant must be eradicated from the land and that land must be kept free of the plant*
Koster's curse	1	State Prohibited Weed
Clidemia hirta		*The plant must be eradicated from the land and that land must be kept free of the plant*
Lagarosiphon	1	State Prohibited Weed
Lagarosiphon major		*The plant must be eradicated from the land and that land must be kept free of the plant*
Leafy elodea	4	Locally Controlled Weed
Egeria densa		*The plant must not be sold, propagated or knowingly distributed*
Lippia	4	Locally Controlled Weed
Phyla canescens		*The plant must not be sold, propagated or knowingly distributed* ***except incidentally in hay or lucerne***
Long-leaf willow primrose	3	Regionally Controlled Weed
Ludwigia longifolia		*The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed*
Mesquite	2	Regionally Prohibited Weed
Prosopis species		*The plant must be eradicated from the land and that land must be kept free of the plant*
Mexican feather grass	1	State Prohibited Weed
Nassella tenuissima		*The plant must be eradicated from the land and that land must be kept free of the plant*
Mexican poppy	5	Restricted Plant
Argemone mexicana		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Miconia	1	State Prohibited Weed

Miconia species		*The plant must be eradicated from the land and that land must be kept free of the plant*
Mikania vine	1	State Prohibited Weed
Mikania micrantha		*The plant must be eradicated from the land and that land must be kept free of the plant*
Mimosa	1	State Prohibited Weed
Mimosa pigra		*The plant must be eradicated from the land and that land must be kept free of the plant*
Mossman River grass	5	Restricted Plant
Cenchrus echinatus		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Mother-of-millions	4	Locally Controlled Weed
Bryophyllum species		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Pampas grass	3	Regionally Controlled Weed
Cortaderia species		*The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed*
Parkinsonia	2	Regionally Prohibited Weed
Parkinsonia aculeata		*The plant must be eradicated from the land and that land must be kept free of the plant*
Parthenium weed	1	State Prohibited Weed
Parthenium hysterophorus		*The plant must be eradicated from the land and that land must be kept free of the plant*
Pond apple	1	State Prohibited Weed
Annona glabra		*The plant must be eradicated from the land and that land must be kept free of the plant*
Prickly acacia	1	State Prohibited Weed
Acacia nilotica		*The plant must be eradicated from the land and that land must be kept free of the plant*
Prickly pear - common pear	4	Locally Controlled Weed
Opuntia stricta		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Prickly pear - Hudson pear	4	Locally Controlled Weed
Cylindropuntia rosea		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Prickly pear - smooth tree pear	4	Locally Controlled Weed
Opuntia monacantha		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Prickly pear - tiger pear	4	Locally Controlled Weed
Opuntia aurantiaca		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Prickly pear - velvety tree pear	4	Locally Controlled Weed
Opuntia tomentosa		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Red rice	5	Restricted Plant

Oryza rufipogon		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Rhus tree	4	Locally Controlled Weed
Toxicodendron succedaneum		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Rubber vine	1	State Prohibited Weed
Cryptostegia grandiflora		*The plant must be eradicated from the land and that land must be kept free of the plant*
Sagittaria	4	Locally Controlled Weed
Sagittaria platyphylla		*The plant must not be sold, propagated or knowingly distributed*
Salvinia	2	Regionally Prohibited Weed
Salvinia molesta		*The plant must be eradicated from the land and that land must be kept free of the plant*
Scotch broom	4	Locally Controlled Weed
Cytisus scoparius		*The plant must not be sold, propagated or knowingly distributed*
Senegal tea plant	1	State Prohibited Weed
Gymnocoronis spilanthoides		*The plant must be eradicated from the land and that land must be kept free of the plant*
Serrated tussock	4	Locally Controlled Weed
Nassella trichotoma		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Siam weed	1	State Prohibited Weed
Chromolaena odorata		*The plant must be eradicated from the land and that land must be kept free of the plant*
Silk forage sorghum	4	Locally Controlled Weed
Sorghum species hybrid cultivar "Silk"		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread*
Silverleaf nightshade	4	Locally Controlled Weed
Solanum elaeagnifolium		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Smooth-stemmed turnip	5	Restricted Plant
Brassica barrelieri subsp. *oxyrrhina*		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Soldier thistle	5	Restricted Plant
Picnomon acarna		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Spongeplant	1	State Prohibited Weed
Limnobium spongia		*The plant must be eradicated from the land and that land must be kept free of the plant*
Spotted knapweed	1	State Prohibited Weed
Centaurea stoebe subsp. *micranthos*		*The plant must be eradicated from the land and that land must be kept free of the plant*
Texas blueweed	5	Restricted Plant
Helianthus ciliaris		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*
Tree-of-heaven	4	Locally Controlled Weed
Ailanthus altissima		*The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed*
Tropical soda apple	1	State Prohibited Weed

Solanum viarum		*The plant must be eradicated from the land and that land must be kept free of the plant*
Water caltrop	1	State Prohibited Weed
Trapa species		*The plant must be eradicated from the land and that land must be kept free of the plant*
Water hyacinth	2	Regionally Prohibited Weed
Eichhornia crassipes		*The plant must be eradicated from the land and that land must be kept free of the plant*
Water lettuce	1	State Prohibited Weed
Pistia stratiotes		*The plant must be eradicated from the land and that land must be kept free of the plant*
Water soldier	1	State Prohibited Weed
Stratiotes aloides		*The plant must be eradicated from the land and that land must be kept free of the plant*
Willows	4	Locally Controlled Weed
Salix species		*The plant must not be sold, propagated or knowingly distributed*
Witchweeds	1	State Prohibited Weed
Striga species		*The plant must be eradicated from the land and that land must be kept free of the plant*
Yellow burrhead	1	State Prohibited Weed
Limnocharis flava		*The plant must be eradicated from the land and that land must be kept free of the plant*
Yellow nutgrass	5	Restricted Plant
Cyperus esculentus		*The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with*

