

Riparian Assessment Report

To Inform Potential Residential Subdivision at New England Hwy & Wyndella Rd, Lochinvar, NSW



Prepared for: Lochinvar Developments

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1.0 Introduction

Anderson Environment & Planning was commissioned by ADW Johnson on behalf of Lochinvar Developments Pty Ltd (the client) to undertake a Riparian Assessment Report (RAR) to inform potential Residential Subdivisions at Lochinvar Urban Release, New England Hwy & Wyndella Rd, Lochinvar, NSW refer **Figure 1**.

For the purposes of referencing, this document should be referred to as:

Anderson Environment & Planning (2022). *Riparian Assessment Report for Lochinvar Urban Release* at New England Hwy and Wyndella Rd, Lochinvar, NSW, Rev 00. Unpublished report for ADW Johnson.


2.0 Site Particulars

Table 1 – Site Details

Detail	Comments
Client	ADW Johnson
Address	New England Hwy and Wyndella Rd, Lochinvar
Title(s)	<ul style="list-style-type: none"> • Lot 2/DP 747391; • Lot 3/DP 747391; • Lot 4/DP 747391; • Lot 5/DP 747391; • Lot 6/DP 747391; • Lot 12/DP 1219648; • Lot 13/DP 1219648; and • Lot 9/DP 747391.
Subject Site	The Subject Site approx. 22.54ha, consists rural land currently being grazed. The vegetation is dominated by pasture grasses, exotics and weeds with remnant native vegetation dominate by scattered paddock trees. There are agricultural structures consisting of an open shed and scattered rubble piles throughout the paddock (refer to Figure 1).
LGA	Maitland
Zoning	R1 – General Residential
Current Land Use	The Subject Site comprises of hydrolines and associated riparian zones.
Surrounding Land Use	The Subject Site is bounded by private rural land to the north, east, south, and west. With a School located in the south west.
State Vegetation	PCT 3433- Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest.
Proposed Development	The proposed development includes residential subdivision within the Lochinvar Urban Release Area.

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

 Subject Site
Cadastral



Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 1 - Site Location

Date: August 2022


Location: New England Hwy and Wyndella Rd, Lochinvar

Client: ADW Johnson

AEP ref: 2699

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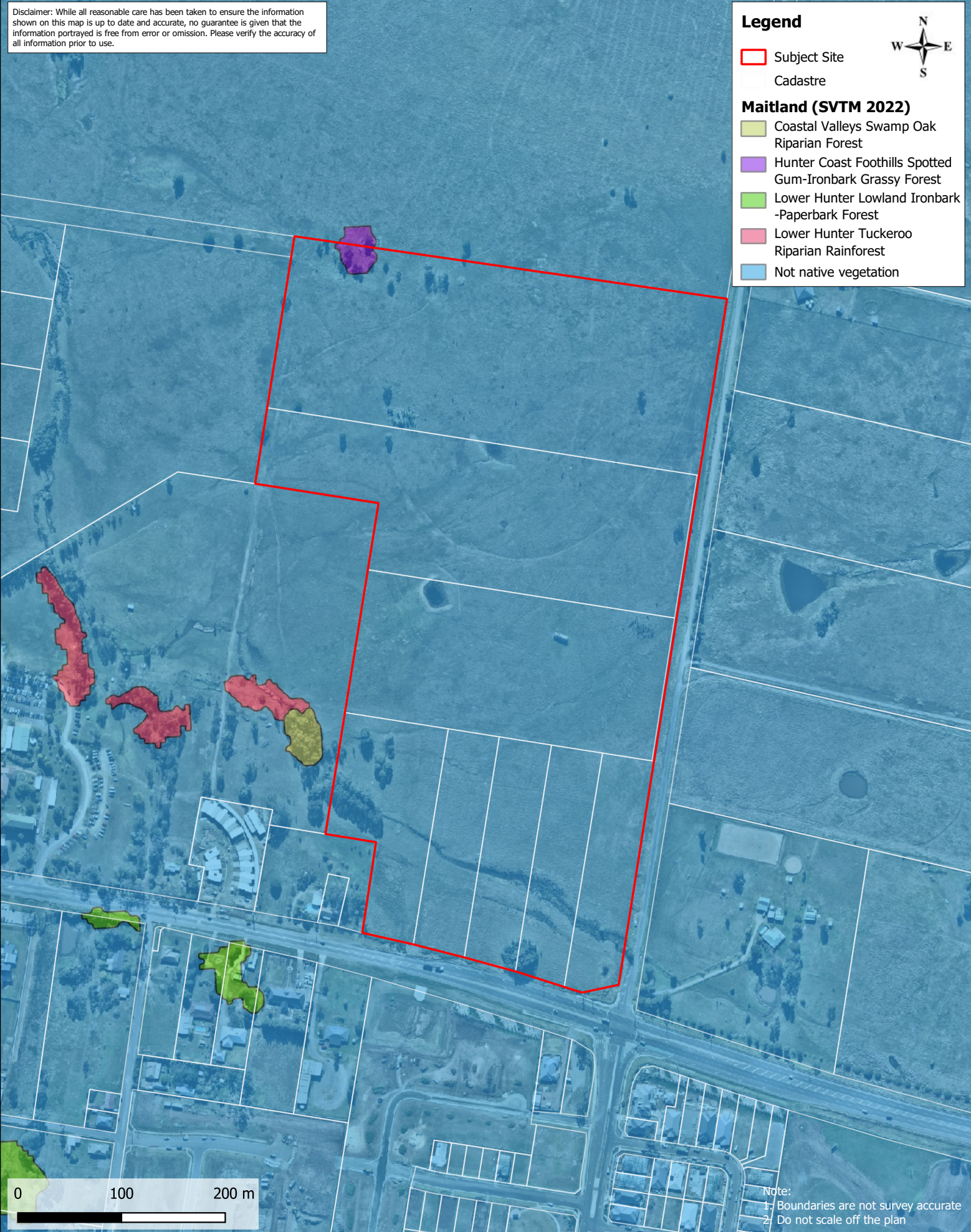
Legend

 Subject Site
Cadastral



Maitland (SVTM 2022)

-  Coastal Valleys Swamp Oak Riparian Forest
-  Hunter Coast Foothills Spotted Gum-Ironbark Grassy Forest
-  Lower Hunter Lowland Ironbark-Paperbark Forest
-  Lower Hunter Tuckeroo Riparian Rainforest
-  Not native vegetation



Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan

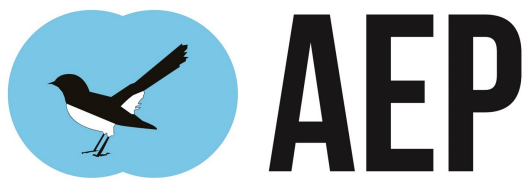


Figure 2 - State Vegetation

Date: August 2022

Location: New England Hwy and Wyndella Rd, Lochinvar

Client: ADW Johnson

AEP ref: 2699

3.0 Methodology

Field surveys for determining the status of waterfront land occurring within the Subject Site have been prepared and performed as per the Natural Resources Access Regulator, 2020, *Waterfront Land Tool*. The tool identifies waterfront land based on three key factors:

- The presence of defined bed and banks;
- Evidence of flow and geomorphic features (whether water is present or not); and
- The presence of aquatic/riparian vegetation.

