Operation of Peel River Drought Protection Works, Tamworth, NSW.

Chaffey to Dungowan Pipeline:

Annual Compliance Report 2022

Author	Jeremy Stacy, Environmental Adviser
Review	Evan Webb, Manager Environmental Services
Revision history	Final

Declaration of accuracy

In making this declaration, I am aware that sections 490 and 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) make it an offence in certain circumstances to knowingly provide false or misleading information or documents. The offence is punishable on conviction by imprisonment or a fine, or both. I declare that all the information and documentation supporting this compliance report is true and correct in every particular. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

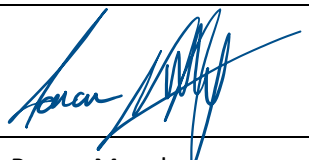
Signed	
Full Name	Ronan Magaharan
Position	Executive Manager, Operations
Organisation (including ABN)	WaterNSW ABD 21 147 934 787
Date:	11 August 2022

Table of Contents

List of Tables

Appendices

1. Introduction

Chaffey Dam is located on the Peel River approximately 43 kilometres (km) south-east of Tamworth, between the towns of Nundle and Woolomin, NSW.

Water NSW obtained approval to operate a temporary drought mitigation pipeline to supply water directly from Chaffey Dam to the Tamworth water supply network via the Chaffey Dam to Dungowan Pipeline in June 2020. The pipeline extends underground approximately 18km from Chaffey Dam to Dungowan and connects with the existing Dungowan Dam to Calala water treatment plant pipeline operated by Tamworth Regional Council (TRC).

The pipeline was constructed to operate during severe drought to increase town water security for Tamworth when the Chaffey Dam storage fell below 20% capacity. During operation, water deliveries to TRC were made via the pipeline resulting in no water deliveries to TRC being made via releases to the Peel River.

On 3 June 2020, WaterNSW received authorisation by the NSW Minister for Water, Property and Housing under the *Water Supply (Critical Needs) Act 2019,* to operate the pipeline in accordance with the conditions of approval. Approval under NSW WSCN Act expired on 30 September 2021.

On 12 June 2020, WaterNSW received approval EPBC 2019/8590 with conditions, from the Commonwealth Minister for the Environment for the controlled activity to operate the pipeline during drought. The approval contained a number of conditions including but not limited to; annual monitoring and compliance reporting; and the development and implementation of a Biodiversity Offset Management Plan (BOMP, GHD 2020). The approval EPBC 2019/8590 to operate the temporary drought mitigation pipeline, has effect until 1 May 2030. The drought ceased September 2020 and the pipeline is not in operation.

Operation of the pipeline commenced on 17 June 2020. This report has been prepared to fulfil the annual compliance reporting requirements of EPBC 2019/8590.

2. Description of Activities

WaterNSW (ABN: 21 147 934 787) is the approval holder for the Chaffey Dam to Dungowan Pipeline Drought Operation project (EPBC 2019/8590) approximately 43 km south-east of Tamworth, approved on 12 June 2020. The construction was completed in March 2020. Operation of the pipeline to deliver water to Tamworth Regional Council's Calala water treatment plant commenced 17 June 2020 and continued to 29 July 2020. The delivery of water via the pipeline has not occurred since 29 July 2020.

This report relates to the activities undertaken during the reporting period from 17 June 2021 to 16 June 2022. Activities completed in response to EPBC2019/8590 approval include:

- Implement the Drought Operations Delivery of Peel Environmental Water Plan and operate the pipeline in accordance with NSW conditions of approval and continue until expiry of the Authorisation.
- Implementation of management actions & prescribed activities within the BOMP (GHD 2020).
    - undertake pump inspections for suitability on Peel River.
    - Undertake re-snagging site inspections between Chaffey Dam and Tamworth
    - Preparation of re-snagging plan
- Preparation of this annual compliance report.

3. Compliance Review – Conditions as per EPBC 2019/8590

The approval notice – to operate a temporary drought mitigation pipeline to supply water directly from Chaffey Dam to the Tamworth water supply network (EPBC 2019/8590) issued on 12 June 2020, requires annual reporting from the commencement of the action on 17 June 2020, against the conditions of consent. Table 2 below outlines these conditions and provides a statement of compliance for the reporting year to 16 June 2022. This report fulfils the requirements of EPBC 2019/8590 Condition 12.

Table 1: Compliance tracking 2021-22

Condition	Source Section No.	Source Page No.	Condition	Action to achieve Compliance	Responsibility	Condition / Commitment Implemented?	Link to Evidence/Record	Status Review	
								June 2022	Evidence / Comments
n/a	EPBC 2019/8590 Notice of Approval letter.	**1**	EPBC notices to be publicly available on WaterNSW website	Make EPBC approval available on WaterNSW website. Weblink to DAWE EPBC approval	WaterNSW	15/06/2020	EPBC 2019/8590 Approval Peel Valley - WaterNSW website	Compliant	ARK reference D2020/58692 Approval link to DCCEEW EPBC website
1	Annexure A Part A	2	The approval holder must implement the Drought Operations - Delivery of Peel Environmental Water Plan for the life of the approval. In addition the approval holder must comply with NSW conditions of authorisation where those conditions relate to environmental water releases and operation of the technical advisory group.	Submission of Delivery plan - submitted with referral Pipeline operated in accordance with State and Commonwealth approval conditions. PEWTAG provided monitoring data as available	WaterNSW , Operations - AS	12 June 2020 until cessation of drought	Peel Valley - WaterNSW website	Compliant	implemented; incorporated into WSCN authorisation conditions; ARK D2020/58721 EPBC Approval D2020/58692 Monitoring data collected as requirement of NSW authorisation F2019/5571 Drought ceased September 2020 WSCN Authorisation expired 30 September 2021
2	Annexure A Part A	2	The approval holder must notify the technical advisory group at least five business days prior to commencing the next phase of operation.	Notice to be sent within time frame required and posted on project website	WaterNSW , Operations - AS	43999	Peel Valley - WaterNSW website	Compliant	Notices posted to website
3	Annexure A Part A	2	The approval holder must invite the Commonwealth Environmental Water Holder to nominate a representative to become a member of the technical advisory group.	Email invitation	WaterNSW , Operations - AS	43994	ARK D2021/120098	Compliant	ARK D2021/120098 CEWH members identified in PEWTAG terms of reference, page 6
4	Annexure A Part A	2	To compensate for impacts to Murray Cod and Silver Perch, the approval holder must, within 20 business days of commencement of the action, submit a Biodiversity Offset Management Plan (BOMP) for approval by the Minister. If the Minister approves the BOMP, then the BOMP must be implemented.	Draft Biodiversity Offset Management Plan	WaterNSW - EnvServ JS	submitted 15/7/20	ARK D2021/119441	Compliant	draft submitted to department 15/7/20 ARK D2021/119441
5	Annexure A Part A	2	The approval holder must make all reasonable efforts to ensure the BOMP (in full) meets the following requirements and promptly address any feedback from the Department on unapproved versions of the BOMP so that the BOMP is suitable for the Minister to approve within three months of the commencement of the action.	Biodiversity Offset Management Plan	WaterNSW - EnvServ JS	plan approved 29 October 2020	EPBC 2019/8590 Biodiversity Offset Plan	Compliant	BOP ARK D2020/101647 Plan approval ARK D2020/116788

Condition	Source Section No.	Source Page No.	Condition	Action to achieve Compliance	Responsibility	Condition / Commitment Implemented?	Link to Evidence/Record	Status Review	
								June 2022	Evidence / Comments
6	Annexure A Part A	2	The BOMP must: **a.** be prepared by a suitably qualified ecologist, and be consistent with the Department's Environmental Management Plan Guidelines and the EPBC Act Environmental Offset Policy; **b.** propose an offset package, including direct habitat restoration works and conservation measures relevant to Murray Cod and Silver Perch **c**. include, but not be limited to: **i.** specific objectives to demonstrate improvements in habitat quality and conservation outcomes for Murray Cod and Silver Perch over the life of the approval; **ii**. specific management actions, and timeframes for implementation, to be carried out to meet the specific objectives to improve habitat quality and conservation outcomes for Murray Cod and Silver Perch; **iii**. key performance indicators to demonstrate the improvements in habitat quality and conservation outcomes for Murray Cod and Silver Perch; **iv**. the nature, timing and frequency of monitoring to determine the success of management actions against key performance indicators; **v**. indicative corrective actions that will be implemented in the event monitoring activities indicate key performance indicators are not or are unlikely to be achieved; **vi.** the roles and responsibilities for implementing the management actions; **vii.** evidence of consistency with relevant conservation advices, recovery plans and/or threat abatement plans; **viii**. commitments to maintain or improve the extent and quality of habitat and populations of other EPBC Act listed threatened species and ecological communities in the offset area; and a timeline and legal mechanism for implementing the offset(s).	Biodiversity Offset Management Plan	WaterNSW - EnvServ JS	plan approved 29 October 2020	ARK D2020/101647	Compliant	BOP ARK D2020/101647 Approval ARK D2020/116788
7	Annexure A Part B	3	The approval holder must notify the Department in writing of the date of commencement of the action within 10 business days after the date of commencement of the action. The approval holder must notify the Department in writing of the date of commencement of each phase of operation within 10 business days after the date of commencement of each phase of operation.	Send advice via email at each change of operation phase.	WaterNSW , Operations - AS	Notice #1 - 17 June 2020 - Commencement of Action Notice #2 - 1 July 2020 Notice #3 - 29 July 2020	ARK D2021/120827 D2021/120845 D2021/120866	Compliant	Media Release - https://www.waternsw.com.au/about/newsroom/2020/chaffey-to-tamworth-pipeline-operational
8	Annexure A Part B	3	The approval holder must maintain accurate and complete compliance records.	Maintain approval tracking spreadsheet and identified records within	WaterNSW - EnvServ JS; Ops	implemented compliance tracking	ARK D2022/18480	Compliant	This spreadsheet tracks compliance ARK D2022/18480
9	Annexure A Part B	3	If the Department makes a request for compliance records in writing, the approval holder must provide electronic copies of compliance records to the Department within the timeframe specified in the request.	Notice from Department to be received	WaterNSW PM EnvServ		Nil requests received	Not applicable	
10	Annexure A Part B	3	The approval holder must: **a.** submit plans electronically to the Department; **b**. publish each plan on the website within 20 business days of the date of this approval, or the date that the plan is approved by the Minister or of the date a revised action management plan is submitted to the Minister or the Department, unless otherwise agreed to in writing by the Minister; **c**. exclude or redact sensitive ecological data from plans published on the website or provided to a member of the public; and **d.** keep plans published on the website until the end date of this approval.	Submit plans via email to Department Post Approval PostApproval@awe.gov.au Approved plans to be published to WaterNSW website https://www.waternsw.com.au/supply/drought-information/regional-nsw/peel-valley	WaterNSW - EnvServ JS	BOP submitted to DAWE BOP published to WNSW project website	https://www.waternsw.com.au/__data/assets/pdf_file/0016/161620/Biodiversity-Offset-Plan-EPBC-2019-8590.pdf BOP ARK D2020/101647 Approval ARK D2020/116788	Compliant	BOP ARK D2020/101647 Approval ARK D2020/116788