APPENDIX 3: ASSESSMENT OF LIKELIHOOD OF THREATENED SPECIES, COMMUNITIES AND POPULATIONS

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
Australasian Bittern	*Botaurus poiciloptilus*	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleoacharis spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch.	Endangered	Endangered	Known	Species or species habitat may occur within Area	Unlikely
Ausfeld's Wattle	Acacia ausfeldii	Found to the east of Dubbo in the Mudgee-Ulan-Gulgong area of the NSW South Western Slopes bioregion, with some records in the adjoining Brigalow Belt South, South Eastern Highlands and the Sydney Basin bioregions. Populations are recorded from Yarrobil National Park, Goodiman State Conservation Area and there is a 1963 record from Munghorn Gap Nature Reserve. A large population is also known from Tuckland State Forest to the northwest of Gulgong. Established plants are likely to be killed by fire, as mature and juvenile plants have a single-stemmed growth form. Associated species include Eucalyptus albens, E. blakelyi and Callitris spp., with an understorey dominated by Cassinia spp. and grasses.	Vulnerable		Known		Potential
Bilby	Macrotis lagotis	Once widespread in arid, semi-arid and relatively fertile areas, the Bilby is now restricted to arid regions and remains a threatened species. The Bilby prefers arid habitats because of the spinifex grass and acacia shrub.	Presumed extinct	Vulnerable			No
Barking Owl	*Ninox connivens*	Nesting occurs during mid-winter and spring. Female incubates for 5 weeks, roosts outside the hollow when chicks are 4 weeks old, then fledging starts 2 weeks later. Young are dependent for several months Territorial pairs respond strongly to recordings of Barking Owl calls from up to 6 kilometres away, though humans rarely hear this response farther than 1.5 kilometres. Because disturbance reduces the pair's foraging time, and can pull the female off her eggs even on cold nights, recordings should not be broadcast unnecessarily nor during the nesting season.	Vulnerable		Known		Likely. Pair known to occupy territory adjacent to the Macquarie River. Hunting ground may exist in the Subject Site. Hollow bearing trees adjacent to a permanent watercourse (breeding habitat) does not occur in the Subject Site.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
Black Falcon	Falco subniger	The Black Falcon is widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kilometres (Marchant & Higgins 1993). The Black Falcon occurs as solitary individuals, in pairs, or in family groups of parents and offspring.	Vulnerable		Known		Potential
Black-breasted Buzzard	*Hamirostra melanosternon*	Lives in a range of inland habitats, especially along timbered watercourses which is the preferred breeding habitat. Also hunts over grasslands and sparsely timbered woodlands. Not a powerful hunter, despite its size, mostly taking reptiles, small mammals, birds, including nestlings, and carrion. Also specialises in feeding on large eggs, including those of emus, which it cracks on a rock. Breeds from August to October near water in a tall tree. The stick nest is large and flat and lined with green leaves. Normally two eggs are laid.	Vulnerable		Predicted		Potential. Hunting ground may exist in the Subject Site, however tall trees near water (breeding habitat) do not occur in the Subject Site.
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (*Eucalyptus sideroxylon*), White Box (*E. albens*), Inland Grey Box (*E. microcarpa*), Yellow Box (*E. melliodora*) and Forest Red Gum (*E. tereticornis*). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees. A gregarious species usually seen in pairs and small groups of up to 12 birds. Feeding territories are large making the species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares Breeds solitarily or co-operatively, with up to five or six adults, from June to December. The nest is placed high in the crown of a tree, in the uppermost lateral branches, hidden by foliage. It is a compact, suspended, cup-shaped nest. Two or three eggs are laid and both parents and occasionally helpers feed the young.	Vulnerable		Known		Potential.
Black-necked Stork	*Ephippiorhynchus asiaticus*	Black-necked Storks are mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and	Endangered		Predicted		Unlikely. Wetland habitat suitable for this species

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation. In NSW, Black-necked Storks breed in late spring and summer. Breeding activity has been recorded in most months, with activities from nest construction to fledging of young recorded from May to January. Most activity, however, takes place between June and December, and clutches present May to September. In NSW, Storks usually nest in a tall, live and isolated paddock tree, but also in other trees, including paperbarks, or even lower shrubs within wetlands. The nest is a large platform, 1-2 metres in diameter, made in a live or dead tree, in or near a freshwater swamp. The clutch-size of nests in NSW is not properly known, but nests have been observed with from one to three young in the nest. Broods of four young have been recorded in northern Queensland.					does not occur in the Subject Site.
Black-tailed Godwit	*Limosa limosa*	Primarily a coastal species. Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps. Individuals have been recorded in wet fields and sewerage treatment works. Forages for insects, crustaceans, molluscs, worms, larvae, spiders, fish eggs, frog eggs and tadpoles in soft mud or shallow water. Roosts and loafs on low banks of mud, sand and shell bars. Frequently recorded in mixed flocks with Bar-tailed Godwits.	Vulnerable		Predicted		Unlikely. Suitable habitat for this species does not occur in the Subject Site.
Blue-billed Duck	*Oxyura australis*	The Blue-billed Duck 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. It will fly if disturbed, but prefers to dive if approached. Blue-billed Ducks will feed by day far from the shore, particularly if dense cover is available in the central parts of the wetland. They feed on the bottom of swamps eating seeds, buds, stems, leaves, fruit and small aquatic insects such as the larvae of midges, caddisflies and dragonflies. Blue-billed Ducks are partly migratory, with short-distance movements between breeding swamps and overwintering lakes	Vulnerable		Known		Unlikely. Suitable habitat for this species does not occur in the Subject Site.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		with some long-distance dispersal to breed during spring and early summer. Blue-billed Ducks usually nest solitarily in Cumbungi over deep water between September and February. They will also nest in trampled vegetation in Lignum, sedges or Spike-rushes, where a bowl-shaped nest is constructed. The most common clutch size is five or six. Males take no part in nest-building or incubation. Young birds disperse in April-May from their breeding swamps in inland NSW to non-breeding areas on the Murray River system and coastal lakes.					
Brolga	*Grus rubicunda*	Though Brolgas often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged. They feed using their heavy straight bill as a 'crowbar' to probe the ground or turn it over, primarily on sedge roots and tubers. They will also take large insects, crustaceans, molluscs and frogs. The nest comprises a platform of grasses and sticks, augmented with mud, on an island or in the water. Two eggs are laid from winter to autumn.	Vulnerable		Known		Unlikely. Suitable habitat for this species does not occur in the Subject Site.
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	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 inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains. Sedentary, considered to be resident in many locations throughout its range; present in all seasons or year-round at many sites; territorial year-round, though some birds may disperse locally after breeding. Gregarious and usually observed in pairs or small groups of eight to 12 birds; terrestrial and arboreal in about equal proportions; active, noisy and conspicuous while foraging on trunks and branches of trees and amongst fallen timber; spend much more time foraging on the ground and fallen logs than other treecreepers. When foraging in trees and on the ground, they peck and probe for	Vulnerable		Known		Likely

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		insects, mostly ants, amongst the litter, tussocks and fallen timber, and along trunks and lateral branches; up to 80% of the diet is comprised of ants; other invertebrates (including spiders, insects larvae, moths, beetles, flies, hemipteran bugs, cockroaches, termites and lacewings) make up the remaining percentage; nectar from Mugga Ironbark (*Eucalyptus sideroxylon*) and paperbarks, and sap from an unidentified eucalypt are also eaten, along with lizards and food scraps; young birds are fed ants, insect larvae, moths, craneflies, spiders and butterfly and moth larvae. Hollows in standing dead or live trees and tree stumps are essential for nesting. The species breeds in pairs or co-operatively in territories which range in size from 1.1 to 10.7 ha (mean = 4.4 ha). Each group is composed of a breeding pair with retained male offspring and, rarely, retained female offspring. Often in pairs or cooperatively breeding groups of two to five birds.					
Bush Stone-curlew	*Burhinus grallarius*	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.	Endangered		Known		Unlikely.
Cattle Egret	Ardea ibis	The Cattle Egret is widespread and common according to migration movements and breeding localities surveys. Two major distributions have been located; from north-east Western Australia to the Top End of the Northern Territory and around south-east Australia. The Cattle Egret breeds in coastal areas.		Migratory > Listed		Species or species habitat may occur within area	Potential.
Curlew Sandpiper	Calidris (Erolia) ferruginea	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. Curlew Sandpipers forage on mudflats and nearby shallow water.	Endangered	Migratory > Marine> Listed			Unlikely. Previously recorded in 10km radius however suitable habitat for this species does not occur in the Subject Site.
Diamond Firetail	*Stagonopleura guttata*	Usually encountered in flocks of between five to 40 birds, occasionally more. 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.	Vulnerable		Known		Likely. Habitat within the Subject Site may be suitable for this species. Requires shrubby