3.1 Information Sources

Information and spatial data provided within this RAR has been compiled from various sources including:

- Department of Planning, Industry and Environment (2020), Natural Resources Access Regulator Waterfront Land Tool
- Aerial Photograph Interpretation (API) of the site using the latest Nearmap imagery (August 2022) and surrounding locality;
- NSW Government (2018) *Determining Stream Order* Fact Sheet;
- Water Management (General) Regulation 2018 Hydroline spatial data, accessed 2022;
- State vegetation *Maitland 2022*, for native vegetation of southeast NSW;
- Collective knowledge gained from previous ecological survey and assessment in the area over the past 30 years.

3.2 Desktop Assessment

The following desktop analysis was conducted for the Subject Site:

- Stream orders were determined using the Strahler Order system via both API and *Water Management (General) Regulation 2018 Hydroline spatial data 1.0*;
- State vegetation mapping, *Maitland, 2022*, was utilised to identify vegetation communities occurring within the Subject Site (**Figure 2**).
- Literature review of stream ordering assessment and field assessment criteria to determine accuracy of mapped hydrolines.
- Assignment of survey identification numbers to potential watercourses (Survey ID) (**Figure 4**).
- Investigations for streams outside of the Subject Site will consist of roadside visual inspections and further desktop analysis.

3.3 Field Survey

Field surveys were completed on 23rd and 30th of August 2022, within the multiple lots listed above; the mapped hydrolines to the east of the Subject Site were assessed via publicly accessible lands in order to determine the presence of one or more of the following features: defined bed and banks; evidence of flow and geomorphic features (whether water is present or not); and the presence of aquatic/riparian vegetation within the unnamed tributaries.





General observations along New England Highway and Wyndella Road were undertaken to assess the broader locality where access to lots was not available (refer **Figure 5** for survey effort).

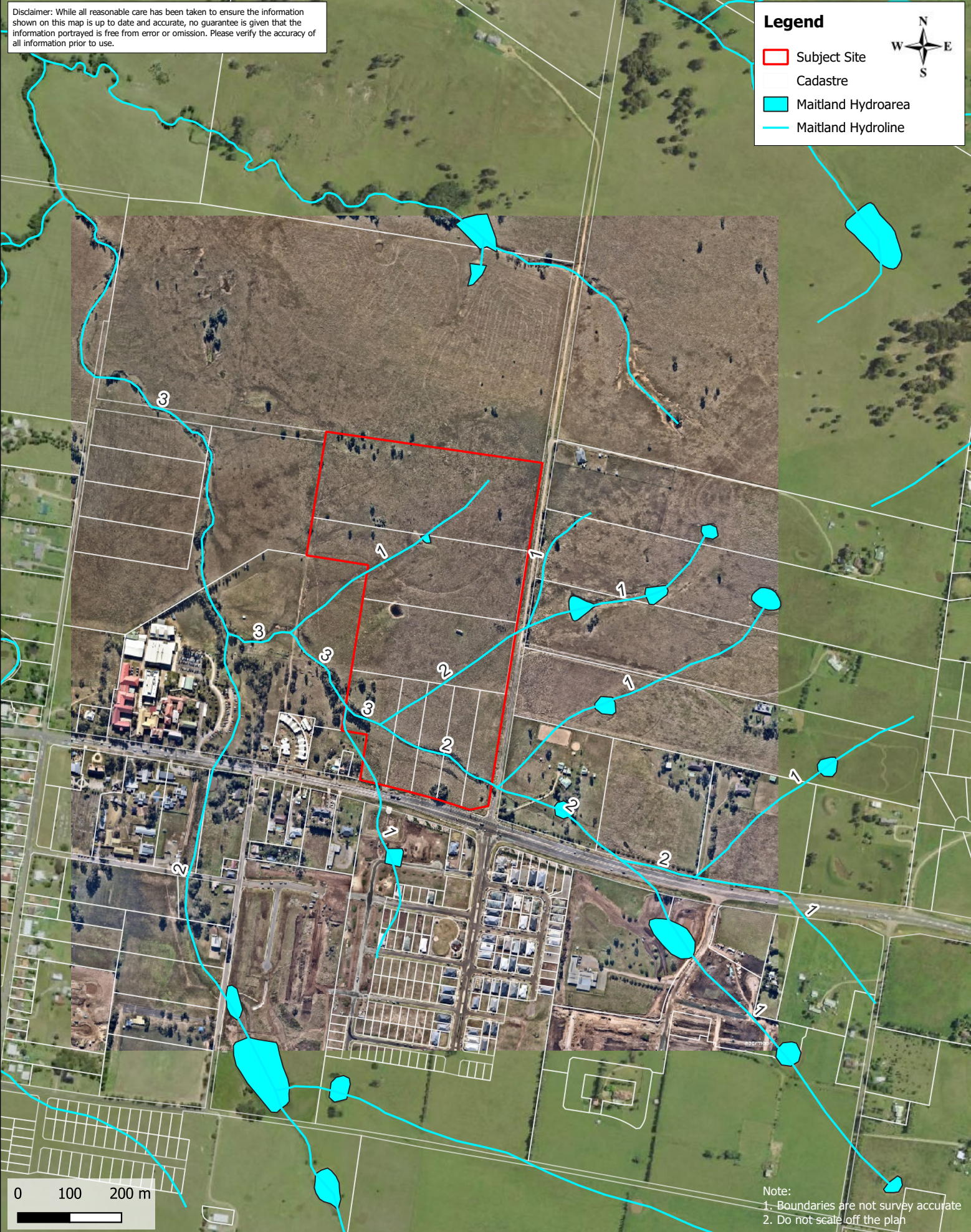
At the sites that were inspected the following data was collected to ground-truth desktop level assessments:

- Assessing each mapped hydroline to determine if defined bed and banks (including locating high bank) are present;
- Identifying what type of watercourse is present (in accordance with NRAR Guide – Watercourse types);
- Determine and notate watercourse features;
- Determine presence of any Lakes or Wetlands; and
- Determine and notate any changes in vegetation communities.