Condition	Source Section No.	Source Page No.	Condition	Action to achieve Compliance	Responsibility	Condition / Commitment Implemented?	Link to Evidence/Record	Status Review	
								June 2022	Evidence / Comments
11	Annexure A Part B	3	The approval holder must ensure that any monitoring data (including sensitive ecological data), surveys, maps, and other spatial and metadata required under a plan, is prepared in accordance with the Department's Guidelines for biological survey and mapped data (2018) and submitted electronically to the Department in accordance with the requirements of the plan.	Submit with annual compliance report via email to Department EPBCMonitoring@awe.gov.au	WaterNSW Project Delivery PM; EnvServ	Nil monitoring to date	Offset yet to be implemented.	Not applicable	No offset monitoring reports prepared to date
12	Annexure A Part B	3	The approval holder must prepare a compliance report for each 12 month period following the date of commencement of the action, or otherwise in accordance with an annual date that has been agreed to in writing by the Minister. The approval holder must: a. publish each compliance report on the website within 60 business days following the relevant 12 month period; b. notify the Department by email that a compliance report has been published on the website and provide the weblink for the compliance report within five business days of the date of publication; c. keep all compliance reports publicly available on the website until this approval expires; d. exclude or redact sensitive ecological data from compliance reports published on the website; and e. where any sensitive ecological data has been excluded from the version published, submit the full compliance report to the Department within five business days of publication.	Compliance report to be prepared and published to WaterNSW website https://www.waternsw.com.au/supply/drought-information/regional-nsw/peel-valley Biodiversity monitoring report to be prepared as per BOP requirements; Email notification to DAWE EPBCMonitoring@awe.gov.au to advise of compliance report availability and link to publication on WaterNSW website	WaterNSW - EnvServ WQS	Compliance report prepared/submitted within required period. Monitoring of Biodiversity offsets not commenced within reporting period.	Report published to website within required period and DCCEEW notified	Compliant	Final 2020-21 Report ARK D2022/67509 Biodiversity Offsets implementation due 28 October 2022 Monitoring in accordance with BOMP has not commenced.
13	Annexure A Part B	4	The approval holder must **notify** the Department in writing of any: incident; non-compliance with the conditions; or non-compliance with the commitments made in plans. The notification must be given as soon as practicable, and no later than two business days after becoming aware of the incident or non-compliance. The notification must specify: **a.** any condition which is or may be in breach; **b**. a short description of the incident and/or non-compliance; and **c.** the location (including co-ordinates), date, and time of the incident and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.	Send advice via email to Department: EPBCMonitoring@awe.gov.au	WaterNSW	nil incidents or non-compliance	Not applicable	Not applicable	Letters sent to DAWE 2021: ARK D2021/117921 &D2022/47990; D2022/60557. Response June 2022 D2022/57622.
14	Annexure A Part B	4	The approval holder must **provide** to the Department the details of any incident or noncompliance with the conditions or commitments made in plans as soon as practicable and no later than 10 business days after becoming aware of the incident or non-compliance, specifying: **a.** any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future; **b**. the potential impacts of the incident or non-compliance; and **c.** the method and timing of any remedial action that will be undertaken by the approval holder.	Send advice via email to Department: EPBCMonitoring@awe.gov.au	WaterNSW	nil incidents or non-compliance	Not applicable	Not applicable	2021 refer to ARK D2021/117921; ARK D2022/60557
15	Annexure A Part B	4	The approval holder must ensure that independent audits of compliance with the conditions are conducted as requested in writing by the Minister.	as per written advice received from Minister	WaterNSW	Nil to date	Not applicable	Not applicable	Nil requests to date

Condition	Source Section No.	Source Page No.	Condition	Action to achieve Compliance	Responsibility	Condition / Commitment Implemented?	Link to Evidence/Record	Status Review	
								June 2022	Evidence / Comments
16	Annexure A Part B	4	For each independent audit, the approval holder must: **a**.provide the name and qualifications of the independent auditor and the draft audit criteria to the Department; **b**.only commence the independent audit once the audit criteria have been approved in writing by the Department; and **c**.submit an audit report to the Department within the timeframe specified in the approved audit criteria.		WaterNSW	Nil to date	Not applicable	Not applicable	No audits undertaken to date
17	Annexure A Part B	4	The approval holder must publish the audit report on the website within 10 business days of receiving the Department's approval of the audit report and keep the audit report published on the website until the end date of this approval.	Nil to date	WaterNSW	Nil to date	Not applicable	Not applicable	No reports prepared to date
18	Annexure A Part B	4	The approval holder may, at any time, apply to the Minister for a variation to an action management plan approved by the Minister under condition 4, or as subsequently revised in accordance with these conditions, by submitting an application in accordance with the requirements of section 143A of the EPBC Act. If the Minister approves a revised action management plan (RAMP) then, from the date specified, the approval holder must implement the RAMP in place of the previous action management plan.	Nil to date	WaterNSW	Nil to date	Not applicable	Not applicable	No variations currently sought
19	Annexure A Part B	44	Within 30 days after the completion of the action, the approval holder must notify the Department in writing and provide completion data.	notification letter/email EPBCMonitoring@awe.gov.au	WaterNSW - EnvServ	Nil to date	Not applicable	Not applicable	

'Compliance' is achieved when all the requirements of a condition have been met, including the implementation of management plans or other measures required by those conditions.

A designation of 'non-compliance' should be given where the requirements of a condition or elements of a condition, including the implementation of management plans and other measures, have not been met.

A designation of 'not applicable ' should be given where the requirements of a condition or elements of a condition fall outside of the scope of the current reporting period. For example, a condition which applies to an activity that has not yet commenced.

4. Implementation of Offset Plan

The Biodiversity Offset Management Plan (GHD 2020) outlines the key management actions required to achieve the objectives of improving habitat for Murray Cod and Silver Perch. Table 2 below outlines the activities undertaken in order to implement the management actions identified within the BOMP.

The BOMP required a baseline aquatic habitat survey to be undertaken to identify potential suitable sites to receive snags. This survey was completed during 2020 and has provided the background data to prepare for and implement the re-snagging of the Peel River between Chaffey Dam and Tamworth.

Covid-19 travel restrictions and above average rainfalls leading to elevated river levels and flooding in the region have both combined to cause significant delays to field work and site assessments critical to the successful implementation of the offset measures. Covid-19 restrictions are identified in Table 3 and have been ongoing since 2020 and have amounted to over 12 months of delays to the ability to travel and undertake the site assessments. Elevated river levels, flooding and saturated property access have prevented river and site access to undertake site assessment.

The implementation of the offsets within two years of the approval of the BOMP (approved 29 October 2020) is unlikely to occur leading to non-compliance of the EPBC 2019/8590 approval condition 6 and the commitment given with the BOMP.

The following actions have been undertaken during the reporting period June 2021 to June 2022:

Table 2: Summary of actions undertaken during reporting period

Offset Measure	Actions Undertaken	Performance in accordance with BOMP
1 – Re-snagging Plan Develop plan to install up to 50 snags as habitat for Murray Co and Silver Perch	Snag Installation Plan: Field investigation of re-snagging sites: - Placement design/number and installation location within the river - identify site constraints Consultation with stakeholder Agencies- Fisheries, Local Land Service, Local Council Secured 60 logs suitable for re-snagging from a single sustainable source. Commence Aboriginal Heritage Due Diligence and Biodiversity assessment at 17 river stretches	Compliant
2 – Self-cleaning Pump Screens Install self-cleaning pumps screens on extraction points to seven licenced pumps	Undertake site inspections of Peel pumps to assess suitability to receive self-cleaning pump screens, including: - identify site constraints	Compliant The EPBC approval condition requires offsets benefit Murray Cod and Silver Perch. The BOMP identifies offsets will be installed

downstream from Chaffey Dam	- specify pump screen requirements for manufacture EoI sent to selected licensed pump owners on Namoi River – April/May 2022	within the Namoi catchment and Peel River. Following pump suitability assessments of Peel River pumps it was found that up to 3 pumps could receive self-cleaning pump screens remaining pumps assessed unsuitable. Additional pumps on the Namoi near the confluence with the Peel are being investigated to meet shortfall on Peel.

Following pump site inspections along the Peel River by the screen manufacturer it became evident that the majority of potential licenced pumps were not of a suitable size or capable of flows rates required to operate the self-cleaning pump screens. Up to three pumps were identified on the Peel as being suitable from those that responded to the expression of interest sent the previous year.

The lack of Peel pumps available and suitable for the self-cleaning pump screens has required that alternate suitable locations meeting the criteria set within the BOMP be identified. Consultation with NSW DPI Fisheries to identify similar sites on the Namoi River were undertaken and a second expression of interest was sent to pump owners.

4.1 Restrictions and Impacts to Implementation - Covid-19 and Flooding

Significant delays to undertaking the actions required to progress the offset implementation were experienced during the 2021-2022 reporting period as a result of Covid-19 travel restrictions put in place by both the NSW and Victorian State governments. Workplace restrictions put in place by WaterNSW to meet these State restrictions and to protect its employees and contractors to ensure business continuity has also had significant impacts on the ability to deliver the offsets. These delays have been in addition to the delays experienced during the previous 2020-2021 reporting year.

Continuation of water supply is an essential service, however ancillary activities undertaken by WaterNSW were not considered as essential during Covid-19 restrictions. The implementation of the BOMP was not considered essential to maintaining water supply and all site work needed to be delayed until travel restrictions were lifted in line with State requirements.

The inability to commence the activities due to the restrictions has condensed the available time to install the offsets. The BOMP was approved on 29 October 2020 with the requirement to have the offset measures implemented within 2 years of the plan's approval, being 28 October 2022. Effort continues to meet the installation timeframe, however the ability to undertake the field assessments required to complete the implementation has been significantly affected. The combined effects of Covid-19 restrictions and above average rainfall has continued to impact implementation throughout the reporting period.

The following activities required to progress the implementation of the BOMP while planned to occur, were not able to be undertaken during the reporting period:

- Obtain design and manufacture self-cleaning pump screens.
- Enter self-cleaning pump screen recipient agreements.
- Preparation of EIA and Aboriginal Heritage Due Diligence Assessment to obtain additional approvals required to install snags.

WaterNSW ability to progress with the installation of the biodiversity offsets as required by EPBC 2019/8590 conditions 4-6 and have them implemented by 28 October 2022 is unlikely to occur as a direct

result of the Covid-19 travels restrictions. Further consultation with the Department in regards to WaterNSW ability to meet offset implementation delivery timeframes will be undertaken.

The chronology of WaterNSW Covid-19 restrictions is shown in Table 3. This table identifies the restrictions in place at WaterNSW before and throughout the reporting period. Above average rainfall continued to be experienced during 2022 along Eastern Australia leading to extensive flooding and restricted land access and movements along the river and leading to further significant delays to offset related activities.

Table 3: Covid-19 restrictions affecting implementation

Month/Year	WaterNSW Measure
2021	
January	Only approved travel permitted that is considered essential
February	Only approved travel permitted that is considered essential
March	Only approved travel permitted that is considered essential
April	Only approved travel permitted that is considered essential
May	Only approved travel permitted that is considered essential
June	Lockdown measures for some LGAs
July	Company freeze on non-essential travel - no travel to/from LGAs of concern
August	Company freeze on non-essential travel - no travel to/from LGAs of concern. Stay at home orders for some LGAs
September	Company freeze on non-essential travel - no travel to/from LGAs of concern
October	Travel restrictions begin to ease for LGAs of concern

APPENDICES

Appendix 1 – EPBC 2019/8590 Notice of Approval

Australian Government
Department of Agriculture, Water and the Environment

APPROVAL

Operation of Peel River Drought Protection Works, Tamworth, NSW (EPBC 2019/8590)

This decision is made under sections 130(1) and 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*. Note that section 134(1A) of the **EPBC Act** applies to this approval, which provides in general terms that if the approval holder authorises another person to undertake any part of the action, the approval holder must take all reasonable steps to ensure that the other person is informed of any conditions attached to this approval, and that the other person complies with any such condition.

Details

Person to whom the approval is granted (approval holder)	WATER NSW
ACN or ABN of approval holder	ABN: 21 147 934 787
Action	To operate a temporary drought mitigation pipeline to supply water directly from Chaffey Dam to the Tamworth water supply network [See **EPBC Act** referral 2019/8590].

Approval decision

My decision on whether or not to approve the taking of the action for the purposes of the controlling provision for the action is as follows.

Controlling Provisions

Listed Threatened Species and Communities	
Section 18	Approve
Section 18A	Approve

Period for which the approval has effect

This approval has effect until 01 May 2030

Decision-maker

Name and position

The Hon Sussan Ley MP
Minister for the Environment

Signature

Sussan Ley

Date of decision

12 June 20

Conditions of approval

This approval is subject to the conditions under the EPBC Act as set out in ANNEXURE A.