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. 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). Groups separate into small colonies to breed, between August and January. Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially for roosting. Appears to be sedentary, though some populations move locally, especially those in the south. Has been recorded in some towns and near farm houses.					understorey.
Eastern Pygmy-possum	Cercartetus nanus	The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (Pseudocheirus peregrinus) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.	Vulnerable		Predicted		Unlikely.
Fork-tailed Swift	Apus pacificus	The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia (Higgins 1999). In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs (Higgins 1999).		Migratory > Listed		Species or species habitat may occur within area	Potential. Suitable habitat for this species does not occur in the Subject Site.
Flame Robin	*Petroica phoenicea*	Breeds in upland tall moist eucalypt forests and woodlands, often	Vulnerable		Known		Potential. Habitat

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		on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (ie valleys below the ranges, and to the western slopes and plains). Often occurs in recently burnt areas; however, habitat becomes unsuitable as vegetation closes up following regeneration. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. In winter, occasionally seen in heathland or other shrublands in coastal areas. Birds forage from low perches, from which they sally or pounce onto small invertebrates which they take from the ground or off tree trunks, logs and other coarse woody debris. Flying insects are often taken in the air and sometimes gleans for invertebrates from foliage and bark. In their autumn and winter habitats, birds often sally from fence-posts or thistles and other prominent perches in open habitats. Occur singly, in pairs, or in flocks of up to 40 birds or more; in the non-breeding season they will join up with other insectivorous birds in mixed feeding flocks. Breeds in spring to late summer. Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks. Builds an open cup nest made of plant materials and spider webs. Eggs are oval in shape and are pale bluish- or greenish-white and marked with brownish blotches; clutch size is three or four eggs.					within the Subject Site may be suitable for this species. Requires shrubby understorey.
Freckled Duck	*Stictonetta naevosa*	Prefer 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. Feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates. Nesting usually occurs between October and December but can take place at other times when conditions are favourable.	Vulnerable		Predicted		Unlikely. Suitable habitat for this species does not occur in the Subject Site.

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		Nests are usually located in dense vegetation at or near water level.					
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	Community occurs on brown loam or clay, alluvial or colluvial soils on prior streams and abandoned channels or slight depressions on undulating plains or flats of the western slopes. Community often occurs upslope from River Red Gum communities above frequently inundated areas of the floodplain. It also occurs on colluvium soils on lower slopes and valley flats. Less than 5% of the original extent is estimated to remain. Shrubs include Wilga, Deane's Wattle, Hop Bush, Cassia, Water Bush and Sifton Bush.	Endangered Ecological Community		Known		Yes. Known to occur in Subject Site.
Golden Sun Moth	Synemon plana	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species' historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, through to central and western Victoria, to Bordertown in eastern South Australia. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses Austrodanthonia spp. Grasslands dominated by wallaby grasses are typically low and open - the bare ground between the tussocks is thought to be an important microhabitat feature for the Golden Sun Moth, as it is typically these areas on which the females are observed displaying to attract males.	Endangered	Critically Endangered			No. One previous record in proximity to the Subject Site is likely to be incorrect. No suitable habitat for this species occurs in the Subject Site.
Gilbert's Whistler	*Pachycephala inornata*	The Gilbert's Whistler occurs in a range of habitats within NSW, though the shared feature appears to be a dense shrub layer. It is widely recorded in mallee shrublands, but also occurs in box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests. Though at this stage it is only known to use this habitat along the Murray, Edwards and Wakool Rivers. Within the mallee the species is often found in association with an understorey of spinifex and low shrubs including wattles, hakeas, sennas and hop-bushes. In woodland habitats, the understorey comprises dense patches of shrubs, particularly thickets of regrowth *Callitris* pine. Parasitic 'cherries' (*Exocarpus* species) appear to be an important habitat component in Belah and Red Gum communities, though in the latter case other dense shrubs, such as Lignum and wattles, are also utilised. The Gilbert's Whistler forages on or near the ground in shrub	Vulnerable		Known		Unlikely.

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		thickets and in tops of small trees. Its food consists mainly of spiders and insects such as caterpillars, beetles and ants, and occasionally, seeds and fruits are eaten. The movements of this species are poorly known but it is believed that generally it does not make any regular large-scale movements and pairs may hold and defend territories all year round.					
Great Egret, White Egret	Ardea alba	Great Egrets prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands. Great Egrets can be seen alone or in small flocks, often with other egret species, and roost at night in groups. The Great Egret usually feeds alone. It feeds on molluscs, amphibians, aquatic insects, small reptiles, crustaceans and occasionally other small animals, but fish make up the bulk of its diet. The Great Egret usually hunts in water, wading through the shallows, or standing motionless before stabbing at prey. Birds have also been seen taking prey while in flight.		Migratory > Listed		Species or species habitat likely to occur within area	Potential
Glossy Black-cockatoo	*Calyptorhynchus lathami*	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 metres in which stands of she-oak species, particularly Black She-oak (*Allocasuarina littoralis*), Forest She-oak (*A. torulosa*) or Drooping She-oak (*A. verticillata*) occur. In the Riverina area, again usually associated with woodlands containing Drooping She-oak but also recorded in open woodlands dominated by Belah (Casuarina cristata). Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. One or two eggs are laid between March and August.	Vulnerable	Endangered (Only South-Australian Sub-species).	Known		Potential. Goonoo SCA is a stronghold for this species.
Greater Long-eared Bat	*Nyctophilus timoriensis/corbeni (South-eastern form)*	The South-eastern Long-eared Bat occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands. The species also occurs in Bulloke woodland, Brigalow woodland, Belah woodland, Smooth-barked Apple, *Angophora leiocarpa,* woodland; River Red Gum, *Eucalyptus camaldulensis,* forests lining watercourses and lakes, Black Box, *Eucalyptus largiflorens,* woodland, dry sclerophyll forest.	Vulnerable	Endangered	Predicted	Species or species habitat may occur within Area	Potential. Some trees with small hollows or decorating bark in the Subject Site.
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar		Inland Grey Box Woodland occurs on fertile soils of the western slopes and plains of NSW. The community generally occurs where average rainfall is 375- 800 mm pa and the mean maximum annual temperature is 22- 26°C. There is a correlation between the distribution of *Eucalyptus microcarpa* communities and soils of Tertiary and Quaternary	Endangered Ecological Community	Endangered	Known	Community may occur within area	Yes. Known to occur in the Subject Site on undulating land and footslopes