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Legend

-  Subject Site
-  Cadastre
-  Maitland Hydroarea
-  Maitland Hydroline



Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 3 - Desktop Stream Order

Date: August 2022

Location: New England Hwy and Wyndella Rd, Lochinvar

Client: ADW Johnson

AEP ref: 2699

4.0 Riparian Assessment Results


Fieldwork was conducted in August 2022 to ground-truth the stream order of the watercourses within the Subject Site and the upper tributaries in the surrounding locality as is mapped in the New South Wales Hydrolines Data Set. Investigations revealed only 1st order streams occur within the Subject Site (Refer to **Table 2** and **3**).


Table 2 – Assignment of survey identification numbers to potential watercourses

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Preparation			
Prepare map allocating survey identification numbers	Yes	A desktop assessment indicated that several segments of the mapped hydrolines may have varying features representative of watercourses. Therefore, 15 segments were identified for individual targeted assessments.	4













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Legend

 Subject Site

 Cadastre 8

Survey Segments

 1	 10
 2	 11
 3	 12
 4	 13
 5	 14
 6	 15



Note:
 1. Boundaries are not survey accurate
 2. Do not scale off the plan



Figure 4 - Survey Identification Number

Date: August 2022

Location: New England Hwy and Wyndella Rd, Lochinvar

Client: ADW Johnson

AEP ref: 2699


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Legend

- Subject Site
- Cadastre
- Survey ID Points

Ground-truthed

- Wet Areas
- 1st Order Stream
- 2nd Order Stream
- Stormwater
- Overland Flow



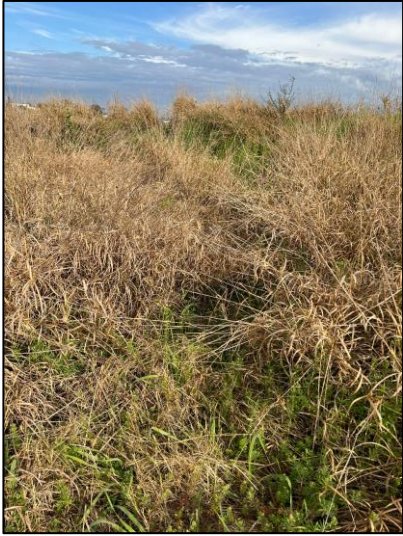
Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan






Figure 5 - Survey Efforts
Date: September 2022
Location: New England Hwy and Wyndella Rd, Lochinvar
Client: ADW Johnson
AEP ref: 2699

Table 3 - Riparian Assessment


Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Desktop Assessment Survey Id - 1			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1- NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area?</i> (Appendix 2- NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	No	Desktop assessment shows mapped hydrolines, however aerial imagery shows rural property and roadways with no visible watercourse.	-
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines, 2020—Lakes and Wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 - NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	1	Based on the desktop assessment, Hydroline ID 1 is mapped as Stream Order 1 using the Strahler Stream order classification.	3
Field Assessment – Survey Id - 1			
Defined Bed and Banks (Yes / No)	No	No watercourse. Drain on south side of road running along parallel.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Refer Appendix 5 - NRAR Guidelines, 2020)	None		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None		-
Lakes or Wetlands (Appendix 3 - NRAR Guidelines, 2020)	None		-
Vegetation Present to Indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	None		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	No		-
Ground-truthed Survey Results			5
Controlled Activity Approval Required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	None		-
Comments	Overgrown drain alongside of road		
Ground-truthed Stream Order	0		6



Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
			
Plate 1: Survey ID 1			
Desktop Assessment– Survey Id - 2			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1- NRAR Guidelines, 2020)	No	No.	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area?</i> (Appendix 2 - NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	No	Desktop assessment shows mapped hydrolines, however aerial imagery shows rural property and roadways with a wet area but no visible watercourse.	-
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR - NRAR Guidelines, 2020)—Lakes and wetlands)	No		-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 - NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	1	Based on the desktop assessment, Hydroline ID 2 is mapped as Stream order 1 using the Strahler Stream order classification.	3
Field Assessment – Survey Id - 2			
Define Bed and Banks (Yes / No)	No	The site inspection showed a depression at the entrance to the property running into roadside drainage. Drainage runs along north side of road connecting to segment 3 via a drain under the road.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	None		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None		-
Lakes or Wetlands (Appendix 3 - NRAR Guidelines, 2020)	None		-

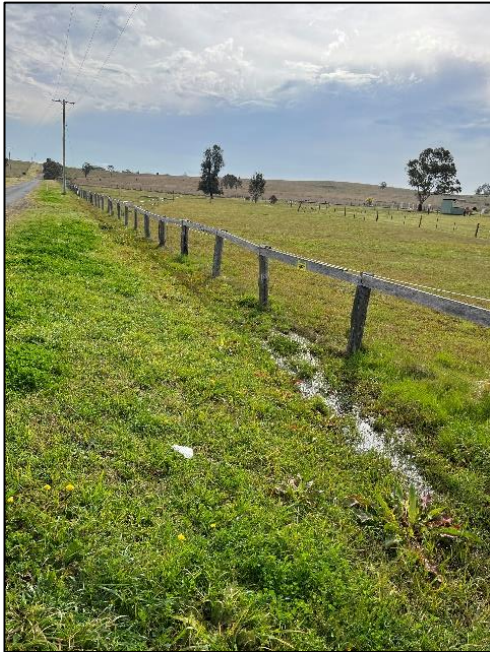
Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Vegetation Present to Indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	None		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	No		-
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	None		-
Comments	Survey ID point 2 the site inspection showed a depression at the entrance to the property running into roadside drainage. Drainage runs along north side of road connecting to segment 3 via a drain under the road. In dry times this area would not hold water.		
Ground-truthed Stream Order	0		5
 <p>Plate 3: Survey ID 2</p>			
Desktop Assessment – Survey Id - 3			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps (Appendix 1- NRAR Guidelines, 2020)	No	No.	-
Is your property within the shaded area on the NRAR Map—Western land map local government area? (Appendix 2- NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	No	Desktop assessment shows mapped hydrolines, however aerial imagery shows rural property, developments and roadways with detention basins but no visible watercourse.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3- NRAR - NRAR Guidelines, 2020) —Lakes and wetlands)	No	No	-