ANNEXURE A – CONDITIONS OF APPROVAL

Part A – Conditions specific to the action

1. The approval holder must implement the **Drought Operations – Delivery of Peel Environmental Water Plan** for the life of the approval. In addition the approval holder must comply with **NSW conditions of authorisation** where those conditions relate to environmental water releases and operation of the **technical advisory group**.
2. The approval holder must notify the **technical advisory group** at least five **business days** prior to commencing the next **phase of operation**.
3. The approval holder must invite the **Commonwealth Environmental Water Holder** to nominate a representative to become a member of the **technical advisory group**.
4. To compensate for impacts to **Murray Cod** and **Silver Perch**, the approval holder must, within 20 **business days** of **commencement of the action**, submit a Biodiversity Offset Management Plan (BOMP) for approval by the **Minister**. If the **Minister** approves the BOMP, then the BOMP must be implemented.
5. The approval holder must make all reasonable efforts to ensure the BOMP (in full) meets the following requirements and promptly address any feedback from the **Department** on unapproved versions of the BOMP so that the BOMP is suitable for the **Minister** to approve within three months of the **commencement of the action.**
6. The BOMP must:
    a. be prepared by a **suitably qualified ecologist**, and be consistent with the **Department's Environmental Management Plan Guidelines** and the **EPBC Act Environmental Offset Policy**;
    b. propose an offset package, including direct habitat restoration works and conservation measures relevant to **Murray Cod** and **Silver Perch**;
    c. include, but not be limited to:
        i. specific objectives to demonstrate improvements in habitat quality and conservation outcomes for **Murray Cod** and **Silver Perch** over the life of the approval;
        ii. specific management actions, and timeframes for implementation, to be carried out to meet the specific objectives to improve habitat quality and conservation outcomes for **Murray Cod** and **Silver Perch**;
        iii. key performance indicators to demonstrate the improvements in habitat quality and conservation outcomes for **Murray Cod** and **Silver Perch**;
        iv. the nature, timing and frequency of monitoring to determine the success of management actions against key performance indicators;
        v. indicative corrective actions that will be implemented in the event monitoring activities indicate key performance indicators are not or are unlikely to be achieved;
        vi. the roles and responsibilities for implementing the management actions;
        vii. evidence of consistency with relevant conservation advices, recovery plans and/or threat abatement plans;
        viii. commitments to maintain or improve the extent and quality of habitat and populations of other **EPBC Act** listed threatened species and ecological communities in the offset area; and
        ix. a timeline and legal mechanism for implementing the offset(s).

Part B – Standard administrative conditions

Notification of date of commencement of the action

7. The approval holder must notify the **Department** in writing of the date of **commencement of the action** within 10 **business days** after the date of **commencement of the action.** The approval holder must notify the **Department** in writing of the date of **commencement** of each **phase of operation** within 10 **business days** after the date of **commencement** of each **phase of operation**.

Compliance records

8. The approval holder must maintain accurate and complete **compliance records**.
9. If the **Department** makes a request for **compliance records** in writing, the approval holder must provide electronic copies of **compliance records** to the **Department** within the timeframe specified in the request.

Note: **Compliance records** may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, and or used to verify compliance with the conditions. Summaries of the result of an audit may be published on the **Department**'s **website** or through the general media.

Preparation and publication of plans

10. The approval holder must:
    a. submit **plans** electronically to the **Department**;
    b. publish each **plan** on the **website** within 20 **business days** of the date of this approval, or the date that the **plan** is approved by the **Minister** or of the date a revised action management **plan** is submitted to the **Minister** or the **Department**, unless otherwise agreed to in writing by the **Minister**;
    c. exclude or redact **sensitive ecological data** from **plans** published on the **website** or provided to a member of the public; and
    d. keep **plans** published on the **website** until the end date of this approval.
11. The approval holder must ensure that any **monitoring data** (including **sensitive ecological data**), surveys, maps, and other spatial and metadata required under a **plan**, is prepared in accordance with the **Department's** *Guidelines for biological survey and mapped data* (2018) and submitted electronically to the **Department** in accordance with the requirements of the **plan**.

Annual compliance reporting

12. The approval holder must prepare a **compliance report** for each 12 month period following the date of **commencement of the action**, or otherwise in accordance with an annual date that has been agreed to in writing by the **Minister**. The approval holder must:
    a. publish each **compliance report** on the **website** within 60 **business days** following the relevant 12 month period;
    b. notify the **Department** by email that a **compliance report** has been published on the **website** and provide the weblink for the **compliance report** within five **business days** of the date of publication;
    c. keep all **compliance reports** publicly available on the **website** until this approval expires;
    d. exclude or redact **sensitive ecological data** from **compliance reports** published on the **website**; and
    e. where any **sensitive ecological data** has been excluded from the version published, submit the full **compliance report** to the **Department** within five **business days** of publication.

Note: The first **compliance report** may report a period less than 12 months so that it and subsequent **compliance reports** align with the similar requirement under state approval. **Compliance reports** may be published on the **Department**'s **website**.

Reporting non-compliance

13. The approval holder must notify the **Department** in writing of any: **incident;** non-compliance with the conditions; or non-compliance with the commitments made in **plans**. The notification must be given as soon as practicable, and no later than two **business days** after becoming aware of the **incident** or non-compliance. The notification must specify:

    a. any condition which is or may be in breach;

    b. a short description of the **incident** and/or non-compliance; and

    c. the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.

14. The approval holder must provide to the **Department** the details of any **incident** or non-compliance with the conditions or commitments made in **plans** as soon as practicable and no later than 10 **business days** after becoming aware of the **incident** or non-compliance, specifying:

    a. any corrective action or investigation which the approval holder has already taken or intends to take in the immediate future;

    b. the potential impacts of the **incident** or non-compliance; and

    c. the method and timing of any remedial action that will be undertaken by the approval holder.

Independent audit

15. The approval holder must ensure that **independent audits** of compliance with the conditions are conducted as requested in writing by the **Minister**.

16. For each **independent audit**, the approval holder must:

    a. provide the name and qualifications of the independent auditor and the draft audit criteria to the **Department**;

    b. only commence the **independent audit** once the audit criteria have been approved in writing by the **Department**; and

    c. submit an audit report to the **Department** within the timeframe specified in the approved audit criteria.

17. The approval holder must publish the audit report on the **website** within 10 **business days** of receiving the **Department's** approval of the audit report and keep the audit report published on the **website** until the end date of this approval.

Revision of action management plans

18. The approval holder may, at any time, apply to the **Minister** for a variation to an action management **plan** approved by the **Minister** under condition 4, or as subsequently revised in accordance with these conditions, by submitting an application in accordance with the requirements of section 143A of the **EPBC Act**. If the **Minister** approves a revised action management **plan** (RAMP) then, from the date specified, the approval holder must implement the RAMP in place of the previous action management **plan**.

Completion of the action

19. Within 30 days after the **completion of the action**, the approval holder must notify the **Department** in writing and provide **completion data**.

Part C - Definitions

In these conditions, except where contrary intention is expressed, the following definitions are used:

Business day means a day that is not a Saturday, a Sunday or a public holiday in the state or territory of the action.

Commencement / Commencement of the action means the first instance of any specified activity associated with the action.

Commonwealth Environmental Water Holder means as established under the *Water Act 2007* (Cth.) to manage water acquired by the Australian Government as part of a suite of national water reforms, including the Murray-Darling Basin Plan.

Completion data means an environmental report and spatial data clearly detailing how the conditions of this approval have been met. The **Department**'s preferred spatial data format is **shapefile**.

Completion of the action means all specified activities associated with the action have permanently ceased.

Compliance records means all documentation or other material in whatever form required to demonstrate compliance with the conditions of approval in the approval holder's possession or that are within the approval holder's power to obtain lawfully.

Compliance report(s) means written reports:

i. providing accurate and complete details of compliance, **incidents**, and non-compliance with the conditions and the **plans**;

ii. consistent with the **Department's** *Annual Compliance Report Guidelines* (2014);

iii. include a **shapefile** of any clearance of any **protected matters**, or their habitat, undertaken within the relevant 12 month period; and

iv. annexing a schedule of all **plans** prepared and in existence in relation to the conditions during the relevant 12 month period.

Department means the Australian Government agency responsible for administering the **EPBC Act**.

Department's Environmental Management Plan Guidelines means the *Environmental Management Plan Guidelines, Commonwealth of Australia*, 2014.

Drought Operations – Delivery of Peel Environmental Water Plan means the environmental management plan submitted to the **Department** on 20 April 2020 as Appendix C to the finalised preliminary documentation.

EPBC Act means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

EPBC Act Environmental Offset Policy means *EPBC Act Environmental Offsets Policy, Commonwealth of Australia*, 2012.

Incident means any event which has the potential to, or does, impact on one or more **protected matter(s)**.

Independent audit: means an audit conducted by an independent and **suitably qualified person** as detailed in the *Environment Protection and Biodiversity Conservation Act 1999 Independent Audit and Audit Report Guidelines* (2019).

Monitoring data means the data required to be recorded under the conditions of this approval.

Minister means the Australian Government Minister administering the **EPBC Act** including any delegate thereof.

Murray Cod means the Murray Cod (*Maccullochella peelii*), listed as a vulnerable species under the **EPBC Act**.

NSW conditions of authorisation means the conditions set out in the NSW authorisation under the NSW *Water Supply (Critical Needs) Act 2019*.

Phase of operation means each discrete phase of the action as specified in Table 1 in the **Drought Operations – Delivery of Peel Environmental Water Plan**.

Plan(s) means any of the documents required to be prepared, approved by the **Minister**, and/or implemented by the approval holder and published on the **website** in accordance with these conditions (includes action management plans and/or strategies).

Protected matter means a matter protected under a controlling provision in Part 3 of the **EPBC Act** for which this approval has effect.

Sensitive ecological data means data as defined in the Australian Government Department of the Environment (2016) *Sensitive Ecological Data – Access and Management Policy V1.0.*

Shapefile means location and attribute information of the action provided in an Esri shapefile format. Shapefiles must contain '.shp', '.shx' , '.dbf' files and a '.prj' file that specifies the projection/geographic coordinate system used. Shapefiles must also include an '.xml' metadata file that describes the shapefile for discovery and identification purposes.

Silver Perch means the Silver Perch (*Bidyanus bidyanus*), listed as a critically endangered species under the **EPBC Act**.

Suitably qualified ecologist means a person who has professional qualifications and at least three (3) years of work experience designing and implementing surveys and management plans for **Murray Cod** and **Silver Perch**, and can give an authoritative assessment and advice on the presence and environmental requirements of **Murray Cod** and **Silver Perch** applying relevant protocols, standards, methods and literature.

Suitably qualified person means a person who has professional qualifications, training, skills and/or experience related to the nominated subject matter and can give authoritative independent assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods and/or literature.

Technical advisory group means the Technical Advisory Group established as specified in the **Drought Operations – Delivery of Peel Environmental Water Plan** and is the same as the Peel Environmental Water Technical Advisory Group established under the **NSW conditions of authorisaton**.

Website means a set of related web pages located under a single domain name attributed to the approval holder and available to the public.

Appendix 2 – Peel River Re-snagging Report (Draft)

Re-Snagging Report

Peel River - Chaffey Dam to Tamworth

Quality solutions. Sustainable future.

GeoLINK
environment | engineering | planning | design

GeoLINK Consulting Pty Ltd

PO Box 119
Lennox Head NSW 2478
T 02 6687 7666

PO Box 1446
Coffs Harbour NSW 2450
T 02 6651 7666

PO Box 1267
Armidale NSW 2350
T 02 6772 0454

PO Box 229
Lismore NSW 2480
T 02 6621 6677

info@geolink.net.au

Prepared for: WaterNSW

This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GeoLINK reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GeoLINK disclaims any responsibility or liability arising from or in connection with this draft document.

Certification
Delete if unnecessary

	Name	Signature	Date
Prepared by	David Howley		11/04/2022
Reviewed by	Theresa Choi		11/04/2022

UPR	Description	Issued By	Date Issued
4132-1006	Draft – First Issue	David Howley	12/04/2022
4132-1007	Draft – Second Issue	David Howley	29/04/2022
4132-1009	Draft – Third Issue	David Howley	31/05/2022

Table of Contents

Figures

Appendices

1. Introduction

1.1 Background

In 2019 WaterNSW implemented emergency measures to improve the reliability of Tamworth's water supply in response to drought. The project was designed to slow the depletion of Chaffey Dam by reducing water losses within the Peel River through river transmissions to supply water to Tamworth Regional Council's Calala water treatment plant. A pipeline and pumping station were constructed between Chaffey Dam and Dungowan which resulted in water delivery from Chaffey Dam to Tamworth being undertaken via the pipeline and water releases to the Peel River from Chaffey Dam ceased.