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Peneplain, Nandewar and Brigalow Belt South Bioregions/Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia		alluvial origin, largely corresponding with the Red Brown Earths. The majority of remnant patches of Inland Grey Box Woodland survive with trees largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification. Some species that are part of the community appear intolerant to heavy grazing by domestic stock and are confined to the least disturbed remnants.					
Grey Falcon	*Falco hypoleucos*	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. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring; two or three eggs are laid.	Endangered		Known		Potential to have hunting areas within the Subject Site.
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Flight is laborious so birds prefer to hop to the top of a tree and glide down to the next one. Birds are generally unable to cross large open areas. Live in family groups that consist of a breeding pair and young from previous breeding seasons. A group may consist of up to fifteen birds. All members of the family group remain close to each other when foraging. A soft 'chuck' call is made by all birds as a way of keeping in contact with other group members. Feed on invertebrates, either by foraging on the trunks and branches of eucalypts and other woodland trees or on the ground, digging and probing amongst litter and tussock grasses Build and maintain several conspicuous, dome-shaped stick nests about the size of a football. A nest is used as a dormitory for roosting each night. Nests are usually located in shrubs or sapling eucalypts, although they may be built in the outermost leaves of	Vulnerable		Known		Yes. Known. Suitable habitat for this species is known to occur in the Subject Site

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		low branches of large eucalypts. Nests are maintained year round, and old nests are often dismantled to build new ones. Breed between July and February. Usually two to three eggs are laid and incubated by the female. During incubation, the adult male and several helpers in the group may feed the female as she sits on the nest. Young birds are fed by all other members of the group. Territories range from one to fifty hectares (usually around ten hectares) and are defended all year. Territorial disputes with neighbouring groups are frequent and may last up to several hours, with much calling, chasing and occasional fighting.					
Homoranthus darwinioides	*Homoranthus darwinioides*	Rare in the central tablelands and western slopes of NSW, occurring from Putty to the Dubbo district. It is found west of Muswellbrook between Merriwa and Bylong, and north of Muswellbrook to Goonoo SF. The species has been collected from Lee's Pinch, but not relocated at its original locality north of Mt Coricudgy above the headwaters of Widden Brook. Goonoo SF is established as a definite locality. Grows in in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand. Associated species include Callitris endlicheri, Eucalyptus crebra, E. fibrosa, E. trachyphloia, E. beyeri subsp. illaquens, E. dwyeri, E. rossii, Leptospermum divaricatum, Melaleuca uncinata, Calytrix tetragona, Allocasuarina spp. and Micromyrtus spp. Flowers in spring or from March to December. The species has been cultivated in Sydney from Rylstone cuttings and at Burrendong Arboretum near Wellington. Forms small shrubs or shrublets, often in tangled masses. It has a localised distribution and may be the dominant undershrub at some sites. Its abundance in populations ranges from rare (only one plant at site) to very locally abundant.	Vulnerable	Vulnerable	Known		Potential to occur in the Subject Site. Known to occur in Goonoo SCA.
Lathams Snipe	Gallinago hardwickii	Latham's Snipe is a non-breeding visitor to south-eastern Australia. The distribution of Latham's Snipe is naturally fragmented (although, because of the mobility of the species, this is unlikely to have any effect on survival). The distribution is fragmented because the preferred habitat (ie freshwater wetlands) occurs in patches throughout the non-breeding grounds (Weston 2006, pers. comm.).		Listed		Species or species habitat may occur within area	Unlikely. Suitable habitat for this species does not occur in the Subject Site.
Hooded Robin (south-eastern	*Melanodryas*	Prefers lightly wooded country, usually open eucalypt woodland,	Vulnerable		Known		Unlikely

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form)	*cucullata cucullata*	acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Often perches on low dead stumps and fallen timber or on low-hanging branches, using a perch-and-pounce method of hunting insect prey. Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season. May breed any time between July and November, often rearing several broods. The nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than 1 metre to 5 metres above the ground. The nest is defended by both sexes with displays of injury-feigning, tumbling across the ground. A clutch of two to three is laid and incubated for fourteen days by the female. Two females often cooperate in brooding.					
Keith's Zieria		Grows in dry sclerophyll forest on light sandy soils. All known populations have been recorded in Eucalyptus-Callitris woodland or open forest with a shrubby to heathy understorey. Mostly from gentle slopes in red-brown and yellow-brown sandy loams, often with a rocky surface. Associated and understorey species include Eucalyptus crebra, Eucalyptus fibrosa, Eucalyptus dwyeri, Eucalyptus beyeriana, Eucalyptus microcarpa, Callitris endlicheri, Allocasuarina diminuta, Allocasuarina distyla, Allocasuarina verticillata, Leptospermum divaricatum, Leptospermum parvifolium, Acacia triptera, Acacia gladiiformis, Acacia brownii, Grevillea floribunda, Grevillea triternata, Hakea decurrens, Boronia glabra, Philotheca salsolifolia, Leucopogon attenuatus, Melaleuca uncinata, Melaleuca erubescens, Kunzea parvifolia, Calytrix tetragona, Brachyloma daphnoides, Melichrus urceolatus, Cassinia aculeata, Dodonaea viscosa subsp. spatulata, Dodonaea peduncularis, Dodonaea heteromorpha, Dillwynia sericea, Hibbertia riparia, Dampiera lanceolata, Dianella longifolia, Prostanthera species and Goodenia species. Flowering time is in spring and plants bear fruit in summer. Plants can produce flowers and fruits any time between July and March. Grows only in small localised populations within the north-east and central areas of Goonoo State Forest. Population sizes vary from 6 to 80 individuals. The age structure within populations may be even and single-aged or uneven and multi-aged.	Endangered	Endangered	Known		Unlikely.

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Koala	*Phascolarctos cinereus*	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.	Vulnerable		Known	Species or species Known to occur within Area	Potential
Leafless Indigo	Indigofera efoliata	Indigofera efoliata occurs in the central western slopes of NSW, from Dubbo to Geurie (Ayres et al., 1996). In August 1955, the species was recorded along the Dubbo to Minore railway line and road, on Wallaringa and Geurie properties and in Goonoo State Forest (DECC, 2005). Forty eight sites were searched in November 1997, but no plants were found. There are only two early records that contain precise locality details, both of which have been either heavily grazed or cleared of native vegetation, with one site now supporting a dense cover of weeds (Mackay & Gross, 1998). The species is very rare and considered to be possibly extinct (DECC, 2005). The species occurs within the Central West (NSW) Natural Resource Management Regions (DECC, 2005). Indigofera efoliata prefers stony ground in red-brown sandy loam on a slight rise, among ironstone formation (Harden, 1991; Ayres et al., 1996; Mackay & Gross, 1998). It appears to inhabit Yellow-box (Eucalyptus melliodora) woodland (Mackay & Gross, 1998), E. crebra–Callitris glaucophylla dry sclerophyll forest and E. microcarpa–Callitris glaucophylla tall woodland (DECC, 2005). The average annual rainfall where the species has been recorded is between 475 and 600 mm (Mackay & Gross, 1998).	Endangered	Endangered	Known		Unlikely.
Large-eared Pied Bat	*Chalinolobus dwyeri*	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes.	Vulnerable	Vulnerable	Predicted	Species or species habitat may occur within Area	Unlikely
Little Eagle	*Hieraaetus morphnoides*	Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior	Vulnerable		Known		Potential have hunting grounds