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 - NRAR Guidelines, 2020) and the NSW <i>Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	1	Based on the desktop assessment, Hydroline ID 3 is mapped as Stream order 1 using the Strahler Stream order classification.	3
Field Assessment – Survey Id - 3			
Define Bed and Banks (Yes / No)	No	Surveys determined to be a combination of constructed dry Retention Basin and roadside swales.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	None		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None		-
Lakes or Wetlands (Appendix 3 - NRAR Guidelines, 2020)	None		-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	None		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	No		-
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	None		-
Comments	Surveys determined to be a combination of constructed dry Retention Basin and roadside swales.		
Ground-truthed Stream Order	0		5
 <p>Plate 4: Survey ID 3 from south of New England Highway facing North</p>		 <p>Plate 5: Survey ID 3 from north of New England Highway facing south</p>	
Desktop Assessment – Survey Id - 4			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1- NRAR Guidelines, 2020)	No	No	-



Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area?</i> (Appendix 2 - NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	No	Desktop assessment shows mapped hydrolines, however aerial imagery shows small pool feature.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines, 2020 —Lakes and wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	2	Based on the desktop assessment, Hydroline ID 4 is mapped as Stream order 2 using the Strahler Stream order classification.	3
Field Assessment – Survey Id - 4			
Define Bed and Banks (Yes / No)	Yes	The area been surveyed and determined to be a combination of overland flow to the north, stormwater swales along the road and a depression within the private agricultural land to the north of the New England Highway.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	4		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	Pool		-
Lakes or Wetlands (Appendix 3 - NRAR Guidelines, 2020)	None		-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	None		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	No as private land where watercourse commences, no access to the site.		7
Ground-truthed Survey Results			6
Controlled Activity Approval required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	0		-
Comments	The area been surveyed and determined to be a combination of overland flow to the north, stormwater swales along the road and a depression within the private agricultural land to the north of the New England Highway		
Ground-truthed Stream Order	0		5



Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
			
Plate 6: Survey ID 4			
Desktop Assessment – Survey Id - 5			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	Yes	Stream Order 2	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area</i> ? (Appendix 2- NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	Yes	Visible from aerial	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines —Lakes and Wetlands, 2020)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 - NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	2	Based on the desktop assessment, Hydroline ID 5 is mapped as Stream order 2 via the Strahler Stream order classification.	3
Field Assessment – Survey Id - 5			
Define Bed and Banks (Yes / No)	No	The site inspection showed that the mapped hydroline was overland flowing across lawn and paddocks, with no defined bed or bank obvious, however a path is visible.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	-		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	No		-
Lakes or Wetlands (Appendix 3 - NRAR Guidelines, 2020)	None		-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	None		-

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
High Bank (Appendix 8 - NRAR Guidelines, 2020)	-		-
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	0		-
Comments	Survey ID point 5 is consist of a stormwater drainage system. Therefore, the desktop assessment classifying the hydroline as a Stream Order 2 is inaccurate having been confirmed by ground-truthing.		
Ground-truthed Stream Order	0		5
 <p>Plate 7: Survey ID 5</p>		 <p>Plate 8: Survey ID 5</p>	
Desktop Assessment – Survey Id - 6			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area?</i> (Appendix 2 - NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Westen Land map.	-
Is there a watercourse visible on your property?	No	Desktop assessment shows mapped hydrolines, however aerial imagery shows, water areas but no visible watercourse.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines—Lakes and Wetlands 2020)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 - NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	1	Based on the desktop assessment, Hydroline ID 6 is mapped as Stream Order 1 via the Strahler Stream order classification, due to the convergence of the mapped upper tributaries.	3

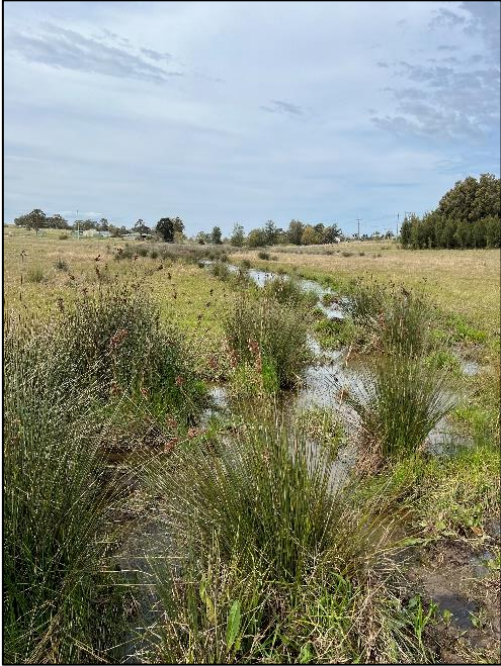
Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Field Assessment – Survey Id - 6			
Define Bed and Banks (Yes / No)	No	The site inspection showed that the mapped hydroline was overland flowing across paddocks and then alongside road.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	None		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None		-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines)	None		-
Vegetation Present to Indicate Wetlands (Appendix 7 - NRAR Guidelines)	None		-
High Bank (Appendix 8 - NRAR Guidelines)	None		-
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	0		-
Comments	Survey ID point 6 was determined to be overland flow. Therefore, desktop assessment indicating the presence of a Stream Order 1 hydroline is inaccurate having been confirmed by ground-truthing.		
Ground-truthed Stream Order	0		5
			
Plate 9: Survey ID 6			
Desktop Assessment – Survey Id - 7			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines)	No		-

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area?</i> (Appendix 2 - NRAR Guidelines)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	Yes	As per the desktop assessment there is a mapped hydroline. Ground truthing is required.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guide—Lakes and Wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 - NRAR Guidelines) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	2	Based on the desktop assessment, Hydroline ID 7 is mapped as Stream Order 2 using the Strahler Stream order classification, due the convergence of the mapped upper tributaries. This will be confirmed by ground-truthing.	3
Field Assessment – Survey Id - 7			
Define Bed and Banks (Yes / No)	Yes	Refer to Plate 10 .	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines)	Type 4	The stream bed is wider than the main channel in which water flows providing a wide floodplain.	-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None		-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines)	None		-
Vegetation Present to Indicate Wetlands (Appendix 7 - NRAR Guidelines)	None		-
High Bank (Appendix 8 - NRAR Guidelines)	Yes		7
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	Yes		-
Vegetated Riparian Zone Required (m)	10m (either side of the watercourse)		8
Comments	<p>A defined natural bed, present riparian vegetation and marginal flow of water indicate a watercourse. Highly degraded with <i>Juncus acutus</i> present at the top of bank. It is noted that there is a small tributary with a depression in the south of this arm, as shown in Figure 5. It appears that this area is the overflow from the culvert in times of heavy rainfall. There are aquatic flora species present, mostly weed species, however in times of lower rainfall this area would not have these characteristics and would be a depression within the landscape, hence AEP has determined the area is not a wetland.</p> <p>If wet conditions continue, MCC may question this assessment and request a 40m buffer around the depression, which would need to be justified.</p>		
Ground-truthed Stream Order	1		6