The drought response project received Commonwealth approval under the EPBC Act and State approval under the *Water Supply (Critical Needs) Act* 2019.

As a result of EPBC approval of the controlled action (EPBC 2019/8590) WaterNSW is required to implement measures to offset the residual impacts of the pipeline operation during drought. Two offset measures, to improve aquatic habitat quality and conservation of threatened species, form the offset package.

The two offset measures involve developing and implementing an aquatic habitat assessment and re-snagging plan that will install a minimum of 50 snags and installation of self-cleaning pump screens on seven existing pumps. Both measures provide habitat restoration and conservation measures relevant to Murray Cod and Silver Perch.

The implementation of the offset package will be undertaken as two separate projects. This document considers the re-snagging of the Peel River.

WaterNSW engaged NSW Fisheries to undertake an aquatic habitat mapping survey of the Peel River between Chaffey Dam and Tamworth, a 50 km section of river (DPI 2020).

In addition to the habitat mapping report, WaterNSW has also been undertaking river health monitoring on a weekly to monthly basis. This monitoring has occurred at key refuge pools identified by the habitat mapping and previous surveys, from Chaffey Dam to Carroll Gap near the Peel and Namoi rivers' confluence.

WaterNSW has engaged GeoLINK to follow on from the DPI (2020) to assist with identifying suitable snagging sites within the Peel River between Chaffey Dam to Tamworth. As part of the identification of sites, Aboriginal Heritage Impacts, Environmental Impacts and Approvals required will be investigated and obtained. Scoping documentation for works at each individual site will be prepared along with the identification of potential sources of appropriate logs and materials to enable the installation of 50 snags.

2. Site Identification

2.1 Landownership

GIS data from the DPI (2020) report has been used to provide a starting point for the identification of land ownership and for site ground truthing. Refer to **Appendix A** and **Appendix B** for the preferred sites and associated land ownership.

Once the refuge areas, stock damage, erosion areas, pump sites, Lot and DP were matched up, WaterNSW provided land ownership and contact details.

Landowners that enabled the best access to the desired sites were contacted to notify them and to obtain their permission to access the Peel River via their properties. Two landowners were not agreeable to allowing us to access the river via their property. Refer to **Appendix B** for details.

2.2 Ground Truth Sites

Once sites were identified and landowners were contacted, site inspections commenced. The inspection occurred from 7 to 18 March 2022. The site inspection of each site was to ascertain the following, refer to **Appendix B**:

- Site suitability, which is defined as below:
  - **Not Suitable** - Bed is shallow, access is difficult, close to obstacles, significant earthworks and vegetation clearing required, landholder not supportive.
  - **Suitable** - Bed is deep, access is ok, minimal obstacles, minimal earthworks and vegetation clearing required, landholder mostly supportive.
  - **Ideal** - Bed is deep, access is easy, minimal to no obstacles, minimal to no earthworks or vegetation clearing required, landholder very supportive.
  - Categorising three options enabled individual site comparison as the site inspections progressed. Once all inspections were undertaken the more ideal sites could be compared to all possible sites and these preferences refined upon reflection of the data.
- To define the above suitability the following was considered:
  - Landowner agreement to allow access and is access practically achievable via their property.
  - Vegetation to be trimmed or cleared to obtain access to the river.
  - Vegetation to be trimmed or cleared to get logs into the river.
  - Earthworks / roadworks required to get logs to the river.
  - Earthworks required to get logs into the river.
  - Obstacles to log access to and into the river. Such obstacles would include access tracks, cropping, ground condition (wet etc), fencing, irrigation infrastructure, existing snags, pump sites, steep banks, animal burrow and general habitat etc.
  - Plant, equipment, and materials required.
  - Number of snags per site.
  - Will there be significant environmental issues with accessing this site i.e., vegetation clearing, soil erosion, habitat disturbance etc.

The inspection ascertained that of the sites inspected, approximately four were deemed Not Suitable, 40 were Suitable and 13 were Ideal. Some sites had potential for multiple snags to be placed within that location and surrounds.

If two snags per site were used on average for each site, then at least half the required snags (25) could be placed within the Ideal sites. The remaining snags could be placed within the Suitable sites based on a reach spread, landowner/ manager approval, extent of works required and the logistics of delivery and placement.

2.3 Alternative Sites

Alternative sites for re-snagging would be considered if sufficient sites within the section of river investigated didn't provide enough possible sites. These alternative sites would most likely be downstream of Tamworth. At this stage no alternative sites have been investigated.

2.4 Site Constraints

Based on the site inspections, the following were identified as consistent constraints across all possible (Suitable and Ideal) sites:

- Weed management will need to be undertaken at all sites to limit potential weed trafficking between sites.
- Vegetation pruning in most locations.
- Vegetation removal of introduced species in some locations.
- Vegetation removal of small native species in some locations and subsequent revegetation.
- Fencing management (removal and reinstatement) at some locations.
- Earthworks required to the riverbank to allow machine access and log placement is a common theme at most locations. Where sites require significant works these sites tended to be considered as not suitable.
- Landowners were in most part agreeable; two refused and some had concerns with snag placement creating future bank erosion issues.

2.5 Preferred sites

In initial site assessment of the 56 reaches, reaches 53 to 56 offered several snagging opportunities within the Tamworth township area. Discussions with stakeholders, principally, NSW Fisheries, North West Local Land Services, Tamworth Regional Council and WaterNSW occurred on 25 May 2022 via a teleconference. This was undertaken as part of a consultative process to obtain feedback from these parties in relation to the proposed snagging locations and associated potential issues with the overall project. After discussions a number of these parties had concerns about snags being located within the Tamworth township (reaches 53 to 56) area due to Aboriginal heritage areas of significance and recreational users use of this area.

As a result of these discussions, WaterNSW has decided to exclude reaches 53 to 56 from potential areas for re-snagging. The reaches that now are the preferred sites are all sites identified within reaches 1 to 52. These reaches have identified 56 potential sites. This will be sufficient for the requirements that WaterNSW have for installing 50 snags within the Peel River between Chaffey Dam and Tamworth. There are 21 erosion sites, within the 52 reaches, that potentially offer additional sites if they may be required, refer to **Appendix A**.

3. Impacts and Approvals

3.1 Aboriginal Heritage Impacts

Aboriginal heritage impacts have been initiated by undertaking an Aboriginal Heritage Information Management Systems (AHIMS) search, refer to Appendix C. This search indicates that there are no identified items that are close to potential snag sites. Access tracks to some snags sites will need to be defined to stay clear of some identified items that appear to be close to existing tracks.

As part of the project's environmental management plan, an unexpected finds procedure will be developed to guide the process if unidentified items are found during site works. The general process will involve stopping work immediately, protecting the area and notify the site EMR or Principal. The item will be identified and assessed. If its determined to be of significance mitigation measures will be developed that may include relocating the item or the work site may be abandoned and works recommenced on another site.

3.2 Environmental Impacts

The following environmental issues have been identified during the inspections:

- Weeds, vegetation pruning and removal, soil erosion and sedimentation, potential animal habitat disturbance, land and water pollution from plant and equipment operation, rehabilitation after snag placement and monitoring.

A project Review of Environmental Factors is being undertaken which will clearly identify potential environmental impacts and mitigation measures allowing the project to continue.

3.3 Regulatory Requirements, Permits and Approvals

A project Review of Environmental Factors is being undertaken which will clearly identify potential environmental impacts, permits, approvals and mitigation measures allowing the project to continue.

The Fisheries Management Act 1994, Section 199A, requires that a Public Authority, WaterNSW in this case, notify the Minister of the proposed works and consider any matters of concern raised by the Minister in formulating project implementation.

4. Scope of Works

4.1 Snags and their positioning

The scope of works for the sourcing, transportation and installation of timber snags will include the following aspects outlined within this **Section**.

4.1.1 Preferred tree species for snags

Eucalypt species are the preferred tree species for re-snagging of inland waterways. Species selection is based on tree size, timber hardness and density characteristics, with the broad categories of box, redgum and ironbark species acceptable. Examples of suitable eucalypt species are listed in **Table 4.1**.

Table 4.1 - Examples of Eucalyptus species suitable for re-snagging projects in inland NSW

Species Group	Representative Eucalyptus
Box	Grey Box (E. microcarpa) White Box (E. albens) Fuzzy Box (E. conica) Yellow Box (E. melliodora) Bimbil Box (E. populnea) Coolibah (E. coolabah)
Redgum	River Red Gum (E. camaldulensis) Blakelys Red Gum (E. blakelyi)
Ironbark *	Mugga Ironbark (E. sideroxylon) Silver-leaved Ironbark (E. melanophloia) Narrow-leaved Ironbark (E. crebra)

* *The outer bark from ironbark species should be removed before installation as it contains high levels of tannins and resin that may impact water quality (Source: S. McCaffrey, NSW Fisheries, pers com, April 27, 2022)*

Native Australian riverine animals have become uniquely adapted to native hardwood timbers including both Redgum, Yellow or White Box species (DEW 2021).

Recently felled timber is ideal, some native timbers such as Redgum dry out quite quickly and therefore are too light and buoyant, causing havoc for positioning and exposing potential risks downstream if they become loose (DEW 2021).

If the timber is very dry and has been out of the ground for many months or years, it will most likely be providing terrestrial habitat to land based animals and removing it for re-snagging would disrupt what is already a healthy land-based habitat (DEW 2021).

The dense hardwood not only is preferred by the animals, but it is also safer for re-snagging too, as it can stabilise and secure in the riverbed quickly. Exotic species (e.g., willow) are not desirable as they are generally too light, can be difficult to stabilise and will decay rapidly once positioned. In addition, some invasive species have the capacity to re-sprout when re-settled and are of little ecological benefit to native biota (DEW 2021).

4.1.2 Snag size and complexity

Suitable trees will have trunks of at least 250mm Diameter at Breast Height (DBH = 1.5m AGL) and be at least 2.5m long. The largest trees available are preferred, with size only limited by the timber source and the capability of machinery and load capacity for transport truck and trailers. Where only smaller

diameter trees are available then multiple logs can be positioned together to form a one snag complex structure.

Snags having an intact rootball, multiple branches and hollows are preferred. Snag complexity will be limited by the log source and load capacity for transport trailers and size limits for loads as specified in the *Heavy Vehicle (Mass, Dimension and Loading) National Regulation*.

Generally, inflexible snag dimensions (trunk and major branches) will be a maximum of 2.5m wide and 12m long. Flexible branches and foliage exceeding these dimensions are acceptable where they are able to be tied down for transport and are easily incorporated into a standard oversize load dimensions (*S. McCaffrey, NSW Fisheries, pers com, April 27, 2022*).

The upper reaches of the Peel River will take shorter logs and lower reaches longer logs, due to channel width and suitable space to position such sized logs. Deep pools within the lower Peel may take smaller logs thus allowing a submerged complex habitat.

4.1.3 Tree felling protocol

An intact rootball is important for anchoring snags in place during periods of high flow, as well as providing habitat complexity. Trees should be felled in a manner to preserve the rootball, by ripping a complete circuit around the base of the tree with heavy machinery prior to pushing the tree over.

To minimise impacts on water quality and for safety during transport, as much dirt as possible will be removed from rootballs. Where ironbark species are felled, bark will also be removed (*S. McCaffrey, NSW Fisheries, pers com, April 27, 2022*).

4.1.4 Snag source locations

At this stage two sources of timber have been identified for this project. Both of these sources have had and are having trees removed under approved conditions. Both proponents are supportive of their use for fish habitat as both sources of timber would either be mulched or burnt. These two opportunities provide a positive reuse outcome for the proponents, WaterNSW and the environment.

The timber will be loaded by the proponents onto semi-trailers or truck and dog combinations. The number of trees to be loaded will depend on the tree sizes. It is anticipated 4 to 6 trees will be transported within one load.

