

## **Riparian Assessment - January 2021**

## 1. Introduction

The NSW Department of Planning and Environment (DPE) has identified the Pondicherry Precinct and Oran Park Precinct as priority areas for development within the South West Growth Centre. Greenfields Development Company (GDC), on behalf of DPE, engaged Eco Logical Australia Pty Ltd (ELA) to prepare a preliminary riparian assessment on the Pondicherry Precinct in 2017. ELA has since assessed the site further, providing updated Top of Bank (TOB) mapping and riparian assessment to confirm the current condition of the waterways within the Precinct. GDC has outlined Tranche 41, in the south-western corner, of the Pondicherry Precinct as an area of priority (Figure 1 and Figure 2). The proposed rezoning design is shown in Figure 3. This letter provides an updated overview of the riparian values and statutory framework, specific to the Tranche 41 area to support the application to rezone this area.

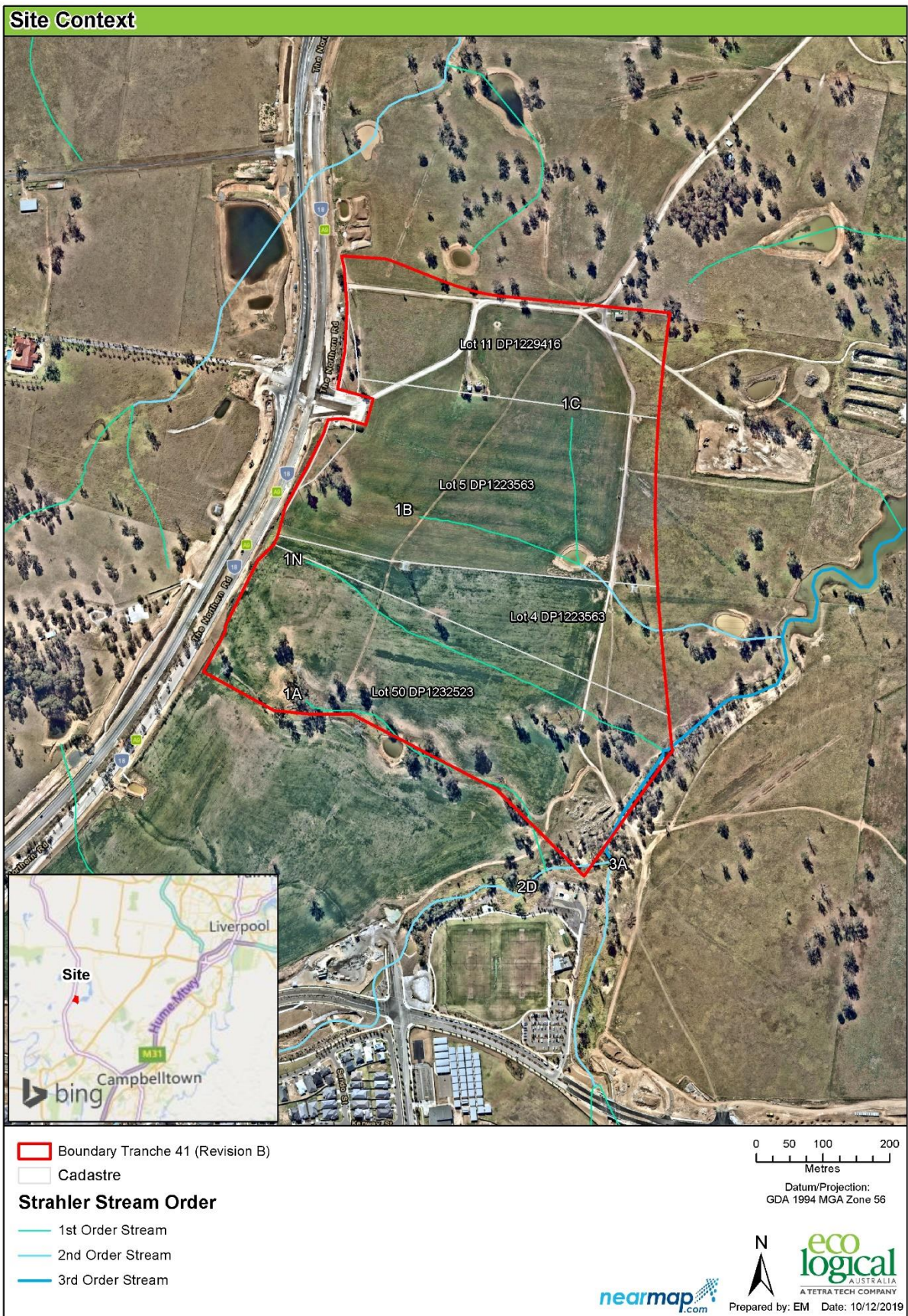
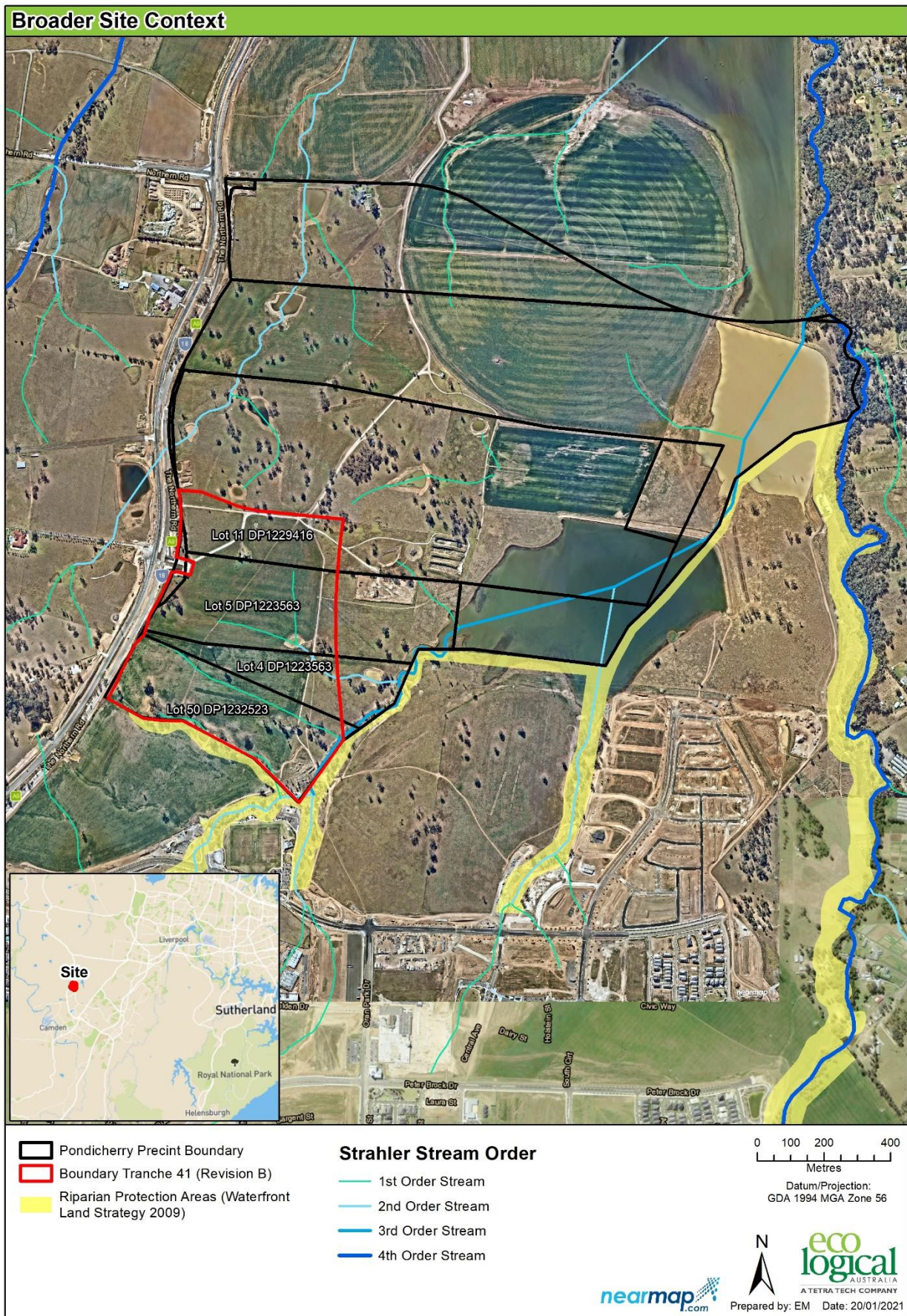