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
 <p style="text-align: center;">Plate 10: Survey ID 7</p>		 <p style="text-align: center;">Plate 11: Survey ID 7</p>	
Desktop Assessment – Survey Id - 8			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area</i> ? (Appendix 2 - NRAR Guidelines)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	Yes	As per the desktop assessment there is a mapped hydroline. Aerial demonstrates the presence of a watercourse. Ground truthing is required.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guide—Lakes and wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 - NRAR Guidelines) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	2	Based on the desktop assessment, Hydroline ID 8 is mapped as Stream Order 2 using the Strahler Stream order classification.	3
Field Assessment – Survey Id - 8			
Define Bed and Banks (Yes / No)	Yes	Refer to Plate 12 .	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines)	Type 4	The stream bed is wider than the main channel in which water flows providing a wide floodplain.	-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	Disposition	Small areas of deposition which would likely be washed away during rain event.	-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines)	No	No	-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines)	No	No	-

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
High Bank (Appendix 8 - NRAR Guidelines)	Yes	No	7
Ground-truthed Survey Results		No	5
Controlled Activity Approval required (Y / N)	Yes	No	-
Vegetated Riparian Zone Required (m)	10m (either side of the watercourse)	No	8
Comments	<p>A defined natural creek bed, present riparian vegetation and marginal flow of water indicate a watercourse.</p> <p>Continuation of the 1st order stream identified at Survey ID 7. At this stage no additional hydrolines join this creek.</p>		
Ground-truthed Stream Order	1		6
 <p>Plate 12: Survey ID 8</p>		 <p>Plate 13: Survey ID 8</p>	
Desktop Assessment – Survey Id - 9			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the NRAR Map—Western land map local government area? (Appendix 2 - NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	Yes	As per the desktop assessment there is a mapped hydroline. Aerial demonstrates the presence of a watercourse. Ground truthing is required.	3
Is there a lake or wetland on your property or within 40 metres of the	No	No	-

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
proposed work? (Appendix 3 - NRAR Guidelines, 2020—Lakes and Wetlands)			
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 – NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	3	Based on the desktop assessment, Hydroline ID 9 is mapped as Stream Order 3 using the Strahler Stream order classification, due the convergence of the mapped upper tributaries (Figure 3). This will be confirmed by ground-truthing.	3
Field Assessment – Survey Id - 9			
Define Bed and Banks (Yes / No)	Yes	Refer to Plate 14 .	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	Type 4	No	-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	Disposition	No	-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines, 2020)	No	No	-
Vegetation Present to indicate Wetlands (Appendix 7 – NRAR Guidelines, 2020)	No	No	-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	Yes	No	7
Ground-truthed Survey Results		Banks are sloped and defined providing flow of water. The river bed is a natural channel and riparian vegetation is present.	5
Controlled Activity Approval required (Y / N)	Yes	No	-
Vegetated Riparian Zone Required (m)	10m (either side of the watercourse)		8
Comments	A defined natural creek bed, riparian vegetation present, and marginal flow of water indicate a watercourse. This is a continuation of the 1 st order stream identified at Survey ID 8. At this stage no additional hydrolines join this creek. Due to the lack of stream at Survey ID 11 and 10 the desktop assessment indicating the presence of a Stream Order 3 hydroline is inaccurate having been confirmed by ground-truthing.		
Ground-truthed Stream Order	1		6



Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
			
Plate 14: Survey ID 9			
Desktop Assessment – Survey Id - 10			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area</i> ? (Appendix 2 - NRAR Guidelines, 2020)	No	No	-
Is there a watercourse visible on your property?	No	Desktop assessment shows mapped hydrolines, however aerial imagery shows, water areas but no visible watercourse.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines, 2020—Lakes and Wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 - NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	2	Based on the desktop assessment, Hydroline ID 10 is mapped as Stream Order 2 using the Strahler Stream order classification, due to the convergence of the mapped upper tributaries (Figure 3). This will be confirmed by ground-truthing.	3
Field Assessment – Survey Id - 10			
Define Bed and Banks (Yes / No)	No		-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	None	No	-

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	Erosion	Overland flow erosion	-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines, 2020)	No	No	-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	No	No	-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	No	No	-
Ground-truthed Survey Results		No	5
Controlled Activity Approval required (Y / N)	No	No	-
Vegetated Riparian Zone Required (m)	0	No	-
Comments	No watercourse was confirmed, overland flow with water erosion.		
Ground-truthed Stream Order	0		5






Plate 15: Survey ID 10

Desktop Assessment – Survey Id -11			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area</i> ? (Appendix 2 - NRAR Guidelines, 2020)	No	No	-
Is there a watercourse visible on your property?	No	Desktop assessment shows mapped hydrolines, however aerial imagery shows no visible watercourse.	3
Is there a lake or wetland on your property or within 40 metres of the	No	No	-


Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
proposed work? (Appendix 3 - NRAR Guidelines, 2020 — Lakes and Wetlands)			
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 – NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	1	Based on the desktop assessment, Hydroline ID 11 is mapped as Stream order 1 using the Strahler Stream order classification.	3
Field Assessment – Survey Id - 11			
Define Bed and Banks (Yes / No)	No	Overland flow from segment 7 and 8 join and go under road and continue to flow overland across paddock. No defined bed or bank for segment 7 and 8.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	None		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None		-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines, 2020)	No		-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	No		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	No		-
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	0		-
Comments	Survey ID point 11 determined the hydroline across the property to be overland flow. Therefore, the desktop assessment classifying the hydroline as 1 st Stream Order is inaccurate having been confirmed by ground-truthing.		
Ground-truthed Stream Order	0		5
 <p style="text-align: center;">Plate 16: Survey ID 11</p>		 <p style="text-align: center;">Plate 17: Survey ID 11</p>	

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Desktop Assessment – Survey Id - 12			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area</i> ? (Appendix 2 - NRAR Guidelines, 2020)	No	No	-
Is there a watercourse visible on your property?	Yes	The desktop assessment indicates that there is a mapped hydroline. Aerial imagery cannot confirm presence of a watercourse due to canopy vegetation. Ground truthing is required.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines, 2020 — Lakes and Wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 – NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	1	Based on the desktop assessment, Hydroline ID 12 is mapped as Stream order 1 via the Strahler Stream order classification, due the convergence of the mapped hydrolines above. This will be confirmed by ground-truthing.	3
Field Assessment – Survey Id - 12			
Define Bed and Banks (Yes / No)	Yes	Refer to Plate 18 .	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	Type 4		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	Deposition, erosion	Erosion around banks. Refer to Plate 18 .	-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines, 2020)	None		-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	None		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	Yes		7
Ground-truthed Survey Results		Continuation of the 1st order stream identified at Survey ID 8.	5
Controlled Activity Approval required (Y / N)	Yes		-
Vegetated Riparian Zone Required (m)	10m (either side of the watercourse)		8
Comments	<p>A defined natural creek bed, present riparian vegetation and marginal flow of water indicate a watercourse.</p> <p>Continuation of the 1st order stream identified at Survey ID 8. The stream continues to flow off property onto neighbouring land.</p>		