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		NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.					in the Subject Site
Little Lorikeet	Glossopsitta pusilla	Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards Gregarious, travelling and feeding in small flocks (<10), though often with other lorikeets. Flocks numbering hundreds are still occasionally observed and may have been the norm in past centuries. Roosts in treetops, often distant from feeding areas. 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). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like Allocasuarina. Nesting season extends from May to September. In years when flowering is prolific, Little Lorikeet pairs can breed twice, producing 3-4 young per attempt. However, the survival rate of fledglings is unknown. Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophoras, Melaleucas and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species.	Vulnerable		Known		Potential
Little Pied Bat	*Chalinolobus picatus*	Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress-pine forest, mallee, Bimbil box. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. Can tolerate high temperatures and dryness but need access to nearby open water. Feeds on moths and possibly other flying invertebrates.	Vulnerable		Known		Potential.
Magpie Goose	*Anseranas semipalmata*	Mainly found in shallow wetlands (less than 1 metre deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen	Vulnerable		Known		Unlikely. Suitable habitat for this species does not occur in the

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		walking and grazing on land; feeds on grasses, bulbs and rhizomes. 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. Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands and floodplains; roosts in tall vegetation.					Subject Site.
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*	Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant. Nesting, in tree hollows, occurs throughout the second half of the year; nests are at least 1 kilometre apart, with no more than one pair every 30 square kilometres.	Vulnerable		Known		Potential to occur in the Subject Site.
Malleefowl	*Leipoa ocellata*	Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species. 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. Although Malleefowl will occupy areas within five years of fire, they prefer older age classes, with little breeding in areas less than 20 years after fire, and in one study the highest densities recorded in long unburnt mallee (60 to 80 years post fire). A pair may occupy a range of between 50 and 500 ha, overlapping with those of their neighbours. Mainly forage in open areas on seeds of acacias and other native shrubs (*Cassia, Beyeria, Bossiaea*), buds, flowers and fruits of herbs and various shrubs, insects (cockroaches, ants, soil invertebrates), and cereals if available.	Endangered	Endangered	Predicted	Species or species habitat known to occur within area	No. Suitable habitat for this species does not occur in the Subject Site. No mallee habitat in the Subject Site or adjacent mallee habitat.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		Incubate eggs in large mounds that contain considerable volumes of sandy soil. The litter within the mounds must be dampened for it to decompose and provide heat for incubation of eggs. Up to 34 eggs may be laid in a single season, though usually between 15 and 24 (and clutches smaller in dry years). The male monitors the temperature within the egg chamber using its bill, and regularly works the mound during the breeding season to maintain a constant temperature around 34 degrees. The chicks hatch after between 49 and 96 days (average around 60) and can walk as soon as they emerge from the mound, can run quickly within two hours and can fly within 24 hours.					
Masked Owl	*Tyto novaehollandiae*	Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares.	Vulnerable		Known		Potential. Suitable breeding habitat (large hollow bearing trees and tall forest trees) for this species does not occur in the Subject Site. Potential to hunt in the Subject Site.
Murray Cod	Maccullochella peelii peelii	The Murray Cod is the largest freshwater fish found in Australia. It is a long lived predator species that is highly territorial and aggressive. It occurs naturally in the waterways of the Murray–Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs. The upper reaches of the Murray and Murrumbidgee Rivers are considered too cold to contain suitable habitat.	FM Act	Vulnerable		Species or species habitat may occur within Area	No. The works will not occur in proximity likely habitat
Mauve Burr-daisy	Calotis glandulosa	Found in montane and subalpine grasslands in the Australian Alps. Found in subalpine grassland (dominated by Poa spp.), and montane or natural temperate grassland dominated by Kangaroo Grass (Themeda australis) and Snow Gum (Eucalyptus pauciflora) Woodlands on the Monaro and Shoalhaven area.	Vulnerable	Vulnerable	Known		No
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain,		This EEC is known from parts of the Local Government Areas of Berrigan, Bland, Bogan, Carrathool, Conargo, Coolamon, Coonamble, Corowa, Forbes, Gilgandra, Griffith, Gwydir, Inverell, Jerilderee, Lachlan, Leeton, Lockhart, Moree Plains, Murray, Murrumbidgee, Narrabri, Narranderra, Narromine, Parkes, Urana, Wagga Wagga and Warren, and but may occur elsewhere in these bioregions.	Endangered Ecological Community	Endangered	Known	Community may occur within area	No