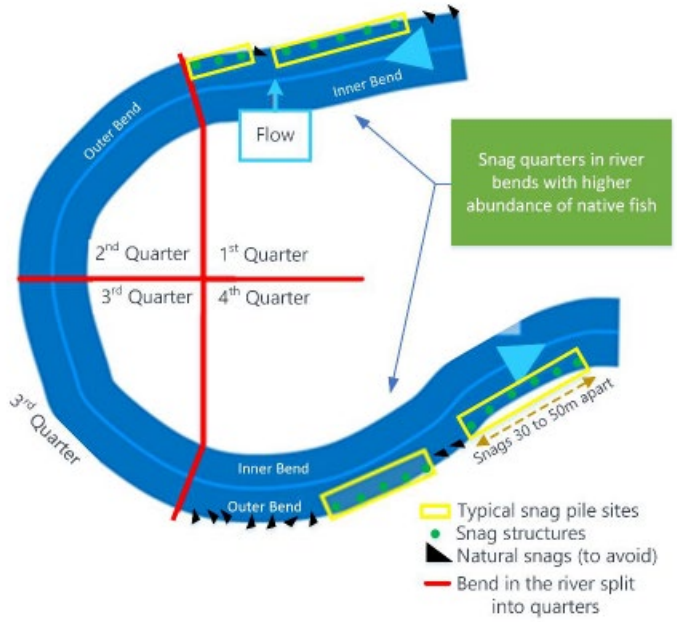
The logs will be delivered to stockpiling sites dependant on log size and timing of log availability. The logs will be unloaded at the receiving stockpiles by machinery contracted or owned by WaterNSW.

It is anticipated that logs will be transported to stockpiles prior to site work occurring. Once the site work commences logs will be transported to individual sites from the stockpile sites as required.

4.1.5 Positioning of snags

The location of re-snagging sites in the broader riverscape, including proximity to existing snags, will influence the overall success of this re-snagging project. Random placement of snags anywhere into the river may benefit fish, however it is likely more beneficial in reaches where new snags will be spatially connected to existing habitat. Targeting an area with known fish populations will also encourage faster colonisation of new snags. Optimal locations for re-snagging sites are in meanders of moderate bends and in the 1st or the 4th quarter of the bends, refer to Figure 4.1 (DEW 2021).

Figure 4.1 Bend scale used to determine potential sites.



Source (DEW 2021).

The rootballs and timbers will be kept intact as much as possible, as maintaining tree complexity is key to creating a new micro habitat. It is also better if the introduced timber contains forks, and hollows to make it more desirable by fish as it will provide refuge and safety for juvenile or small bodied species. In addition, and if practicable, 2.5 metres or more of the trunk attached to the rootball will be left to enable introduced habitat to stretch further into the river (DEW 2021). This will not extent across the thalweg as this may interfere with low and medium flows and could cause bed erosion and potential bed lowering.

As illustrated in F**igure 4.2**, root balls and logs will be positioned at angles between ~25 to ~45 degrees in a downstream direction from the edge of the bank. Snags will be observed to have water movement and flow between limbs, branches etc. and mimic naturally occurring habitat. Therefore, it is important not to have snag structures positioned too close together so as to not over crowd the site with too many structures, this will reduce flow and not entice fish to the snag (DEW 2021). Single snags sites may include just one log and root ball or multiple logs and root balls dependant on log and root ball size and width of the river. This multiple log structures would be referred to as a single snag complex.

Where multiple snags will be installed within one site, they will be spaced 30 to 50 meters apart along the bank, refer to **Figure 4.1.** This spacing will be applied predominantly on the outer bend, where deeper and faster flowing water can be found. Research has also shown that species like Murray cod prefer snags in deeper water but close to the bank. The outside of the bend is normally where erosion occurs and hence tends to be the deeper side. Placing snags close to the bank creates ideal habitat, in addition, they will divert water away from the bank and reduce the risk of erosion. To decrease risks to navigation, snags will be positioned along the bank and not in the middle of the river and especially away from areas within close proximity to an anabranch or creek junction. In doing so could redirect water and change the way that the water course flows (DEW 2021).

Monitoring has shown that a range of different native species use reintroduced snags, and populations can increase in abundance when introduced to rivers in appropriate locations. In the upper Murray, introduced snags are used by many species, including Murray cod, trout cod and golden perch, and use of introduced snags is similar to natural snag piles. Placement and position of snags, however, can influence how quickly and if species start to utilise the structures. Some species of fish are found to prefer the 1st quarter of a bend, refer to F**igure 4.1**, while Murray cod were more abundant in the 1st

and 4th quarter. Conversely, golden perch were less specific in their preferences and could be found in almost the same abundances across the 1st, 3rd and 4th quarter of a bend (Nicol et al. (2002)).

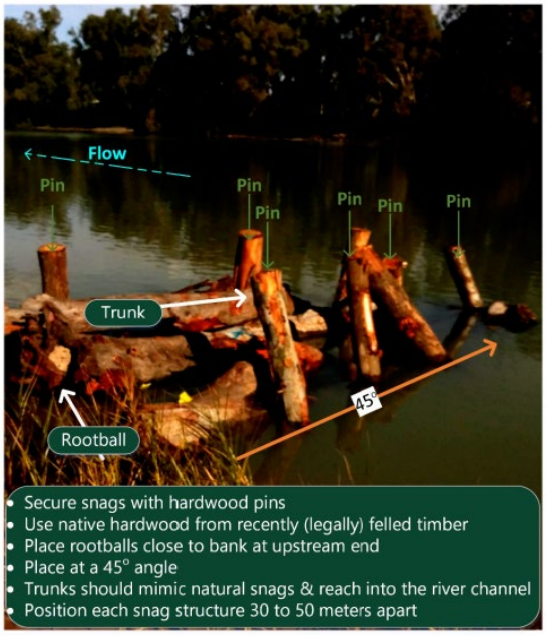
Snags will be placed around outer bends within all 4 quarters where opportunity allows. Where there are pumps sites or other riparian infrastructure that may be interfered with due to snag movement, careful consideration will be given to the snag placement and their securing into position. Snags will be positioned as far as possible away from this infrastructure.

4.1.6 Anchoring of snags

Australian wood is relatively immobile in river systems mainly due to three factors; Lower average stream power of our rivers, Higher density of wood; and A complex branching structure of trees meaning that logs easily anchor in position. All snags installed or placed in a waterway should be securely anchored in place, this will minimise the chance of them being dislodged and moving into the river channel or floating away. If not secured, these introduced structures could impact other assets (third party impacts). Structures most at risk include but are not limited to, culverts, bridges, pontoons, and pump sites. Due to their weight, most snags require the assistance of an excavator to place them in the river, these machines can also be used to drive piles, like pins, to hold the snags in place (DEW 2021).

Hardwood timber pins up to 150mm to 250mm diameter and up to 4m long (straight) will most likely be used to pin a snag or snag complex in place. One end will be cut to have a point, allowing easier pushing into the bed of the river. Each snag will require up to 6 pins to secure them into place. Wire rope of a minimum diameter of 10mm maybe used to help secure snag complexes together along with the pinning operation, refer to **Figure 4.**2.

Figure 4.2 Positioning and anchoring a snag



Source (DEW 2021)

4.2 Site remediation

After the re-snagging of a site is complete, the site will be restored to its former condition as much as possible. Any construction or associated materials (e.g., sediment controls, access signage etc.) will be removed from site, including any disruption caused by equipment or timber debris. Bed and banks will be restored to their original profiles.

It is anticipated that permeant (biodegradable) erosion and sediment controls measures will be installed at completion of works and tidy up. Native trees, shrubs and grasses maybe planted at each site dependant on the extent of disturbance that occurs.

Any fencing, access track and other infrastructure disturbed during construction will be reinstated at the completion of works and when demobilising from site.

4.3 Monitoring

It is recommended that photos points be set up to provide records of works at each site and to visually monitor snag success. This could occur prior, during and post construction and on a 6 monthly basis for up to 5 years. This could be in conjunction with the monitoring requirements detailed within the GHD (2020) Biodiversity Offset Plan.

The success of this project will most likely take several years to see a noticeable increase in native fish populations and potential improvements in river health. There are also a number of other factors that may contribute to its success or otherwise.

4.4 Risk management

In considering the implementation of this project risks associated with WHS, Environment and Quality will be built into the documentation of the project and will be removed or reduced through a variety of mitigation measures.

4.4.1 Work Health and Safety Considerations

The management of safety risks will be managed by the development of a Safety Management Plan and associated Safe Work Methods. Risks associated with such a project include:

- transport of logs, plant, equipment and personnel.
- working with heavy machinery.
- working near and in water.
- working with timber and cabling
- working on uneven unstable ground.
- working with tools and equipment.
- working with corrosive and flammable liquids.
- working near powerlines and trees
- working on steep unstable ground.

4.4.2 Environmental considerations

The management of environmental risks will be managed by the development of a Construction Environmental Management Plan and associated Environmental Work Methods. Risks associated with such a project include:

- soil erosion and sedimentation.
- pollution of land and waters from transport, plant and equipment operation.
- disturbance of flora, including threatened flora.
- disturbance of fauna, including threatened fauna and their habitat.
- disturbance of Indigenous artifacts.
- weed management.
- stakeholder management.

4.4.3 Quality considerations

The management of Quality risks will be managed by the development of an Inspection and Test Plan. Risks associated with such a project include:

- site setup.
- dilapidation.
- damage to infrastructure both on public, private lands and within the riparian zone.
- consideration of movement of snags and potential downstream impacts.
- log and pin quality.
- log and pin sizing.
- snag positioning.
- snag pining.
- snag wrapping.
- site remediation.
- monitoring.

4.5 Project Delivery

Installation of snags can be done either through a land-based approach or a water-based approach and with a variety of equipment and methods. Three methods are explained below:

1. Land based with excavator, long reach excavator or crane.
   This approach will require the use of an excavator or crane with various attachments including a log grab, a bucket and a hydraulic pile driving hammer.
2. A water-based approach with a barge and excavator.
   A water-based approach can be useful for sites which are highly vegetated and/or where high, unstable banks prevents re-snagging to occur from the bank. This approach will require the use of a barge as well as an excavator with various attachments to move and position the trees including a log grab and a hydraulic pile driving hammer.
3. Land based cable dragging.
   This is a land-based approach that uses a cable and a winch to drag trees into the final position.

The most likely method that will be enlisted for this project is number one. Logs will be installed via an excavator most likely a 20ton size machine or larger. A long reach may be used if required. Typical attachments will include a log grab, general purpose bucket, batter bucket and there may be a requirement for a hammer attachment to drive pins in. A loader may be enlisted to supply logs to an excavator if multiple snags are installed at one site.

Although re-snagging is theoretically possible throughout the year, works will most likely be undertaken during low flows (seen typically in late summer through winter). This is generally when the pool level is lower and while banks are more exposed, and therefore potentially the access to sites may be better.

For a typical site the following will occur:

- confirmation that the site is suitable, preferred site.
- written permission obtained from landowner/manager to allow access to the river.
- WHS, Environment and Quality plans and associated site-specific plans (SWMS, EWMS and ITP's) confirmed and approved as per **Section 3** and **Section 4.4**.
- mobilisation of plant and equipment to site.
- access tracks set up to receive machinery and logs, if required.
- log drop off site determined and readied, if required.
- snag location/s defined and marked out.

- access down to river defined and readied. This may include fence removal, vegetation pruning, removal and earthworks to allow machine access.
- temporary ESC installed.
- log and pin delivery from log stockpile sites.
- log and pin placement according to **Section 4.1.5 and 4.1.6.**
- site remediation according to **Section 4.2.**
- site monitoring according to **Section 4.3**.

4.6 Site Management Plan

A generic Site Management Plan (SMP) has been developed to guide the implementation phase of this project. The SMP identifies potential project risks associated with safety, environment and quality. It provides possible mitigation measures for these risks. It is a guidance document and does not negate the need for the development of site specific SWMS, EWMS and ITP's.

Refer to **Appendix D** for the SMP and **Appendix E** for the individual site specific management plans for each snag location within reaches 1 to 52. **Appendix F** shows typical ESC measures that may be utilised.

5. References and Bibliography

Brooks, A. et al. (2006). *Design guideline for the reintroduction of wood into Australian streams*. Land & Water Australia, Canberra.

Dec E, & Marklund, M (DEW) (2021). *Re-snagging Guidelines for the Lower River Murray, DEW Technical report 2021/04*. Government of South Australia, Department for Environment and Water, Adelaide.

Department of Primary Industries (DPI) (2017). *Proposal to Conduct Re-snagging works in the Severn River. Review of Environmental Factors*. NSW Department of Primary Industries, NSW Government, Sydney.