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
		Therefore, desktop assessment indicating the presence of a Stream Order 3 hydroline is inaccurate having been confirmed by ground-truthing.	
Ground-truthed Stream Order	1		6
			
Plate 18: Survey ID 12			
Desktop Assessment – Survey Id - 13			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area</i> ? (Appendix 2 - NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	No	The desktop assessment indicates that there is a mapped hydroline. Aerial imagery does not reveal any watercourses.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines, 2020 — Lakes and Wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 – NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	1	Based on the desktop assessment, Hydroline ID 13 is mapped as Stream order 2 via the Strahler Stream order classification.	3
Field Assessment – Survey Id - 13			
Define Bed and Banks (Yes / No)	No		-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	None	Overland flow from the development south of the New England Highway.	-

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None		-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines, 2020)	No		-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	No		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	No		-
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	No		-
Comments	Overland flow from the development south of the New England Highway. Given the topography and the scattered occurrence of species associated with wetter areas it is likely that the area (identified in Figure 9) will become a wetland if the current drainage remains.		
Ground-truthed Stream Order	0		5
 <p>Plate 19: Survey ID 13</p>		 <p>Plate 19: Survey ID 13a</p>	
Desktop Assessment – Survey Id - 14			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area?</i> (Appendix 2 - NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	Yes	The desktop assessment indicates that there is a mapped hydroline.	3

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
		Aerial imagery does not reveal any watercourses.	
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines, 2020 — Lakes and Wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 – NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	1	Based on the desktop assessment, Hydroline ID 14 is mapped as Stream order 1 via the Strahler Stream order classification.	3
Field Assessment – Survey Id – 14			
Define Bed and Banks (Yes / No)	No	No	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	None	No	-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	Erosion and Disposition	Drainage depression is evident	-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines, 2020)	No	No	-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	No	No	-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	No	No	-
Ground-truthed Survey Results		The site inspection showed that the mapped hydroline was overland flowing across paddocks.	5
Controlled Activity Approval required (Y / N)	No	No	-
Vegetated Riparian Zone Required (m)	0	No	-
Comments	Survey ID point 14 is likely to consist of over land flow that turns into a pond and then runs under a dirt road before becoming a piped drain on school grounds. Therefore, the desktop assessment classifying the hydroline as a Stream Order 1 is inaccurate having been confirmed by ground-truthing.		
Ground-truthed Stream Order	0		5

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
			
Plate 20: Survey ID 14			
Desktop Assessment – Survey Id - 15			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area?</i> (Appendix 2 - NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	No	The desktop assessment indicates that there is a mapped hydroline.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines, 2020 — Lakes and Wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 – NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	3	Based on the desktop assessment, Hydroline ID 15 is mapped as Stream order 3 via the Strahler Stream order classification.	3
Field Assessment – Survey Id – 15			
Define Bed and Banks (Yes / No)	Yes	Defined bed or bank obvious, however a path is visible. Highly degraded with <i>Juncus acutus</i> . Runs through Agricultural School farm and risk being exposed to animal waste. The school has modified the creek by inserting a crossing path.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	Type 4		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	Erosion and Disposition		-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines, 2020)	No		-

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	None		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	Yes		7
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	Yes		-
Vegetated Riparian Zone Required (m)	10m (either side of the watercourse)		8
Comments	Survey ID point 15 is has defined bed and erosion and deposition.		
Ground-truthed Stream Order	1		6



Plate 22: Survey ID 15


Desktop Assessment – Survey Id - 16			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area</i> ? (Appendix 2 - NRAR Guidelines, 2020)	No	No	-
Is there a watercourse visible on your property?	No	The desktop assessment indicates that there is a mapped hydroline.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines, 2020 — Lakes and Wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 – NRAR Guidelines,	3	Based on the desktop assessment, Hydroline ID 16 is mapped as	3


Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?		Stream order 3 via the Strahler Stream order classification.	
Field Assessment – Survey Id – 16			
Define Bed and Banks (Yes / No)	Yes	Defined bed or bank visible. Highly degraded with <i>Juncus acutus</i> . The school has modified the creek by inserting a crossing path.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	Type 4		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	Erosion and Disposition		-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines, 2020)	No		-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	None		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	Yes		7
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	20m (either side of the watercourse)		8
Comments	Survey ID point 16 is has defined bed. However, due to the ground-truthing of the upper tributaries, the desktop assessment classifying the hydroline as a Stream Order 3 is inaccurate having been confirmed by ground-truthing.		
Ground-truthed Stream Order	2		6



Plate 23: Survey ID 16




Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Desktop Assessment – Survey Id - 17			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area</i> ? (Appendix 2 - NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	No	The desktop assessment indicates that there is a mapped hydroline.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines, 2020 — Lakes and Wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 – NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	3	Based on the desktop assessment, Hydroline ID 17 is mapped as Stream order 3 via the Strahler Stream order classification	3
Field Assessment – Survey Id – 17			
Define Bed and Banks (Yes / No)	Yes	Non-natural, the school dug out to aid in flooding events. The northern section is a watercourse with defined bed and bank.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	None		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None		-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines, 2020)	No		-
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	None		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	No		7
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	None		-
Comments	Survey ID point 17 consists of a continuing stormwater drainage system connected to detention basins in the development across the road and the start of watercourse.		
Ground-truthed Stream Order	1		6