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions							
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland		Native tussock grasslands, such as the Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Queensland, once occurred over a large area of Australia (DEWR 2007). The species composition of tussock grasslands varies throughout its range and is influenced by factors such as rainfall, soil, geology and land use history. These influences may vary the expression of the ecological community over short periods or across small distances (Butler 2007 unpublished).	Natural Temperate Grassland of the Southern Tablelands (NSW Act)	Critically Endangered		Community may occur within area	No
Painted Honeyeater	*Grantiella picta*	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.	Vulnerable		Known		Potential.
Painted Snipe	Rostratula australis	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally occurs from September to December. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	Vulnerable	Vulnerable	Known	Species or species habitat may occur within Area	No
Pale-headed Snake	*Hoplocephalus bitorquatus*	Found mainly in dry eucalypt forests and woodlands, cypress woodland and occasionally in rainforest or moist eucalypt forest. Favours streamside areas, particularly in drier habitats. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees.	Vulnerable		Predicted		Unlikely. Suitable habitat for this species does not occur in the Subject Site.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		The main prey is tree frogs although lizards and small mammals are also taken.					
Pink-tailed Legless Lizard	Aprasia parapulchella	The Pink-tailed Worm Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (Themeda australis). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. 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. Feeds on the larvae and eggs of the ants with which it shares its burrows. It is thought that this species lays two eggs inside the ant nests during summer; the young first appear in March.	Vulnerable	Vulnerable	Not identified in Central West Sub CMAs Pilliga or Talbragar Valley		No. However previously recorded near Dubbo. Suitable habitat for this species in the Central West CMA is known to occur on trachyte soils where small flat basalt rocks litter the surface.
Painted Snipe	Rostratula benghalensis (sensu lato)	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Endangered	Endangered		Species or species habitat may occur within area	No
Philotheca ericifolia	*Philotheca ericifolia*	Known only from the upper Hunter Valley and Pilliga to Peak Hill districts of NSW. The records are scattered over a range of over 400 kilometres between West Wyalong and the Pilliga Scrub. Site localities include Pilliga East State Forest, Goonoo State Forest, Hervey Range, Wingen Maid Nature Reserve, Toongi, Denman, Rylstone district and Kandos Weir. 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 Melaleuca uncinata, Eucalyptus crebra, E. rossii, E. punctata, Corymbia trachyphloia, Acacia triptera, A. burrowii, Beyeria viscosa, Philotheca australis, Leucopogon muticus and Calytrix tetragona. Flowering time is in the spring. Fruits are produced from November to December.		Vulnerable (Commonwealth listed only)			No. Not identified in searches however known to have once occurred near Dubbo.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		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. Also recorded growing in a recently burnt site (wildfire) and within a regeneration zone resulting from clearing. Populations comprise from 3-12 adult plants to approx. 200 plants (mostly seedlings in one population). Also described as uncommon, scattered, common, locally occasional and locally frequent. Populations in Pilliga State Forest consist of hundreds or thousands of individuals. A very large population occurs in Lincoln State Forest near Gilgandra.					
Pine Donkey Orchid	*Diuris tricolor*	The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (*Callitris spp.*). It is found in sandy soils, either on flats or small rises. Also recorded from a red earth soil in a Bimble Box community in western NSW. Usually recorded as common and locally frequent in populations, however only one or two plants have also been observed at sites. The species has been noted as growing in large colonies. Disturbance regimes are not known, although the species is usually recorded from disturbed habitats. Associated species include *Callitris glaucophylla, Eucalyptus populnea, Eucalyptus intertexta*, Ironbark and *Acacia* shrubland. The understorey is often grassy with herbaceous plants such as *Bulbine* species. Flowers from September to November or generally spring. The species is a tuberous, deciduous terrestrial orchid and the flowers have a pleasant, light sweet scent.	Vulnerable		Known		Likely. Recorded in similar grassland in proximity to the Subject Site
Powerful Owl	Ninox connivens	Territorial pairs respond strongly to recordings of Barking Owl calls from up to 6 km away, though humans rarely hear this response farther than 1.5 km. Because disturbance reduces the pair's foraging time, and can pull the female off her eggs even on cold nights, recordings should not be broadcast unnecessarily nor during the nesting season. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Is flexible in its habitat use and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils.	Vulnerable		Predicted		Unlikely. Suitable habitat for this species does not occur in the Subject Site.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance. Preferentially hunts small arboreal mammals such as Squirrel Gliders and Ringtail Possums, but when loss of tree hollows decreases these prey populations it becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. Can catch bats and moths on the wing, but typically hunts by sallying from a tall perch. Requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats. Two or three eggs are laid in hollows of large, old trees. Living eucalypts are preferred though dead trees are also used. Nest sites are used repeatedly over years by a pair, but they may switch sites if disturbed by predators (e.g. goannas). Nesting occurs during mid-winter and spring. Female incubates for 5 weeks, roosts outside the hollow when chicks are 4 weeks old, then fledging starts two weeks later. Young are dependent for several months					
Regent Honeyeater	*Anthochaera phrygia*	The Regent Honeyeater is a flagship threatened woodland bird whose conservation will benefit a large suite of other threatened and declining woodland fauna. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast. In the last 10 years Regent Honeyeaters have been recorded in urban areas around Albury where woodlands tree species such as Mugga Ironbark and Yellow Box were planted 20 years ago. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: *E. microcarpa, E. punctata, E. polyanthemos, E. mollucana, Corymbia robusta, E. crebra, E. caleyi, Corymbia maculata,*	Critically Endangered	Endangered	Known	Species or species habitat may occur within Area	Likely. Over-wintering feeding resources. Breeding habitat does not occur in the Subject Site

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		E.mckieana, E. macrorhyncha, E. laevopinea, and Angophora floribunda. Nectar and fruit from the mistletoes A. miquelii, A. pendula, A. cambagei are also eaten during the breeding season. When nectar is scarce lerp and honeydew comprise a large proportion of the diet. Insects make up about 15% of the total diet and are important components of the diet of nestlings. A shrubby understorey is an important source of insects and nesting material.					
Ruff	Philomachus pugnax	The Ruff is a rare but regular visitor to Australia, being recorded in all States and Territories. In Australia the Ruff is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges. It is found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and flood lands. They are occasionally seen on sheltered coasts, in harbours, estuaries, seashores and are known to visit sewage farms and salt works. They are sometimes found on wetlands surrounded by dense vegetation including grass, sedges, saltmarsh and reeds. They have been observed on sand spits and other sandy habitats including shingles. The Ruff forages on exposed mudflats, in shallow water and occasionally on dry mud. They have been observed foraging in dry waterside plants and in swampy areas next to aeration tanks in sewage farms. They prefer to roost amongst shorter vegetation (Higgins & Davies 1996).		Marine Migratory			No. Previously recorded in the Dubbo LGA. No suitable habitat for this species exists in the Subject Site
Rainbow Bee-eater	Merops ornatus	The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins 1999). It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water (Badman 1979; Boekel 1976; Fry 1984; Roberts 1979; Storr 1984a, 1984b, 1985a). It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia, and has been recorded in various other habitat types including heathland, sedgeland, vine forest and vine thicket, and on beaches (Higgins 1999). The Rainbow Bee-eater occurs in open woodlands and shrublands, including mallee, and in open forests that are usually dominated by eucalypts. It also occurs in grasslands (Gibson 1986; Jones 1986; Leach 1988; Longmore 1978; McEvey & Middleton 1968; Saunders & Ingram 1995; Woinarski et al. 1988, 1989) and, especially in arid or semi-arid areas, in riparian, floodplain or wetland vegetation assemblages (Badman 1989; Gee et al. 1996; Gibson 1986; Gibson & Cole 1988; Henle 1989; Longmore 1978; Storr 1977; Woinarski et al. 1988).		Migratory JAMBA		Species or species habitat may occur within area	Potential. Suitable breeding habitat (deep sandy banks near waterways) for this species does not occur in the Subject Site. Potential to hunt in the Subject Site, however more likely to occur near rivers and flowing creeks.
Red-tailed	Phaethon	Marine	Vulnerable				No

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
Tropicbird	rubricauda	Breeds in coastal cliffs and under bushes in tropical Australia. Nests on cliffs of the northern hills and southern mountains on the main island at Lord Howe Island.					
Scarlet Robin	*Petroica boodang*	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 meters in altitude. The Scarlet Robin is primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer. Scarlet Robin pairs defend a breeding territory and mainly breed between the months of July and January; they may raise two or three broods in each season. This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 meters above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub. In autumn and winter, the Scarlet Robin joins mixed flocks of other small insectivorous birds which forage through dry forests and woodlands.	Vulnerable		Predicted		Potential.
Satin Flycatcher	*Myiagra cyanoleuca*	Satin Flycatchers inhabit 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 (Blakers et al. 1984; Emison et al. 1987; Officer 1969). Satin Flycatchers mainly inhabit eucalypt forests, often near wetlands or watercourses. They generally occur in moister, taller forests than the Leaden Flycatcher, Myiagra rebecula, often occurring in gullies		Listed		Species or species habitat may occur in the Subject Site	Potential