Department of Primary Industries – NSW Fisheries (DPI) (2020). *Habitat mapping and prioritisation report prepared for WaterNSW, Peel River between Chaffey Dam and Tamworth*. December 2020 for WaterNSW. NSW Department of Primary Industries, NSW Government, Sydney.

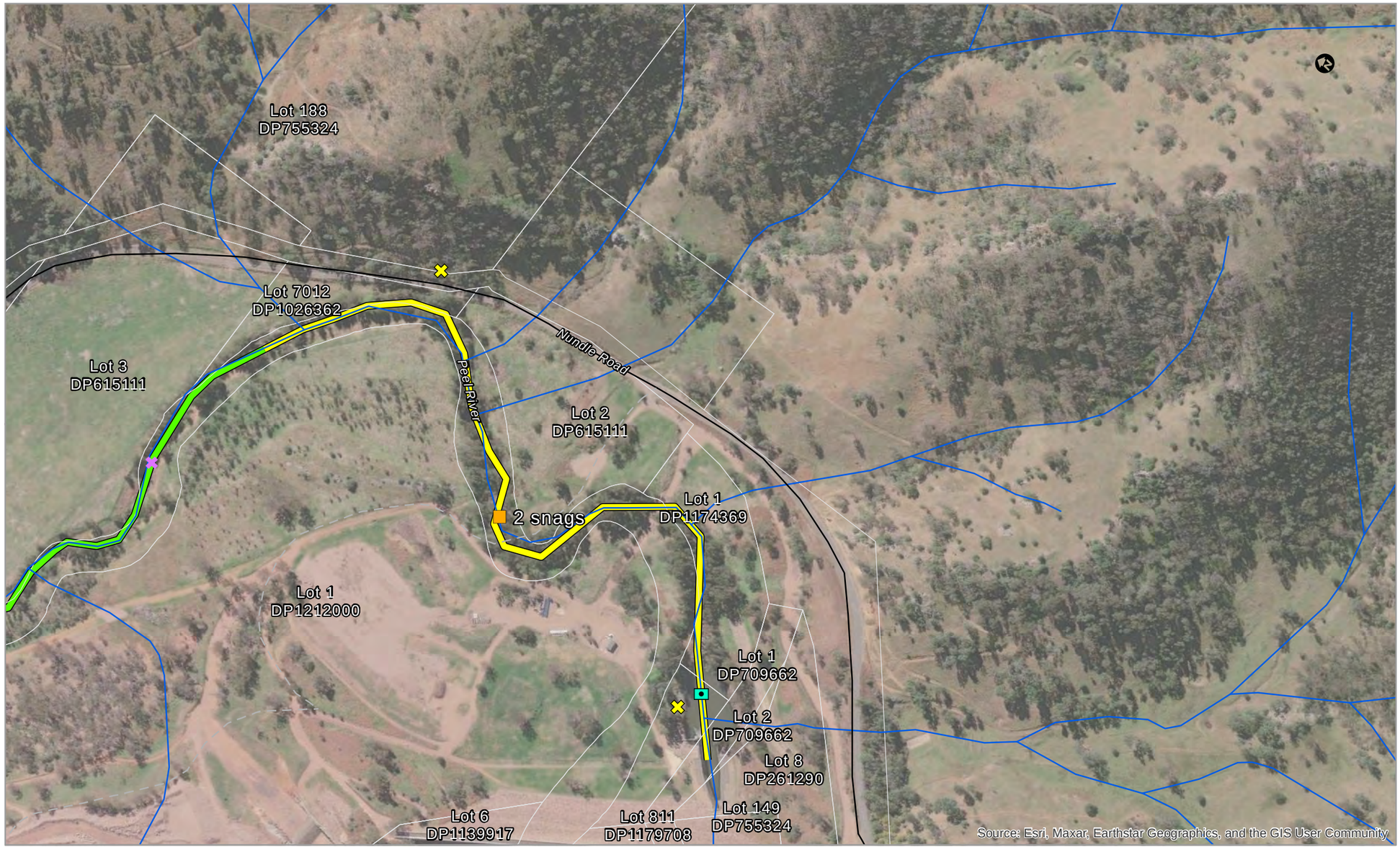
GHD (2020). *WaterNSW Peel River Drought Protection Works – Biodiversity Offset Plan*. October 2020 for WaterNSW. GHD Sydney NSW.

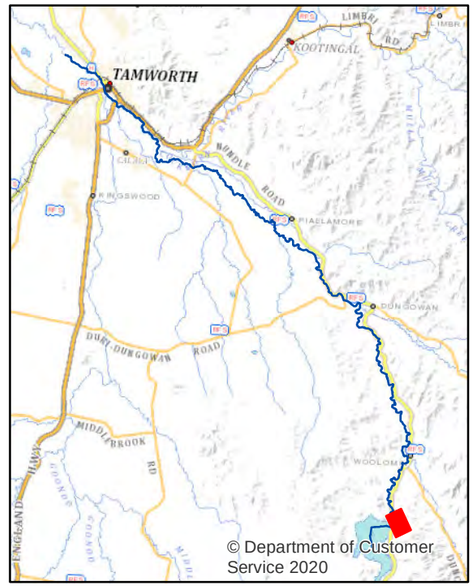
Nicol, S., Lieschke, J., Lyon, J. and Hughes, V. (2002). *Re-snagging Revolution: River Rehabilitation through Re-snagging*. Final Report to Agriculture, Fisheries, Forestry Australia (MD2001 FISH REHAB Program). Department of Natural Resources and Environment.

Copyright and Usage

Appendix A

Reaches





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Track-vehicular

Reach Number
- 1
- 2

Site suitability
- Suitable

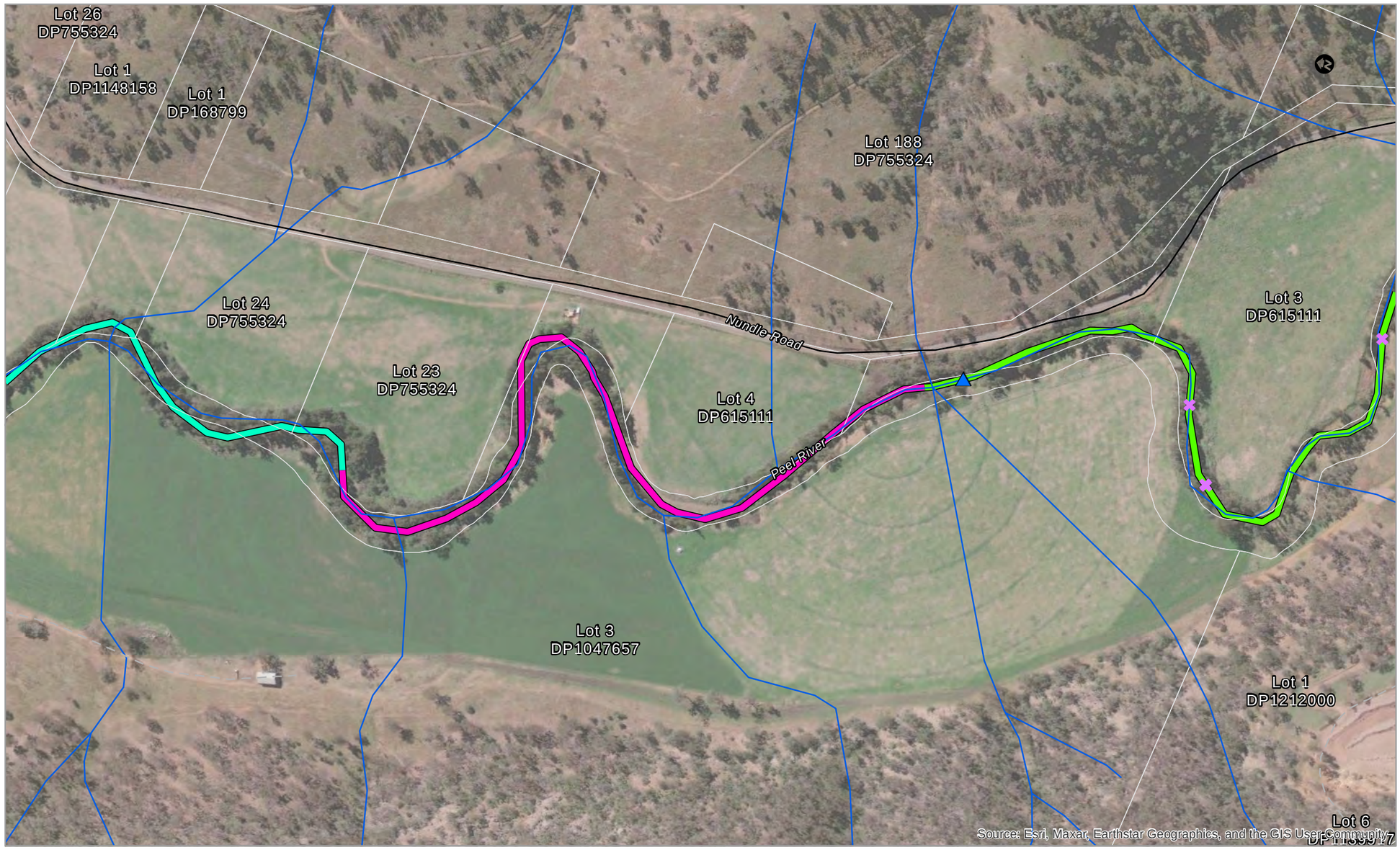
- Refuge
- Stock damage
- Gauging station

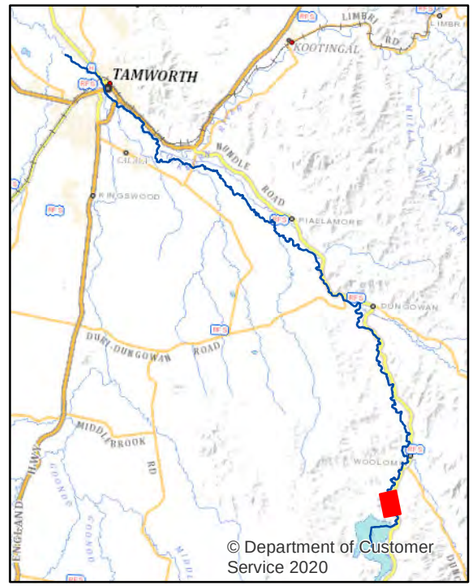
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Track-vehicular