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
			
Plate 24: Survey ID 17			
Desktop Assessment – Survey Id - 18			
Is your property located on a watercourse, lake or estuary within the shaded area in any of the NRAR waterfront land maps? (Appendix 1 - NRAR Guidelines, 2020)	No	No	-
Is your property within the shaded area on the <i>NRAR Map—Western land map local government area?</i> (Appendix 2 - NRAR Guidelines, 2020)	No	The LGA of the site location is Maitland City Council, which is excluded from the Western Land map.	-
Is there a watercourse visible on your property?	No	The desktop assessment indicates that there is a mapped hydroline.	3
Is there a lake or wetland on your property or within 40 metres of the proposed work? (Appendix 3 - NRAR Guidelines, 2020 — Lakes and Wetlands)	No	No	-
Using the <i>Determining Stream Order</i> fact sheet (Appendix 4 – NRAR Guidelines, 2020) and the <i>NSW Hydro Line Spatial Data Map</i> , what is the stream order of your watercourse?	2	Based on the desktop assessment, Hydroline ID 18 is mapped as Stream order 2 via the Strahler Stream order classification	3
Field Assessment – Survey Id – 18			
Define Bed and Banks (Yes / No)	No	No watercourse present. A dam can be seen from the road on private property. It is consistent with land over flow that flows through pipes under the road. Was dry at time of inspection.	-
Type of Watercourse: Type 1, Type 2, Type 3a, Type 3b, Type 3c, Type 4, Type 5, Type 6, Type 7, None (Appendix 5 - NRAR Guidelines, 2020)	None		-
Watercourse Feature Present (Pool, Riffle, Erosion and Disposition, None)	None		-
Lakes or Wetlands (Appendix 3 – NRAR Guidelines, 2020)	No		-

Task – Waterland Tool (2020)	Assessment	Comments (provide evidence)	Figures
Vegetation Present to indicate Wetlands (Appendix 7 - NRAR Guidelines, 2020)	None		-
High Bank (Appendix 8 - NRAR Guidelines, 2020)	No		-
Ground-truthed Survey Results			5
Controlled Activity Approval required (Y / N)	No		-
Vegetated Riparian Zone Required (m)	None		-
Comments	Survey ID point 18 is likely to consist of a continuing stormwater drainage system connected to detention basins or underground drains. Therefore, the desktop assessment classifying the hydroline as a Stream Order 2 is inaccurate having been confirmed by ground-truthing.		
Ground-truthed Stream Order	0		5
			
Plate 25: Survey ID 18			

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

-  Subject Site
-  1st Order Stream
-  2nd Order Stream



0 75 150 m

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 6 - Ground-truthed Stream Order

Date: September 2022




Location: New England Hwy and Wyndella Rd, Lochinvar

Client: ADW Johnson

AEP ref: 2699

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

-  Subject Site
-  Cadastre
-  Top of Bank



0 60 120 m

Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 7 - Top of Bank

Date: September 2022





Location: New England Hwy and Wyndella Rd, Lochinvar

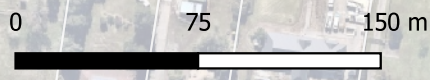
Client: ADW Johnson

AEP ref: 2699

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

-  Subject Site
-  Cadastre
-  Top of Bank
-  Desktop VRZ (Buffer 10m)



Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 8 - VRZ

Date: September 2022

Location: New England Hwy and Wyndella Rd, Lochinvar

Client: ADW Johnson

AEP ref: 2699

5.0 Conclusion

The desktop and field investigations showed that hydrolines Survey ID # 1, 2, 3, 4, 5, 6, 10, 11, 13, and 14 did not show key features of watercourses. Hydrolines Survey ID # 7, 8, 9, 12, 15 and 17 are stream order (one) 1, and ID # 16 are stream order (two) 2 as they have clearly defined bed and banks, erosion, pooling and riparian vegetation. Therefore, a 10m (either side of the watercourse) Vegetated Riparian Zone is appropriate (refer **Table 4**), noting that these zones have been designed by Department of Primary Industries to be flexible allowing for averaging across Sites.

Note that there is potential to negotiate with NRAR to remove First Order Streams in exchange for VRZ on other retained streams. The standard permissible riparian activities are outlined below.

Table 4 – Riparian Corridor Matrix

Watercourse Type	VRZ width (each side of watercourse)	Total RC width	Cycleways and pathways	Detention basins		Stormwater outlet structures and essential services	Stream realignment	Road crossings		
				Only within 50% outer VRZ	Online			Any	Culvert	Bridge
1st order	10m	20m + channel width	Yes	Yes	Yes	Yes	Yes	Yes	-	-
2nd order	20m	40m + channel width	Yes	Yes	Yes	Yes	-	Yes	-	-
3rd order	30m	60m + channel width	Yes	Yes	-	Yes	-	-	Yes	Yes
4th order or greater	40m	80m + channel width	Yes	Yes	-	Yes	-	-	Yes	Yes

Note: Where a watercourse does not exhibit the features of a defined channel with bed and banks, the NRAR may determine that the watercourse is not waterfront land for the purpose of the WM Act.

Figure 9 shows an area that is currently dominated by pasture grasses, however given the stormwater runoff from the development to the south this area is highly likely to become a wetland in the near future.

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

Legend

-  Subject Site
-  Cadastre
-  Overland Dispersion Area



Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan



AEP

Figure 9 - Overland Dispersion Area

Date: September 2022

Location: New England Hwy and Wyndella Rd, Lochinvar

Client: ADW Johnson

AEP ref: 2699

6.0 References

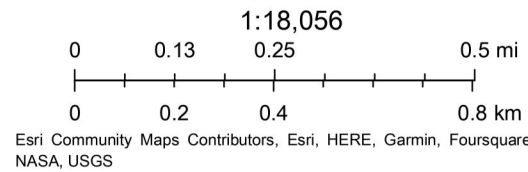
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Appendix A – NRAR Hydroline Spatial Data

2018 Hydroline spatial data 1.0



2022, 6:14:39 AM



Appendix B – Author CVs

Chris Wark

Curriculum Vitae

Chris works as an Ecologist with AEP. He has been involved in ecology for the past 15 years both in the UK and Australia undertaking a diverse range of terrestrial fauna surveys. While in the UK Chris focused on microbat survey and call identification and herpetological survey, capture and translocation. He has used the experience gained in the UK and undergone further training in Australia and now undertakes AEPs bat call analysis and identification works among his other roles within the company.

Qualifications

- Diploma of Conservation and Land Management (2017)
- Bachelor of Teaching (Secondary School), University of Technology, NSW (2008)
- Bachelor of Science Hons (Ecology and Zoology), University of Sydney (2004)
- Bachelor of Science (Cell Biology and Biochemistry), University of Newcastle (2000)

Further Education & Training

- Microbat Call Analysis Workshop
- QLD WHS General Construction Induction (White Card)
- NSW Class C Driver's Licence
- Experienced 4wd operator
- GIS Mapping and training courses (ArcGIS, QGIS and Mapinfo)

Fields of Competence

- Fauna survey and identification utilising camera traps and audio technology
- Microbat survey, call analysis and ID
- GIS mapping and analysis
- Land conservation management
- Ecological field survey, covering terrestrial flora and fauna
- Arid zone ecology and feral cat management

Field Survey Experience

- Fauna survey including bird and reptile survey, spotlighting, koala habitat and SAT assessment, microbat emergence and return surveys along with transect surveys;
- Trapping and translocation works with mammals, reptiles and amphibians;
- Camera trapping, acoustic detection and call playback surveys;
- Vegetation quadrats and transects to identify flora species presence and abundance;
- Targeted vegetation transects for cryptic species;
- Brush-tailed Rock-wallaby habitat survey and macropod scat identification;
- Audio lure surveys including track and carnivore scat identification.