Figure 1: Site context with reach numbers





**Figure 2: Tranche 41 rezoning within the Pondicherry Precinct and defined Riparian Protection Areas**



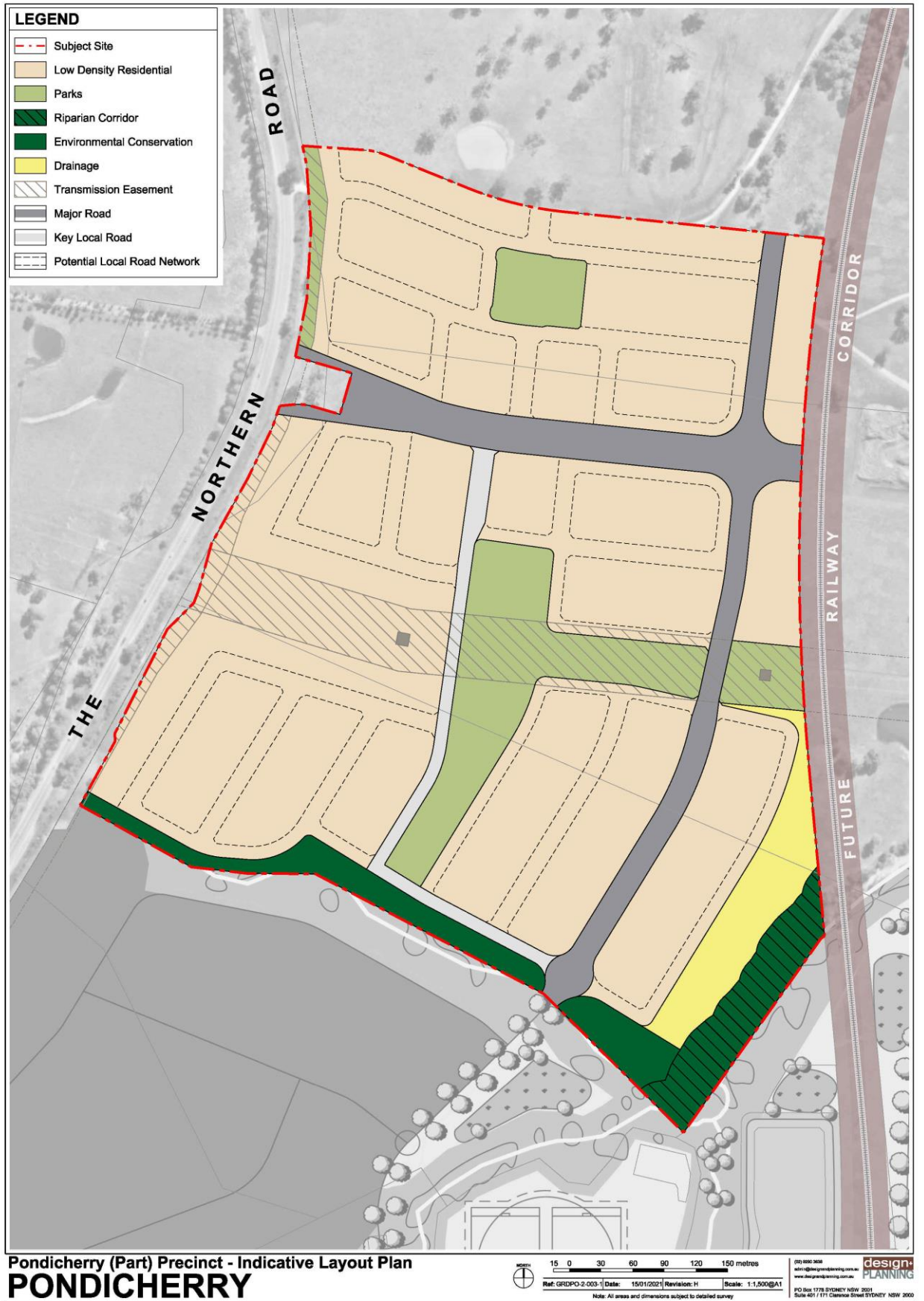


Figure 3: Proposed rezoned areas

## 2. Legislative context

The specific riparian and aquatic regulatory requirements and policies were reviewed to determine their application to Tranche 41. These included:

- *Fisheries Management Act 1994*
- *Water Management Act 2000* and associated guidelines
- NSW Wetlands Management Policy
- Oran Park and Turn Road Waterfront Land Strategy 2009
- Oran Park Precinct – Development Control Plan 2016
- Policy and guidelines for fish habitat conservation and management (Fairfull, 2013)
- *Sydney Regional Environmental Plan No 20 – Hawkesbury Nepean River (No 2 – 1997)*.