Reach Number

- 2
- 3
- 4

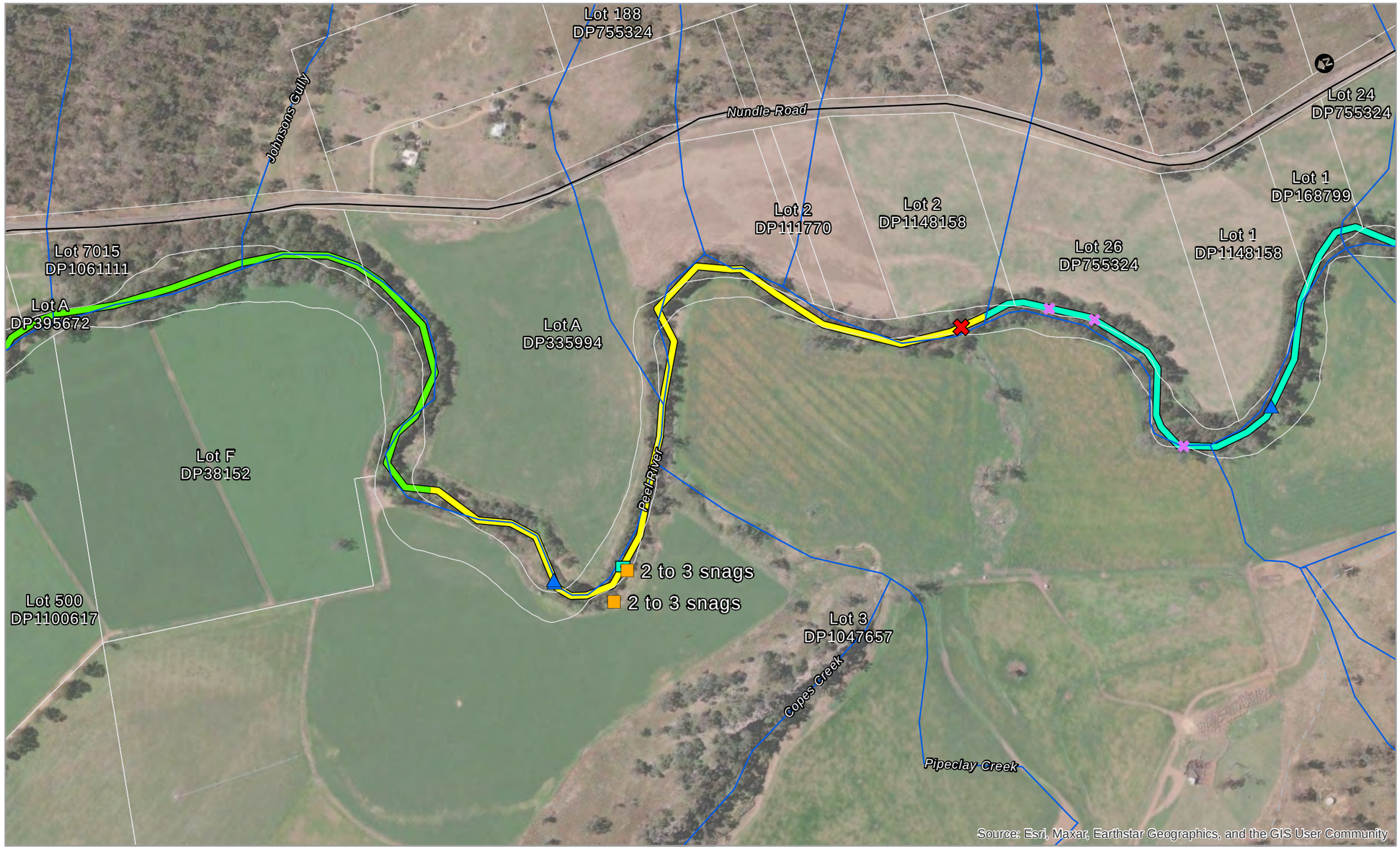
- Stock damage
- Pumpsite

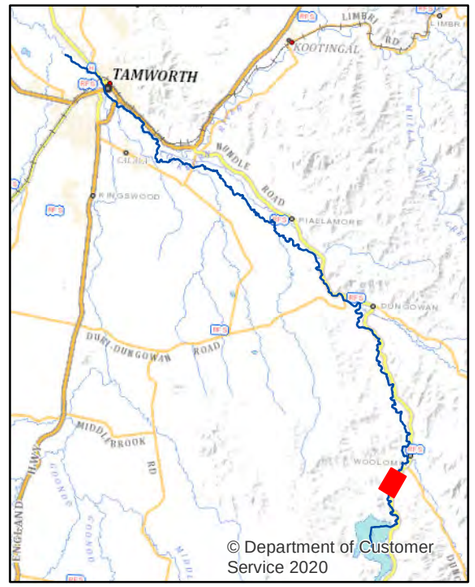
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Track-vehicular

Reach Number

- 4
- 5
- 6

Site suitability

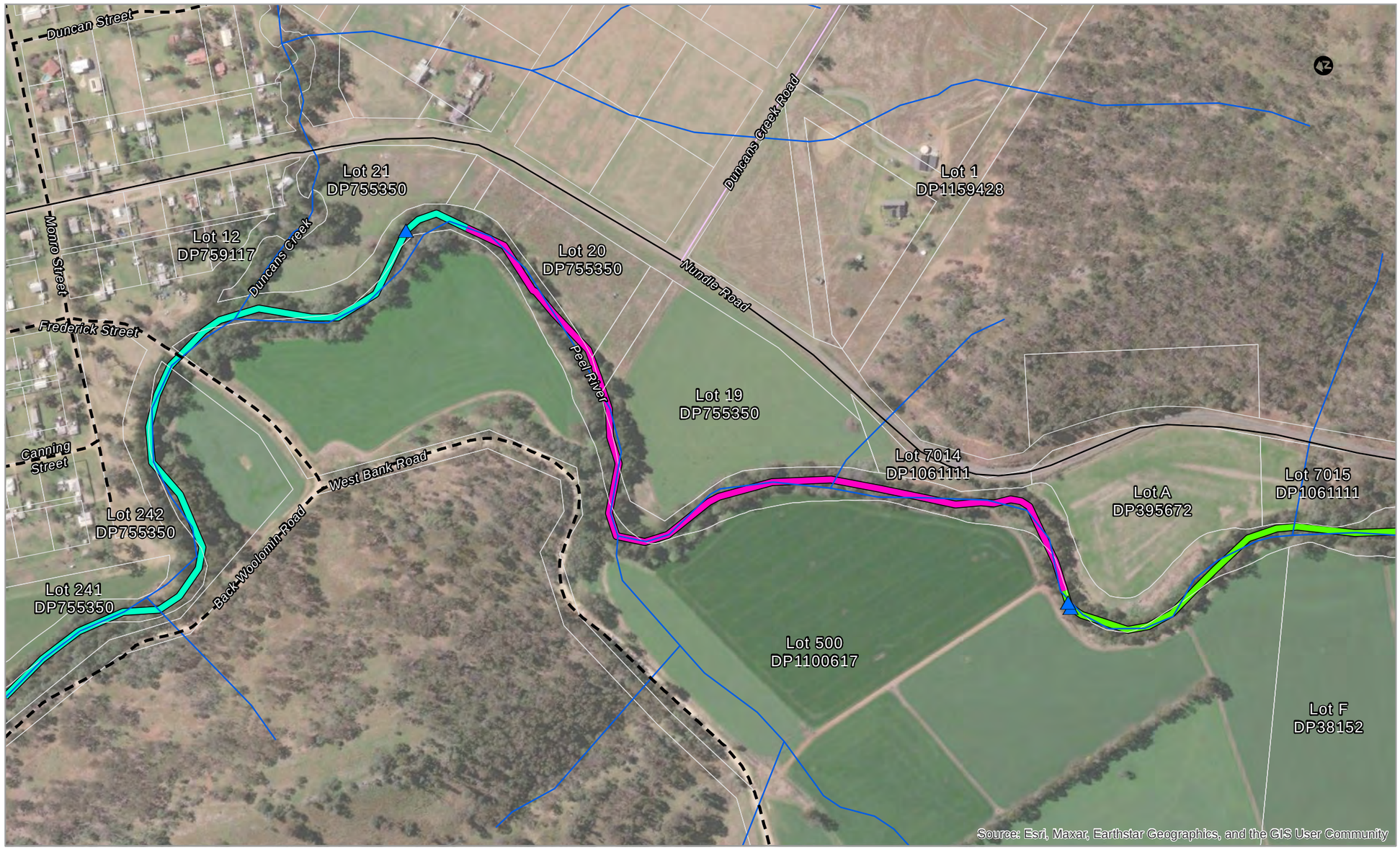
- Suitable

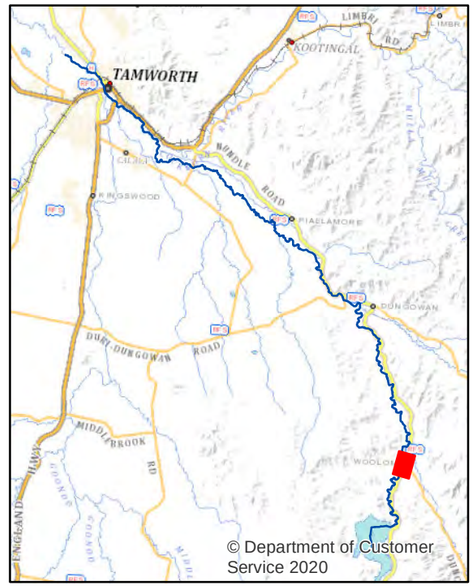
- Refuge
- Stock damage
- Pumpsite
- Erosion

0 100 Metres

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Sub arterial road

Reach Number

- 6
- 7
- 8

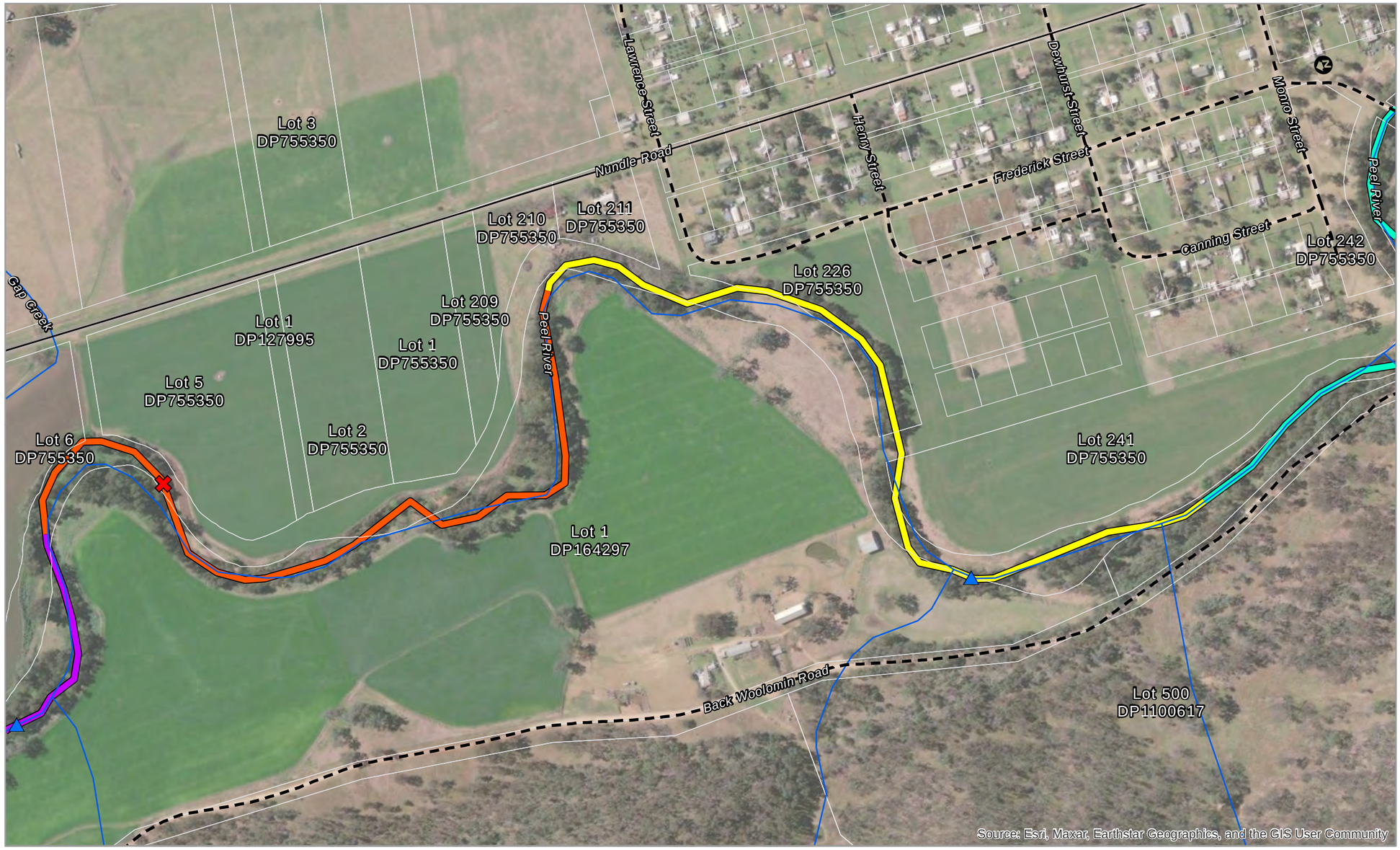
- Pumpsite

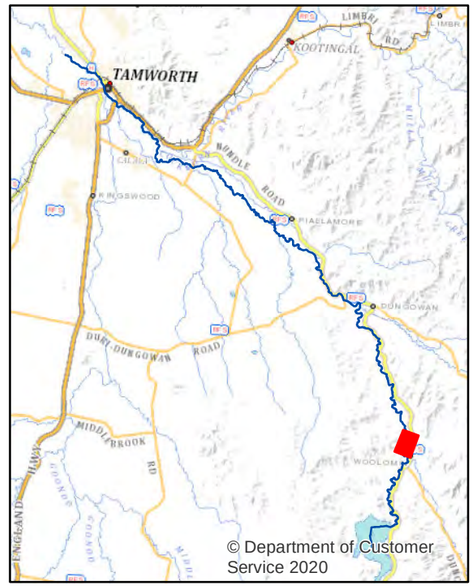
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road