Relevant Employment History

2018 – Present

Senior Ecologist

Anderson Environment & Planning, Newcastle

2013 - 2017

Ecologist

Applied Ecology Ltd, Cambridge UK

2012

Laboratory and Field Technician

Cygnets Potato Breeders, Cambridge UK

2009 – 2011

Secondary School Science Teacher

Taylor's College, Waterloo Sydney

2005 – 2007

Research Assistant and University Tutor

Biological Sciences, University of Sydney

Kathleen Bushell

Curriculum Vitae

Kathleen works with AEP in the role of Ecologist. She Graduated with a Bachelor of Science (Hons) majoring in marine biology, terrestrial ecology, sustainability and conservation. Kathleen was a research assistant and involved with the LiDar research at Newcastle University and an educator for Take 3. These experiences have provided experience in flora and fauna survey requirements, spatial surveying, mapping, research and reporting that contribute to the AEP team.

Qualifications

- Bachelor of Science (Hon), University of Newcastle, NSW. Marine Biology, terrestrial ecology, sustainability and conservation.

Further Education & Training

- Geographic Information Systems ArcGIS, QGIS various providers
- Class C NSW Driver's Licence
- NSW Construction White Card
- First Aid (Provide first aid HLTAID003)
- SSI Open Water Scuba Licence

Fields of Competence

- Experience operating 4x4 vehicles
- GIS and remote sensing
- Ecological field surveys
- Handling of fauna, fauna trapping, and microchipping fauna, including threatened species
- Marine and terrestrial quality surveys, sampling and analysis

Relevant Employment History

2022 – Present	Ecologist Anderson Environment & Planning, Newcastle
2022	Casual Academic The University of Newcastle, Newcastle
2017 – 2021	Research Assistant The University of Newcastle, Newcastle
2020 - 2021	LiDAR Data Quality Analyst Anditi, Newcastle
2018 - 2021	Educator Take 3 for the Sea, Central Coast

Volunteer Experience

- Educator – Irukandji Shark and Ray Centre, Nelson Bay
- GIS Analyst – Work placement, National Parks and Wildlife Services, Newcastle

Natalie Black

Curriculum Vitae

Natalie works with AEP in the role of Senior Environmental Manager. She has extensive knowledge in environmental management, environmental planning, and report writing and assessment. With a detail understanding of planning, catchment management, coastal management and rehabilitation. Natalie has had a successful career with both state and local government in conservation, planning and field investigation roles. Natalie has also gained extensive communication skills and project management through her previous career in lecturing. Her background and experience in the ecological and planning fields is utilised in a diverse array of application in her current role.

Qualifications

- B.Sc (Hons), University of Newcastle, 2002 Sustainable Resource Management and Marine Science.
- Master Planning, University of Technology Sydney 2007.
- Certificate IV Training and Assessment at NSW TAFE 2012.
- BAM Assessor; accreditation number: BAAS19076.

Certification

- Evidence Gathering and Legal Process (Australian Institute of Environmental Health).
- Conflict Resolution Course (LGSA).
- Report Writing Course (LGSA).
- Powerful Presentation (LGSA).
- NSW Rural Fire Services Bush Fire Assessment
- Relocation of Threatened Species (Botanical Gardens Sydney).
- Sustainable Home Assessment Reduction Revolution.
- Flora and Fauna Survey Assessments Niche Environment and Heritage.
- First Aid TAFE.

Fields of Special Competence

- Environmental Planning
- Environmental Management and rehabilitation of catchments coastal waterways. Statement of Environmental Effects (preparation and assessing).
- Fish Passage
- Marine ecosystems including; mangroves, seagrasses, algae, Fauna and habitat assessment.
- vegetation.
- Communicating with a wide range of stakeholders.
- Development Application.
- Education in both Environmental and Planning industries.
- Koala Plans of Management.
- Policy Development.

Employment History

2019 to present AEP Senior Environmental Manager

2010 to 2019

Natalie Black is the Principal Environmental Planner for Black EARTH Environmental. Working a range of projects, Bush Fire Assessments, Landscaping, Development Applications, Statements of Environmental Effect's, Environmental Management Plans, Sustainability Assessment of both private and businesses, sustainable gardens, environmental assessments for proposed projects and environmental advice and volunteering for local Sustainable Community Group and Landcare. During this time Natalie also lectured at Hunter TAFE teaching a range of environmental units both face to face and on-line to a varying range of qualification and levels.

2003 to 2010

Natalie was the Natural Resource Manager and Development Assessment Officer at Lismore City Council working with diverse range of professions such as engineers, town planners, environmental health officer, accountants, building surveyors, arborists, councillors. During this time the main projects were grants application, restoration projects, flora and fauna assessments, environmental legal adviser, bush fire assessments, strategic work, development application assessment (ranging from sheds to Designated Developments) and council development application team for internal projects, Council's for climate change, water wise programs and others. During 2006 -2007 Natalie was the lead Environmental Officer and Development Planner for the development of Council Plans of Management (POM). The POMs were for each parcel of land owned and managed lands, by Council. The parcels of land ranged from easements, parks and recreation areas to urban bushland, each POM provided clear guidelines and procedures for all works including civil, maintenance and regeneration etc.

2002 to 2003 was a step into the Policy unit within DPI where Natalie was part of the team working on the Jervis Bay Indigenous Fishing Strategy, and the closure of Port Botany. Dealing with many stakeholders and running workshops with Ministers and community. During 2003 with Natalie was the North Coast Fish Passage Officer. Managing an Environmental Trust Grant of \$1 million to remove 50 structures that block fish passage within the catchments of the North Coast. This project had all 50 sites contracted by the end of the 12 months with 70% of these projects commenced. This role allowed for the development of field assessments, independent work and communication with a range of stakeholders.

2000 saw the commencement of Natalie's career with NSW Department of Primary Industries (Fisheries Unit) in the Office of Conservation in Sydney. Natalie was part of the Conservation team that reviewed integrated development applications in the Sydney Region, with a focus on the seagrasses present within the estuaries. The assessments ranged from jetties to the Lane Cove Tunnel, North West T-Way and the expansion of the M7 and fish ladders.

BSc Honours Project was research paper into the variations of *Zostera capricorni* wrack located within the Tuggerah Lakes system in comparison to Brisbane Waters and Lake Macquarie.