### 2.1 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) governs the management of fish and their habitat in NSW. The FM Act applies to fish and marine vegetation and requires separate assessment from the NSW *Biodiversity Conservation Act 2016* (BC ACT), which only relates to terrestrial animals and plants. Therefore, if land is bio-certified under the BC Act, an assessment of fish habitat still needs to be undertaken. The objectives of the FM Act are to conserve fish stocks and key fish habitats, conserve threatened species, populations and ecological communities of fish and marine vegetation and to promote ecologically sustainable development. The FM Act also regulates activities involving dredging and/or reclamation of aquatic habitats, obstruction of fish passage, harming marine vegetation and use of explosives within a waterway.

To assess impacts to aquatic habitats, the regulatory framework of the FM Act and associated guidelines have been applied for this assessment. This allows consistent assessment of habitat presence and quality on site, whilst considering the broader catchment to determine the value of each creek.

A search of the Commonwealth Protected Matters Search tool, OEH BioNet database search and Fisheries Threatened Species distribution maps (Riches et al, 2016) identified two species of fish with the potential to be found within the study area (**Table 1**). However, there are no records within 5 km of the study area or in major creeks connected to the site (South Creek). As there is lack of suitable habitat and connectivity to other known occurrences of these species, it is unlikely that these species would be found within Tranche 41 study area.

**Table 1: Likelihood of occurrence table for aquatic species**

Species	FM Act	EPBC Act	Habitat Associations	Records within 5 km	Likelihood of occurrence
<i>Macquarie australasica</i> - Macquarie Perch	E	E	Habitat for this species is bottom or mid-water in slow-flowing rivers with deep holes, typically in the upper reaches of forested catchments with intact riparian vegetation. Macquarie Perch also do well in some upper catchment lakes. In some parts of its range, the species is reduced to taking refuge in small pools which persist in midland–upland areas through the drier summer periods.	0	No, no suitable habitat. Nearest modelled occurrence is in Nepean River and Georges River (Riches et al 2016).
<i>Prototroctes maraena</i> - Australian Grayling	E	V	Historically, this species inhabited coastal streams from the Grose River southwards through NSW, VIC and TAS. On the mainland, this species has been recorded from rivers flowing east and south of the main dividing range. This species spends only part of its lifecycle in freshwater, mainly inhabiting clear, gravel-bottomed streams with alternating pools and riffles, and granite outcrops. Grayling migrate between freshwater streams and the ocean and as such, it is generally accepted to be a diadromous species (migratory between fresh and saltwaters).	0	No, no suitable habitat. Nearest modelled occurrence is in the Minnamurra River (Riches et al 2016).

Note: E = Endangered, V= Vulnerable.

## 2.2 Water Management Act 2000

The main objective of the *Water Management Act 2000* (WM Act) is to manage NSW water in a sustainable and integrated manner that will benefit current generations without compromising future generations' ability to meet their needs. The WM Act is administered by Natural Resources Access Regulator (NRAR) and establishes an approval regime for activities within waterfront land, defined as the land 40 m from the highest bank of a river, lake or estuary.

Under WM Act framework, activities and works proposed on waterfront land are regulated. These activities include:

- the construction of buildings or carrying out of works
- the removal of material or vegetation from land by excavation or any other means
- the deposition of material on land by landfill or otherwise
- any activity that affects the quantity or flow of water in a water source.

In order to inform a comparative and acceptable assessment of riparian impacts, the regulatory framework of the WM Act and associated guidelines have been adopted for this assessment.

NRAR's *Guidelines for Controlled Activities on waterfront land—Riparian corridors* (NRAR, 2018) outlines the need for a Vegetated Riparian Zone (VRZ) adjacent to the channel to provide a transition zone between the terrestrial environment and watercourse. This vegetated zone helps maintain and improve the ecological functions of a watercourse whilst providing habitat for terrestrial flora and fauna. The VRZ plus the channel (bed and banks of the watercourse to the highest bank) constitute the 'riparian corridor' (Figure 4). To be consistent with the guidelines VRZ widths should be based on watercourse order as classified under the Strahler System of ordering watercourses and using Hydroline Spatial Data which is published on the department's website (Table 2).

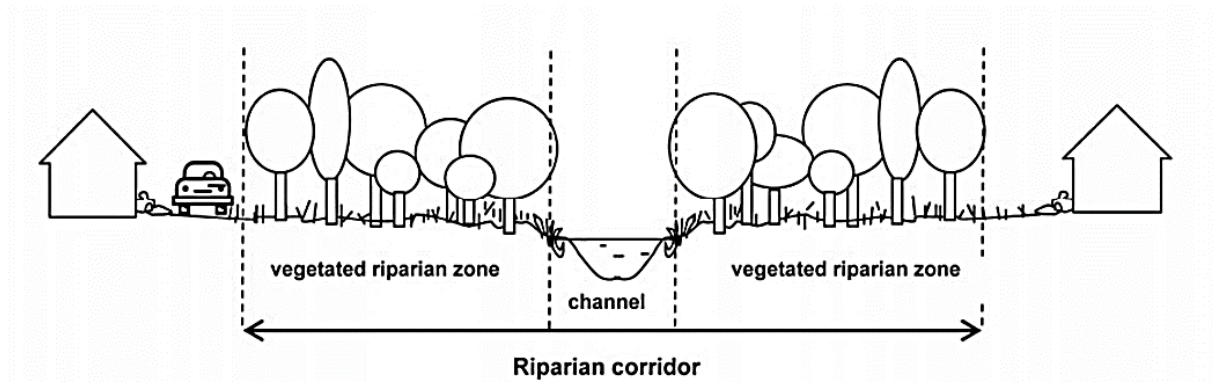


Figure 4: Vegetated Riparian Zone and watercourse channel comprising the riparian corridor (NRAR, 2018).