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
Rufous Fantail	*Rhipidura rufifrons*	The Rufous Fantail occurs in coastal and near coastal districts of northern and eastern Australia (Lindsey 1992). Rhipidura rufifrons rufifrons has breeding populations occurring from about the South Australia-Victoria border, through south and central Victoria, on and east of the Great Divide in New South Wales (NSW), and north to about the NSW-Queensland border; and R. r. intermedia has breeding populations occurring on and east of the Great Divide, from about the NSW-Queensland border, north to the Cairns-Atherton region, Queensland (Higgins et al. 2006). Both subspecies winter farther north from Cape York Peninsula in Queensland to Torres Strait and southern Papua New Guinea. The two subspecies intergrade in a zone between the Queensland-NSW border ranges and the Clarence-Orara rivers in NSW (Scodde & Mason 1999).		Listed		Species or species habitat known to occur within area	Potential
Sharp-tailed Sandpiper	*Calidris acuminata*	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage (Cramp 1985; Higgins & Davies 1996).		Marine Migratory			Unlikely.
Silky Swainson-pea	*Swainsona sericea*	Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. Found in Natural Temperate Grassland and Snow Gum Eucalyptus pauciflora Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. Sometimes found in association with cypress-pines Callitris spp. Habitat on plains unknown. Regenerates from seed after fire.	Vulnerable		Known		Unlikely.
Silver Perch	Bidyanus bidyanus	Silver Perch were once widespread and abundant throughout most of the Murray-Darling river system. They have now declined to low numbers or disappeared from most of their former range. Only one remaining secure and self-sustaining population occurs in NSW in the central Murray River downstream of Yarrawonga weir, as well as several anabranches and tributaries	Vulnerable (FM Act)				No. Habitat suitable for this species will not be impacted.
Sloane's Froglet	*Crinia sloanei*	It is typically associated with periodically inundated areas in grassland, woodland and disturbed habitats.	Vulnerable		Predicted		Unlikely
Speckled Warbler	*Pyrrholaemus saggitatus*	The Speckled Warbler lives in a wide range of *Eucalyptus* dominated communities that have a grassy	Vulnerable		Known		Yes. Known to occur in similar

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		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. Large, relatively undisturbed remnants are required for the species to persist in an area. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter. A side entrance allows the bird to walk directly inside. A clutch of 3-4 eggs is laid, between August and January, and both parents feed the nestlings. The eggs are a glossy red-brown, giving rise to the unusual folk names 'Blood Tit' and 'Chocolate bird'. Some cooperative breeding occurs. The species may act as host to the Black-eared Cuckoo. Speckled Warblers often join mixed species feeding flocks in winter, with other species such as Yellow-rumped, Buff-rumped, Brown and Striated Thornbill.					habitat in the Central West.
Spotted Harrier	*Circus assimilis*	Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, and grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. Preys on terrestrial mammals (egg bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion.	Vulnerable		Known		Potential to have hunting ground in the Subject Site.
Spotted-tailed Quoll	*Dasyurus maculatus*	Use 'latrine sites', often on flat rocks among boulder fields and rocky cliff-faces; these may be visited by a number of individuals; latrine sites can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals. 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. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	Vulnerable	Endangered	Known		Potential. Habitat may occur in the Subject Site however the lack of timber and ground debris probably excludes this species.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and may raid possum and glider dens and prey on roosting birds. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects; also eats carrion and takes domestic fowl. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creek lines. Average litter size is five; both sexes mature at about one year of age.					
Scant Pomaderris	*Pomaderris queenslandica*	Widely scattered but not common in north-east NSW and in Queensland. It is only known from a few locations on the New England Tablelands and North West Slopes, including near Torrington and Coolatai, and also from several locations on the NSW north coast. Found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks.	Endangered		Known		Potential to occur in the Subject Site. Known to occur in Goonoo SCA.
Square-tailed Kite	*Lophoictinia isura*	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. 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? Appears to occupy large hunting ranges of more than 100kilometer2. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	Vulnerable		Known		Potential to have hunting territory within the Subject Site.
Squirrel Glider	*Petaurus norfolcensis*	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. Prefers mixed species stands with a shrub or Acacia midstorey. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen	Vulnerable		Predicted		Unlikely to occur in the Subject Site.

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
		providing protein.					
Stripe-faced Dunnart	*Sminthopsis macroura*	Native dry grasslands and low dry shrublands, often along drainage lines. During periods of hot weather they shelter in cracks in the soil, in grass tussocks or under rocks and logs.	Vulnerable		Predicted		Unlikely. The lack of understorey, woody debris precludes this species from occurring in the Subject Site
Superb Parrot	*Polytelis swainsonii*	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree. Breed between September and January. May forage up to 10 kilometres from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.	Vulnerable	Vulnerable	Known	Species or species habitat likely to occur within area	Likely
Swift Parrot	*Lathamus discolor*	Migrates to the Australian south-east mainland between March and October. On the mainland they occur 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*. Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum *Eucalyptus globulus*.	Endangered	Endangered	Known	Species or species habitat likely to occur within Area	Potential to occur. Feeding resources may occur in the Subject Site, however Breeding habitat is in Tasmania
Turquoise	*Neophema pulchella*	Lives on the edges of eucalypt woodland adjoining clearings,	Vulnerable		Known		Potential to occur

Common Name	Scientific Name	Habitat and Ecology (OEH Species Profile and /or EPBC SPRAT Profile)	TSC Act Status	EPBC Act Status	OEH Threatened Species Search	DSEWPaC Protected Matters Search	Potential to occur
Parrot		timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. 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. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. 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.					on the edge of the forested portions of the Subject Site adjoining grassy areas. Breeding habitat does not occur in the Subject Site.
Trout Cod	Maccullochella macquariensis	The Trout Cod is endemic to the southern Murray-Darling river system, including the Murrumbidgee and Murray Rivers, and the Macquarie River in central NSW. The species was once widespread and abundant in these areas but has undergone dramatic declines in its distribution and abundance over the past century. The last known reproducing population of Trout Cod is confined to the Murray River below Yarrawonga downstream to Tocumwal.	Endangered FM Act	Endangered		Species or species habitat may occur within area	No
Varied Sittella	Daphoenositta chrysoptera	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. Generation length is estimated to be 5 years.	Vulnerable		Known		Likely.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		Characterised by the presence or prior occurrence of White Box, Yellow Box and/or Blakely's Red Gum. The trees may occur as pure stands, mixtures of the three species or in mixtures with other trees, including wattles. Commonly co-occurring eucalypts include Apple Box (*E. bridgesiana*), Red Box (*E. polyanthemos*), Candlebark (*E. rubida*), Snow Gum (*E. pauciflora*), Argyle Apple (*E. cinerea*), Brittle Gum (*E. mannifera*), Red Stringybark (*E. macrorhyncha*), Grey Box (*E. microcarpa*), Cabbage Gum (*E. amplifolia*) and others. The understorey in intact sites is characterised by native grasses and a high diversity of herbs; the most commonly encountered include Kangaroo Grass (*Themeda australis*) Poa Tussock (*Poa*	EEC	Critically Endangered	Known	Community likely to occur within area	Yes. Known to on areas of higher ground in the Dubbo area.