Table 2: Recommended riparian corridor widths relative to Strahler Order (NRAR, 2018).

Watercourse type	VRZ width (each side of watercourse)	Total riparian corridor width
1 <sup>st</sup> order	10 m	20 m + channel width
2 <sup>nd</sup> order	20 m	40 m + channel width
3 <sup>rd</sup> order	30 m	60 m + channel width
4 <sup>th</sup> order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 m	80 m + channel width

Certain works are permissible within the riparian zone (Table 3). Non-riparian uses are consistent with NRAR's guidelines in the outer 50% of the VRZ as long compensation (1:1 offset) is achieved within the site. The outer VRZ that is impacted must be offset elsewhere on site using the 'averaging rule' (Figure 5). Section 5, further outlines how the proposed rezoning relates to the WM Act objectives and guidelines.



Table 3: Riparian corridor (RC) matrix of permissible use (NRAR 2018).

Stream order	Vegetated Riparian Zone (VRZ)	RC off-setting for non RC uses	Cycleways and paths	Detention basins		Stormwater outlet structures and essential services	Stream realignment	Road crossings		
				Only within 50% outer VRZ	Online			Any	Culvert	Bridge
1 <sup>st</sup>	10m	•	•	•	•	•	•	•		
2 <sup>nd</sup>	20m	•	•	•	•	•		•		
3 <sup>rd</sup>	30m	•	•	•		•			•	•
4 <sup>th</sup> +	40m	•	•	•		•			•	•

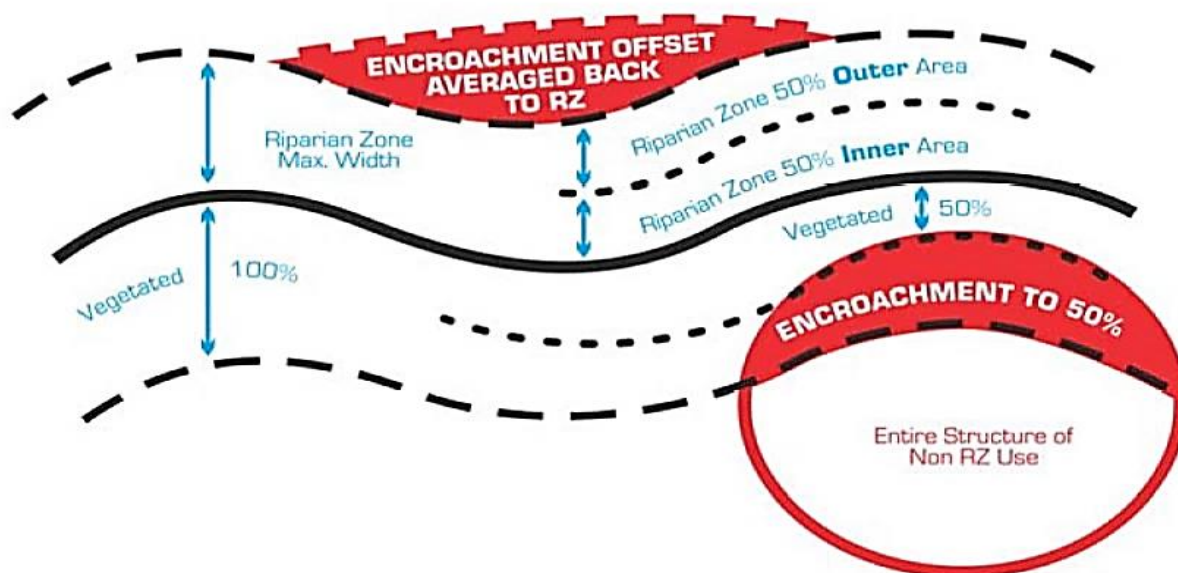


Figure 5: Riparian 'averaging rule' for offsetting encroachment into the outer 50% of the VRZ (NRAR 2018).

## 2.3 NSW Wetlands Management Policy

The NSW Wetlands Management Policy (DECCW, 2010) aims to provide for the protection, ecologically sustainable use and management of NSW wetlands. Wetlands include lakes, lagoons, estuaries, rivers, floodplains, swamps, bogs, billabongs, marshes, coral reefs and seagrass beds. For the sustainable management of wetlands, the NSW Government adopts 12 principles to guide decision-making. The themes of these 12 policies include:

- Catchment scale
- Water regimes
- Floodplain connectivity
- Wetlands of significance
- Land management practices
- Cultural values

- Rehabilitation
- Climate change
- Research
- Protection and offsetting
- Cooperation and incentives
- Monitoring and reporting.

There are no wetlands on site, however, the rezoning would be undertaken in line with the policy's guiding principles.

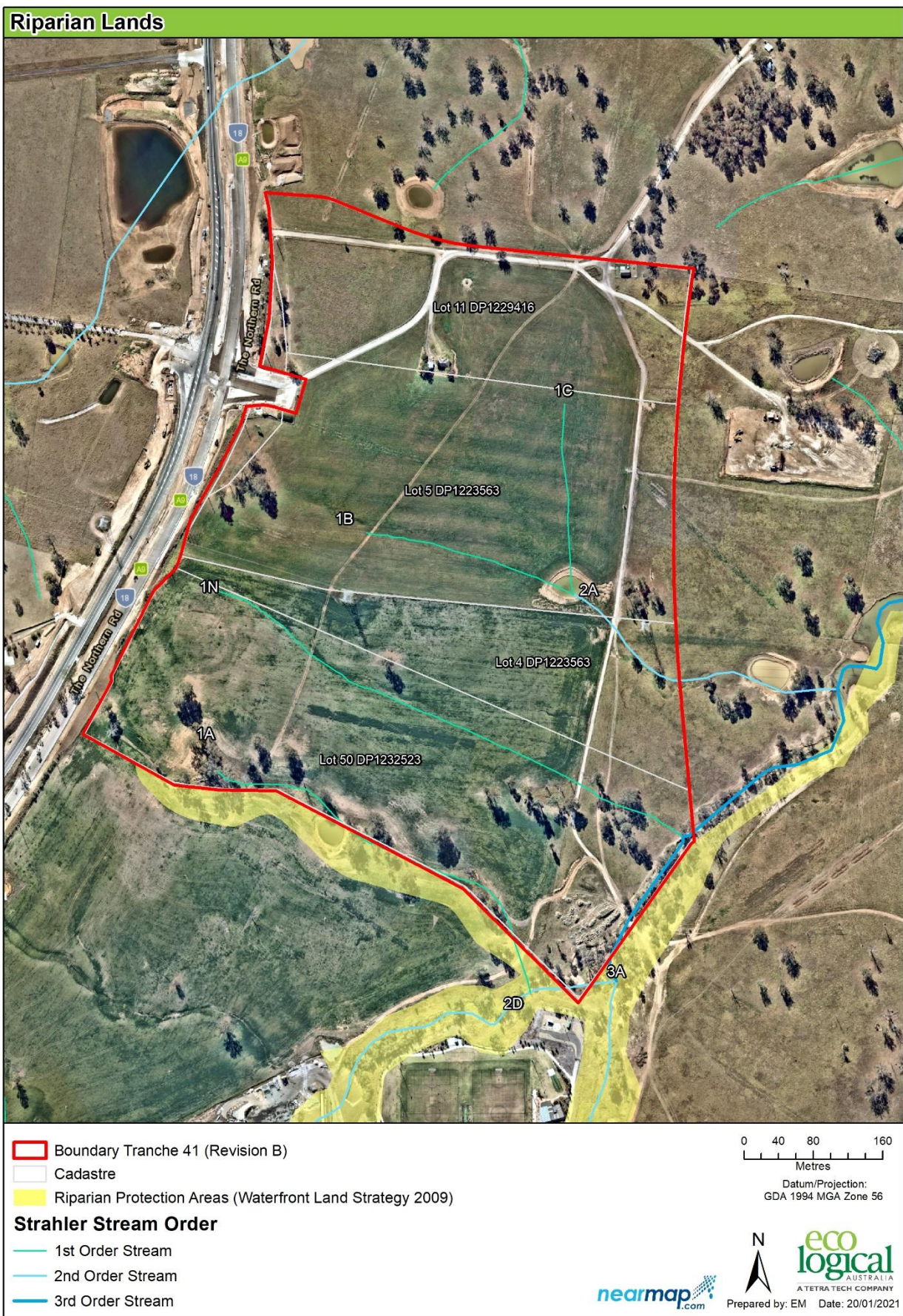
#### *2.4 Oran Park and Turner Road Waterfront Land Strategy 2009*

This strategy applies to Waterfront Land in the Oran Park and Turner Road Precincts, as defined in the State Environmental Planning Policy (Sydney Region Growth Centres) 2006 as being land identified as Riparian Protection Area. The strategy aims to set controls and outcomes for controlled activities in waterfront land, in these Precincts.

Under clause 39A of the Water Management (General) Regulation 2004, development carried out in accordance with this strategy, on land to which this strategy applies, will be exempt from the requirement to obtain a controlled activity approval under the WM Act. Development on land to which this strategy applies that does not comply with the controls to achieve the outcomes of this strategy would require a CAA.

There are riparian protection areas mapped along the boundary of the Tranche 41 study area (**Figure 6**), as part of the strategy. The adjacent area, along the southern boundary of Tranche 41 has considered the riparian protection area by incorporating adjoining riparian corridor into the rezoning design.





**Figure 6: Riparian Protection Areas - mapped under the Oran Park and Turner Road Waterfront Land Strategy 2009**



## 2.5 Oran Park Precinct Development Control Plan (DCP)

The purpose of this DCP is to:

- Communicate the planning, design and environmental objectives and controls against which Camden Council will assess future Development Applications (DAs)
- Consolidate and simplify the planning controls in the Oran Park Precinct, Oran Park Precinct Growth Centres Precinct Development Control Plan 3
- Provide guidance on the orderly, efficient and environmentally sensitive development of the Oran Park Precinct as envisaged by the South West Sector Structure Plan as refined by the Oran Park Precinct Indicative Layout Plan
- Require the preparation of more detailed planning and design controls for important components of the Oran Park Precinct
- Promote high-quality urban design outcomes within the context of environmental, social and economic sustainability.

The planning proposal aligns with the DCP by protecting by enhancing riparian corridors and areas of significant vegetation. There is more riparian corridor area proposed than required under NRAR's guidelines. The riparian corridor along the 3<sup>rd</sup> order creek (east of site) has been designed as a continuous corridor through the broader Oran Park and Pondicherry Precincts. Within the Tranche 41 boundary, additional open space is proposed to be linked with riparian corridors, consistent with the DCP. Overall the rezoning has been designed to consider the wider development areas to align with the DCP.

## 2.6 Policy and guidelines for fish habitat conservation and management

The *Policy and guidelines for fish habitat conservation and management* (Fairfull, 2013) (herein referred to as the 'Policy') is a supplementary document that outlines the requirements and obligations under the FM Act and the *Fisheries Management (General) Regulation 2010* and were developed to maintain and enhance fish habitat and assist in the protection of threatened species. The Policy provides a definition of key fish habitat and provides guidance for assigning a rating for fish habitat sensitivity (Table 4) and the type of key fish habitat (Table 5).

**Table 4: Classification of waterways for fish passage (Fairfull 2013)**

Table 2 - Classification of waterways for fish passage	
Classification	Characteristics of waterway class
<b>CLASS 1</b> <b>Major key fish habitat</b>	Marine or estuarine waterway or permanently flowing or flooded freshwater waterway (e.g. river or major creek), habitat of a threatened or protected fish species or 'critical habitat'.
<b>CLASS 2</b> <b>Moderate key fish habitat</b>	Non-permanently flowing (intermittent) stream, creek or waterway (generally named) with clearly defined bed and banks with semi-permanent to permanent waters in pools or in connected wetland areas. Freshwater aquatic vegetation is present. TYPE 1 and 2 habitats present.
<b>CLASS 3</b> <b>Minimal key fish habitat</b>	Named or unnamed waterway with intermittent flow and sporadic refuge, breeding or feeding areas for aquatic fauna (e.g. fish, yabbies). Semi-permanent pools form within the waterway or adjacent wetlands after a rain event. Otherwise, any minor waterway that interconnects with wetlands or other CLASS 1-3 fish habitats.
<b>CLASS 4</b> <b>Unlikely key fish habitat</b>	Waterway (generally unnamed) with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free standing water or pools post rain events (e.g. dry gullies or shallow floodplain depressions with no aquatic flora present).