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		sieberiana), wallaby grasses (*Austrodanthonia spp.*), spear-grasses (*Austrostipa spp.*), Common Everlasting (*Chrysocephalum apiculatum*), Scrambled Eggs (*Goodenia pinnatifida*), Small St John's Wort (*Hypericum gramineum*), Narrow-leafed New Holland Daisy (*Vittadinia muelleri*) and blue-bells (*Wahlenbergia spp.*). Shrubs are generally sparse or absent, though they may be locally common. Remnants generally occur on fertile lower parts of the landscape where resources such as water and nutrients are abundant. Sites with particular characteristics, including varying age classes in the trees, patches of regrowth, old trees with hollows and fallen timber on the ground are very important as wildlife habitat. Sites in the lowest parts of the landscape often support very large trees which have leafy crowns and reliable nectar flows - sites important for insectivorous and nectar feeding birds. Sites that retain only a grassy groundlayer and with few or no trees remaining are important for rehabilitation, and to rebuild connections between sites of better quality. Remnants support many species of threatened fauna and flora. Retention of remnants is important as they contribute to productive farming systems (stock shelter, seed sources, sustainable grazing and water-table and salinity control). The fauna of remnants (insectivorous birds, bats, etc.) can contribute to insect control on grazing properties. Some of the component species (e.g. wattles, she-oaks, native legumes) fix nitrogen that is made available to other species in the community, while fallen timber and leaves recycle their nutrients. Disturbed remnants are considered to form part of the community, including where the vegetation would respond to assisted natural regeneration.					
White-fronted Chat	Epthianura albifrons	Regularly observed in the saltmarsh of Newington Nature Reserve (with occasional sightings from other parts of Sydney Olympic Park and in grassland on the northern bank of the Parramatta River). Current estimates suggest this population consists of 8 individuals. Regularly observed in the saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve. This population is estimated to comprise 19-50 individuals. The Newington and Towra Point populations are thought to be disjunct from each other (and from the nearest populations outside Sydney Metropolitan CMA). Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous,	Endangered population		Known		No. Suitable habitat for this species does not occur in the Subject Site.

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		feeding mainly on flies and beetles caught from or close to the ground. Have been observed breeding from late July through to early March, with 'open-cup' nests built in low vegetation. Nests in the Sydney region have also been seen in low isolated mangroves. Nests are usually built about 23 cm above the ground (but have been found up to 2.5 metres above the ground). Two to three eggs are laid in each clutch, and the complete nesting cycle from nest-building to independent young is approximately 50 days. Birds can breed at one year of age and are estimated to live for five years.					
White-bellied Sea-Eagle	Haliaeetus leucogaster	The White-bellied Sea-Eagle is distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia. The inland limits of the species are most restricted in south-central and south-western Australia, where it is confined to a narrow band along the coast (Barrett et al. 2003; Bilney & Emison 1983; Blakers et al. 1984; Marchant & Higgins 1993). Recent analysis indicates that the distribution of the sea-eagle may shift in response to climatic conditions, with an apparent decreased occupancy of inland sites (and increased occupancy of coastal sites) during drought conditions (Shephard et al. 2005a). Breeding has been recorded from only a relatively small area of the total distribution. Breeding records are patchily distributed, mainly along the coastline, and especially the eastern coast, extending from Queensland to Victoria, and to Tasmania. Breeding has also been recorded at some sites further inland, e.g. around the Murray, Murrumbidgee and Lachlan Rivers in northern Victoria and south-west NSW, and at other large drainage systems and water storages (Marchant & Higgins 1993). Although known breeding sites are widely dispersed, the species could potentially breed throughout much of its range (Birds Australia 2006c, pers. comm.).		Listed		Species or species habitat likely to occur within area	Unlikely. Suitable habitat for this species does not occur in the Subject Site.
White-throated Needletail	Hirundapus caudacutus	The White-throated Needletail is widespread in eastern and south-eastern Australia (Barrett et al. 2003; Blakers et al. 1984; Higgins 1999). In eastern Australia, it is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. Further south on the mainland, it is widespread in Victoria, though more so on and south of the Great Divide, and there are few records in western Victoria outside the Grampians and the South West. The species occurs in adjacent areas of south-eastern South Australia, where it extends west to the Yorke Peninsula and		Listed			Potential.

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		the Mount Lofty Ranges. It is widespread in Tasmania (Barrett et al. 2003; Blakers et al. 1984; Higgins 1999). White-throated Needletails only occur as vagrants in the Northern Territory (recorded in the Top End, including around Darwin, Katherine and Mataranka and Tennant Creek; and further south around Alice Springs) and in Western Australia (at disparate sites from the Mitchell Plateau in the Kimberley, south to the Nullarbor Plain and Augusta in the South West, and west to Barrow Island, the Houman Abrolhos and the Swan River Plain) (Barrett et al. 2003; Blakers et al. 1984; Brooker et al. 1979; Sedgwick 1978; Slater 1964; Storr 1987; Storr et al. 1986; Wheeler 1959). The species is also a vagrant to various outlying islands, including Norfolk, Lord Howe, Macquarie, Christmas and Cocos-Keeling Islands (Barrand 2005; Green 1989; McAllan et al. 2004; Schodde et al. 1983; Stokes et al. 1984; Warham 1961a).					
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.	Vulnerable		Known		Potential.
	Commersonia procumbens	Grows in sandy sites, often along roadsides. Recorded in *Eucalyptus dealbata* and *Eucalyptus sideroxylon* communities, *Melaleuca uncinata* scrub, under mallee eucalypts with a *Calytrix tetragona* understorey, and in a recently burnt Ironbark and *Callitris* area. Also in *Eucalyptus fibrosa* subsp. *nubila, Eucalyptus dealbata, Eucalyptus albens* and *Callitris glaucophylla* woodlands north of Dubbo. Other associated species include Acacia triptera, Callitris endlicheri, Eucalyptus melliodora, Allocasuarina diminuta, Philotheca salsolifolia, Xanthorrhoea species, Exocarpus cupressiformis, Leptospermum parvifolium and Kunzea parvifolia. Fruiting period is summer to autumn. Flowers from August to December. Appears to produce seed which persists for some time in the seed bank. Large numbers of seedlings have been observed germinating after fire at sites where the species was not apparent above ground before the fires. Clusters of individuals may be	Vulnerable	Vulnerable	Known	Species or species habitat likely to occur within area	Unlikely. Suitable soil for this species does not occur in the Subject Site. Known to occur along the Golden Highway on red sandy ridges.

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		clonal. The species is often found as a pioneer species of disturbed habitats. It has been recorded colonising disturbed areas such as roadsides, the edges of quarries and gravel stockpiles and a recently cleared easement under power lines. Has been recorded in populations of 50+ individuals of various ages, 28 plants on the western side of the road and 58 plants on the sunnier eastern side. Populations may comprise a single cohort of individuals, or have a multi-aged structure where some individuals appear to be old with thickened runners.					
	Tylophora linearis	Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla and Allocasuarina luehmannii. Also grows in association with Acacia hakeoides, Acacia lineata, Melaleuca uncinata, Myoporum species and Casuarina species. Flowers in spring, with flowers recorded in November or May with fruiting probably 2 to 3 months later. Very low number of confirmed populations and has been recorded in very low abundances.	Vulnerable	Endangered	Known	Species or species habitat may occur within area	Potential. Disturbance most likely precludes this species from occurring in the Subject Site. Known to occur in Goonoo SCA.