Table 5: Key Fish Habitat types (Fairfull, 2013)

Table 1 – Key fish habitat and associated sensitivity classification scheme (for assessing potential impacts of certain activities and developments on key fish habitat types)	
<b>TYPE 1 - Highly sensitive key fish habitat:</b> <ul style="list-style-type: none"> <li>▪ <i>Posidonia australis</i> (strapweed)</li> <li>▪ <i>Zostera</i>, <i>Heterozostera</i>, <i>Halophila</i> and <i>Ruppia</i> species of seagrass beds &gt;5m<sup>2</sup> in area</li> <li>▪ Coastal saltmarsh &gt;5m<sup>2</sup> in area</li> <li>▪ Coral communities</li> <li>▪ Coastal lakes and lagoons that have a natural opening and closing regime (i.e. are not permanently open or artificially opened or are subject to one off unauthorised openings)</li> <li>▪ Marine park, an aquatic reserve or intertidal protected area</li> <li>▪ SEPP 14 coastal wetlands, wetlands recognised under international agreements (e.g. Ramsar, JAMBA, CAMBA, ROKAMBA wetlands), wetlands listed in the Directory of Important Wetlands of Australia<sup>2</sup></li> <li>▪ Freshwater habitats that contain in-stream gravel beds, rocks greater than 500 mm in two dimensions, snags greater than 300 mm in diameter or 3 metres in length, or native aquatic plants</li> <li>▪ Any known or expected protected or threatened species habitat or area of declared 'critical habitat' under the FM Act</li> <li>▪ Mound springs</li> </ul>	<b>TYPE 2 – Moderately sensitive key fish habitat:</b> <ul style="list-style-type: none"> <li>▪ <i>Zostera</i>, <i>Heterozostera</i>, <i>Halophila</i> and <i>Ruppia</i> species of seagrass beds &lt;5m<sup>2</sup> in area</li> <li>▪ Mangroves</li> <li>▪ Coastal saltmarsh &lt;5m<sup>2</sup> in area</li> <li>▪ Marine macroalgae such as <i>Ecklonia</i> and <i>Sargassum</i> species</li> <li>▪ Estuarine and marine rocky reefs</li> <li>▪ Coastal lakes and lagoons that are permanently open or subject to artificial opening via agreed management arrangements (e.g. managed in line with an entrance management plan)</li> <li>▪ Aquatic habitat within 100 m of a marine park, an aquatic reserve or intertidal protected area</li> <li>▪ Stable intertidal sand/mud flats, coastal and estuarine sandy beaches with large populations of in-fauna</li> <li>▪ Freshwater habitats and brackish wetlands, lakes and lagoons other than those defined in TYPE 1</li> <li>▪ Weir pools and dams up to full supply level where the weir or dam is across a natural waterway</li> </ul>
	<b>TYPE 3 – Minimally sensitive key fish habitat may include:</b> <ul style="list-style-type: none"> <li>▪ Unstable or unvegetated sand or mud substrate, coastal and estuarine sandy beaches with minimal or no in-fauna</li> <li>▪ Coastal and freshwater habitats not included in TYPES 1 or 2</li> <li>▪ Ephemeral aquatic habitat not supporting native aquatic or wetland vegetation</li> </ul>

## 2.7 Sydney Regional Environmental Plan No 20 – Hawkesbury Nepean River (No 2 – 1997)

Camden LGA is subject to the Sydney Regional Environmental Plan No. 20 – Hawkesbury Nepean River (SREP 20). Part 3, Clause 11 of the SREP 20 lists development controls for land covered under this SREP. Sub-clause 15 relates to 'Land uses in or near the river' and outlines the following controls:

### Definition:

*All uses in the river or a tributary of the river, or within 40 metres of the high-water mark of the river or a tributary of the river where it is tidal or within 40 metres of the bank where it is non-tidal. This includes clearing and the construction and use of piers, wharves, boat sheds or other structures which have direct structural connection to the bank or bed of the river or a tributary of the river.*

*Consent required.*

### Additional matters for consideration by the consent authority:

- The need to locate access points where riverbanks are stable, away from river shallows and major beds of attached aquatic plants, away from fishing grounds and fish breeding areas, where the proposed activities do not conflict with surrounding recreational activities, and where significant fauna and wetland habitats will not be adversely affected.*
- The need to require remedial works, such as the re-establishment of flora and fauna habitats.*
- The potential for use of the land as a buffer to filter water entering the river.*
- The need for an Erosion and Sediment Control Plan.*
- The need for a Vegetation Management Plan.*

The SREP has been considered as part of the rezoning with riparian corridors and green space included as the proposed design in terms of rehabilitating flora and fauna habitats and the use of a riparian corridor as a buffer to filter run off from residential zones. Following the proposed rezoning, residential development would commence having considered and incorporated the additional matters above.



### 3. Methods

The area has been considered in the broader context of the Oran Park and Pondicherry Precincts. Methods were consistent for all sites and consideration has been given to the catchment, meaning creeks have not been assessed in isolation.

The Strahler stream order classification was extracted from the DPI Hydroline Spatial Data. ELA has defined the 3<sup>rd</sup> order waterway flowing through the study area as Class 2 (permanent pool) and Type 2 (online dam), as per the *Policy and Guidelines for fish habitat and conservation*. Upstream and downstream habitat was considered when defining the waterways. Top of bank had previously been preliminarily assessed in the field by ELA in 2017 and validated by ELA in September 2019 by a Senior Aquatic Ecologist.

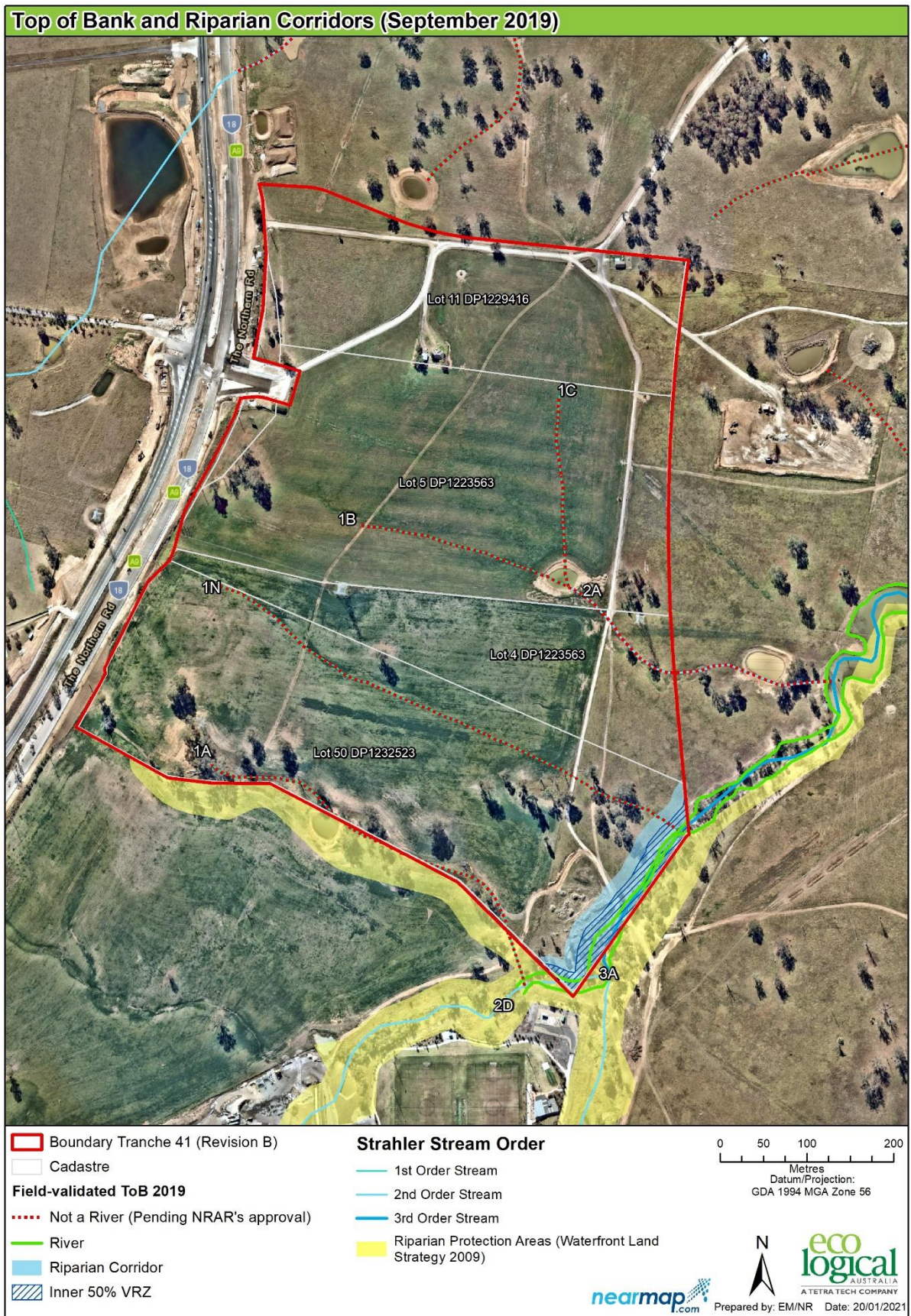
**1. Top of Bank Mapping** – The geomorphic TOB for the creek was mapped using a GPS-enabled tablet and cross-checked with 0.5 m contours and high-resolution aerial imagery. The TOB identifies the geomorphologic extent of the watercourse and forms the basis for measuring any VRZ.

**2. Riparian habitat assessment** – An assessment of riparian condition was conducted for the creek. This assessment considered native vegetation cover, connectivity, quality, bed and bank stability and habitat diversity.

**3. Aquatic habitat assessment** – An assessment of the aquatic habitat within the reach was completed, which examined the general quality of aquatic habitats, including vegetation structure, regeneration and weed infestations.

## 4. Results


The study area is highly modified, with the most dominant land use utilising extensively cleared paddock/pasture. No groundwater dependent ecosystems were identified (besides riparian vegetation). Waterways ranged from undefined overland flows to an incised channel with forested riparian land. Using the Strahler method of stream order, the DPI hydroline map shows four 1<sup>st</sup> order, two 2<sup>nd</sup> order and one 3<sup>rd</sup> order streams in or within 40 m of the site. Of these, only two of the higher order streams, in the south corner of the site, had a distinctive bed, bank and aquatic habitat. The current condition of each reach is summarized below in Table 6 using reach names shown in Figure 7. All site dams may provide habitat for common species such as turtles, eels and wetland birds, however, aquatic vegetation was either absent or sparse.





**Figure 7: Top of bank (validated September 2019) with reach numbers**




Table 6: Reach descriptions


Reach name	Strahler stream order ('Hydroline' desktop mapping only)	Likely WM Act 'river' status (field validated) (to be confirmed with NRAR)	Typical features	Representative photos
1A	1 <sup>st</sup>	Not a river	No defined bed or bank (overland flows only). One small online dam.	

Reach name	Strahler stream order ('Hydroline' desktop mapping only)	Likely WM Act 'river' status (field validated) (to be confirmed with NRAR)	Typical features	Representative photos
1B	1 <sup>st</sup>	Not a river	No defined bed or bank (overland flows only). One small online dam.	 <p>             Date &amp; Time: Wed, 04 Sep 2019, 14:05:41 AEST              Position: -33.53883° / 151.74175°              Altitude: 30m              Distance: 9452.0m              Azimuth: -1.00° - 0.00m/s              Horizontal Offset: 1.00m              Horizon Grade: +0.0%              Zoom: 1X              Reach: 1B              Pondcherry           </p>

Reach name	Strahler stream order ('Hydroline' desktop mapping only)	Likely WM Act 'river' status (field validated) (to be confirmed with NRAR)	Typical features	Representative photos
1C	1 <sup>st</sup>	Not a river	No defined bed or bank (overland flows only). One small online dam.	 <p>             Date &amp; Time: Wed, 04 Sep 2019, 14:43:47 AEST              Position: -43.546104° / 151.527711°              Altitude: 75m              Distance: 945 ft              Azimuth: -100° / -100mils              Elevation Azimuth: -100°              Horizon Grade: -10°              Zoom: 1X              Reach: 1C              Bankline:           </p>




Reach name	Strahler stream order ('Hydroline' desktop mapping only)	Likely WM Act 'river' status (field validated) (to be confirmed with NRAR)	Typical features	Representative photos
1N	1 <sup>st</sup>	Not a river	No defined bed or bank (overland flows only).	 <p> Date &amp; Time: Wed, 04 Sep 2019, 11:25:56 AEST  Position: -33.991692° / 150.737687°  Altitude: 58m  Datum: WGS-84  Azimuth Bearing: 309° N57W, 5387mils (True)  Elevation Grade: -0.01%  Horizontal Grade: -0.01%  Zoom: 1X  Reach: 1N  Pondicherry </p>


Reach name	Strahler stream order ('Hydroline' desktop mapping only)	Likely WM Act 'river' status (field validated) (to be confirmed with NRAR)	Typical features	Representative photos
2A	2 <sup>nd</sup>	Not a river	No defined bed or bank (overland flows only). One small online dam. Minor gully depressions but filled with pasture species.	 <p> Date &amp; Time: Wed, 04 Sep 2019, 11:31:02 AEST  Position: -33°52'06.2" S / 150°52'07.6" E  Altitude: 35m  Datum: WGS 84  Azimuth Bearing: 327° N328° 281km (True)  Horizontal Scale: 0.1m  Vertical Scale: 0.1m  Zoom: 1X  Reach: 2A  Pondcherry </p>

Reach name	Strahler stream order ('Hydroline' desktop mapping only)	Likely WM Act 'river' status (field validated) (to be confirmed with NRAR)	Typical features	Representative photos
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Reach name	Strahler stream order ('Hydroline' desktop mapping only)	Likely WM Act 'river' status (field validated) (to be confirmed with NRAR)	Typical features	Representative photos
2D	2 <sup>nd</sup>	River	Defined channel with shallow pooled water and dense macrophytes. Cattle fenced off from riparian vegetation. Steep banks and scattered trees with the study area, dominated by herbaceous groundcovers. Creek flows from upstream of the study area and has a protected and restored 40 - 50 m wide riparian corridor. Reach cuts southern tip of the study area, then joins with Reach 3A offsite.	

Reach name	Strahler stream order ('Hydroline' desktop mapping only)	Likely WM Act 'river' status (field validated) (to be confirmed with NRAR)	Typical features	Representative photos
3A	3 <sup>rd</sup>	River	<p>The reach surveyed length consists of about 1/3 defined channel and 2/3 large online dams (across the broader Precinct). The dams are downstream of Tranche 41, so only the channel has been discussed here. The channel area was highly impacted from unfenced cattle, with steep eroded banks, compacted and trampled bed, incised channel, sedimentation of bed, turbid water, and a thin row of riparian trees with limited recruitment. Channel habitat for macroinvertebrates and amphibians was very poor. Fish passage along the creeks was severely obstructed by several dam walls downstream, each &gt;5 m high. Overall, there was a poor cover of aquatic macrophytes in the channel, and limited aquatic value.</p>	

Reach name	Strahler stream order ('Hydroline' desktop mapping only)	Likely WM Act 'river' status (field validated) (to be confirmed with NRAR)	Typical features	Representative photos
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## 5. Recommendations/discussion

The principles of the legislation addressed in Section 2, are to provide for the sustainable and integrated management of the waterways of the state. Reaches 1B, 1C, 1N and 2A did not meet the definition of a 'river' under the WM Act, as they had no defined bed and banks. NRAR should be engaged to confirm their removal and, therefore, the need to address these areas as waterfront land would be negated.

Reach 1A, did not meet the definition of a 'river' under the Water Management Act. This area is associated with a Riparian Protection Area in the adjoining precinct to the south. The Planning Proposal provides a corresponding environmental corridor to be zoned E2 on the Tranche 41 side, giving an overall corridor width between 33 and 63 metres. The need for drainage in this corridor will be determined at the DA stage.

All other reaches met the definition of a 'river'.

NRAR's policy requires management and rehabilitation of the riparian land to a functional community, fully protected and vegetated with native endemic riparian plant species. If, however, the intention is to manage the vegetation for non-riparian purposes, such as open space or Asset Protection Zones in the outer 50%, the riparian offsetting guidelines would apply to compensate the reduced VRZ. The inner 50% would still require protection. If offsets are required elsewhere, the average width of the riparian zone would need to be maintained to meet the NRAR's guidelines. To be consistent with the guidelines offset vegetation is located on existing cleared land and seek to preserve any native vegetation. There is the opportunity to rehabilitate with VRZ with native riparian species which will ultimately improve the instream habitat.

For a consistent approach across the development precincts, it is recommended that riparian areas are also assessed under the guidelines of the Oran Park and Turner Waterfront Land Strategy. This would facilitate the consistent management of the riparian zone as a continuous corridor, in line with Council's DCP. Vegetation Management Plans (VMP) should be a continuation of VMPs previously developed and implemented in the South Creek catchment. Currently, the planning proposal aligns with the strategy and would provide protection and rehabilitation of the riparian corridor consistent with upstream and downstream proposals.

Reach status, condition and associated riparian corridors have been discussed in this report and this information should be considered in the design phase of the works. There may be the requirement for a merit-based assessment by NRAR, which should consider the management of the wider catchment. NRAR should be consulted for feedback on the proposed rezoning application, to inform the development of a future design.

## 6. References

Natural Resources Access Regulator (NRAR) 2018. *Controlled activities on waterfront land – Riparian corridors*. NSW Department of Industry. Available online:

[https://www.industry.nsw.gov.au/\\_data/assets/pdf\\_file/0004/156865/NRAR-Guidelines-for-controlled-activities-on-waterfront-land-Riparian-corridors.pdf](https://www.industry.nsw.gov.au/_data/assets/pdf_file/0004/156865/NRAR-Guidelines-for-controlled-activities-on-waterfront-land-Riparian-corridors.pdf)

Riches, M., Gilligan, D., Danaher, K. and Pursey, J. 2016. *Fish Communities and Threatened Species Distributions of NSW*. NSW Department of Primary Industries.