Reach Number

- 8
- 9
- 10
- 11

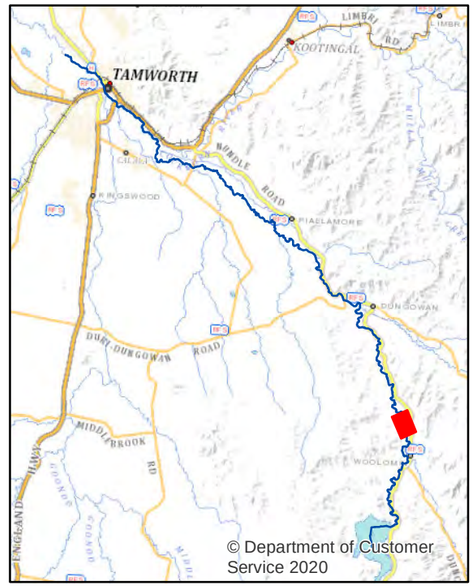
- Pumpsite
- Erosion

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Track-vehicular

Reach Number

- 10
- 11
- 12

Site suitability

- Not suitable

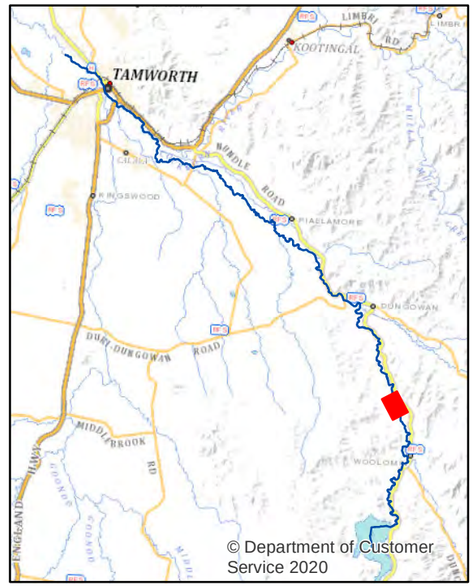
- Refuge
- Pumpsite
- Erosion

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Track-vehicular

Reach Number

- 12
- 13
- 14

Site suitability

- Not suitable

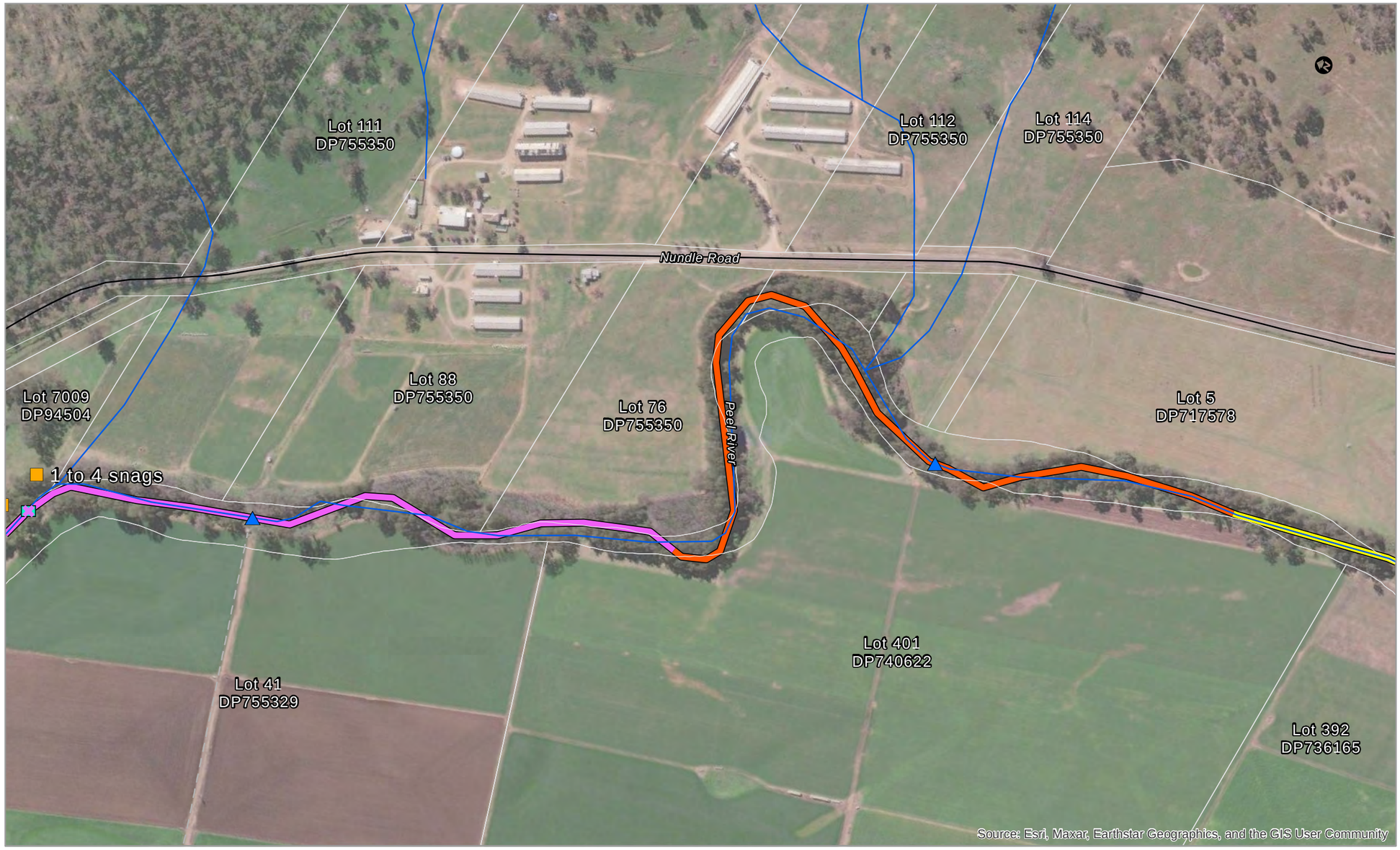
- Refuge
- Stock damage
- Pumpsite

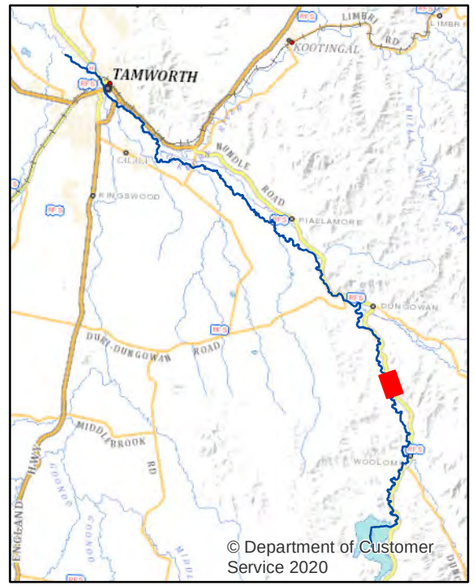
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Track-vehicular

Reach Number

- 14
- 15
- 16

Site suitability

- Suitable

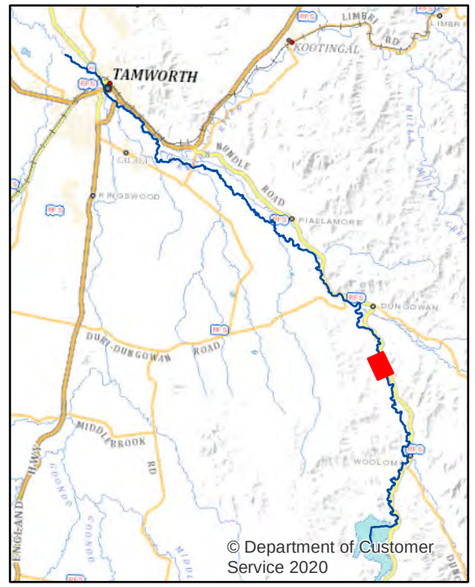
- Refuge
- Stock damage
- Pumpsite

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Track-vehicular

Reach Number

- 16
- 17
- 18

Site suitability

- Suitable

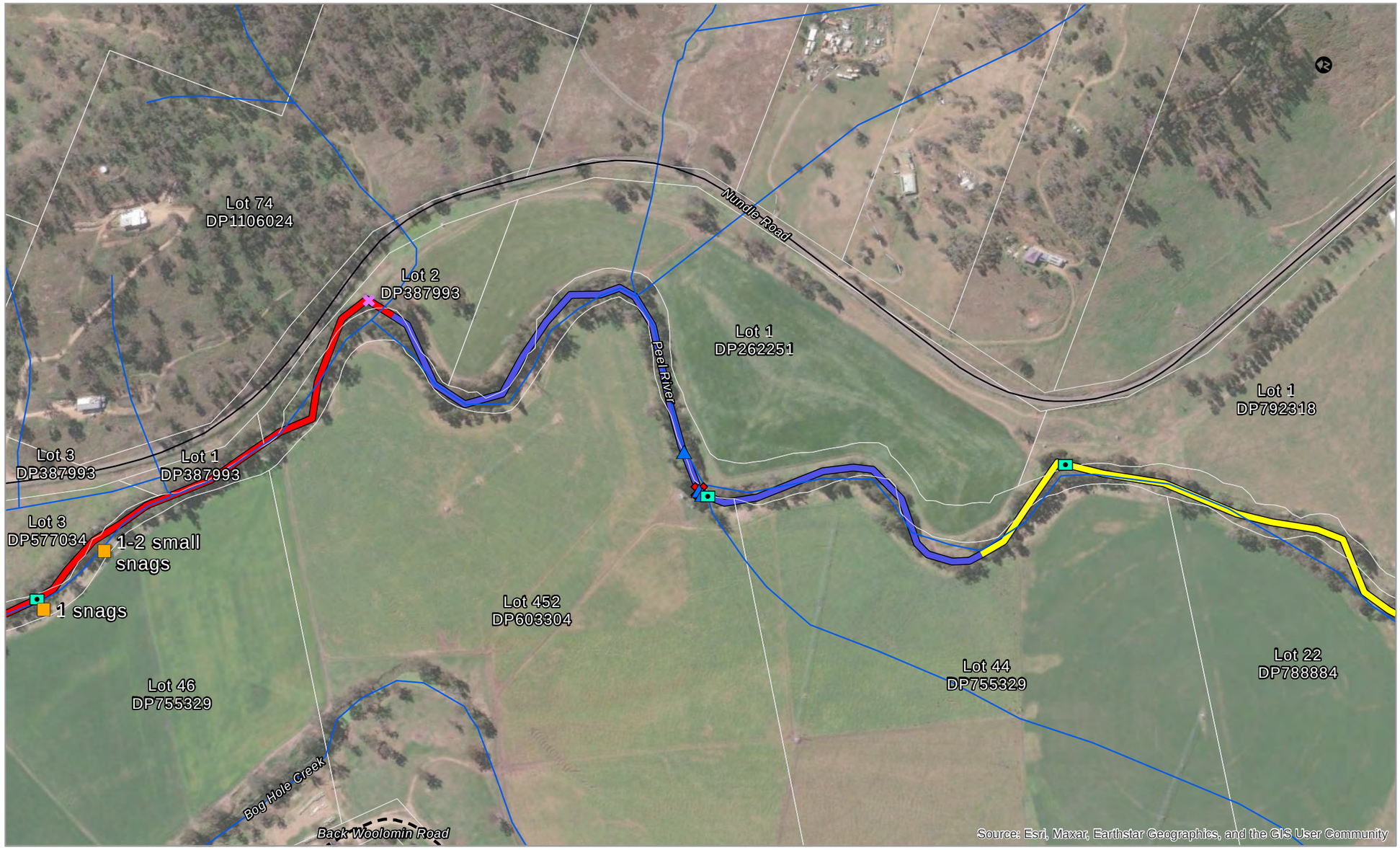
- Refuge
- Stock damage
- Pumpsite
- Erosion

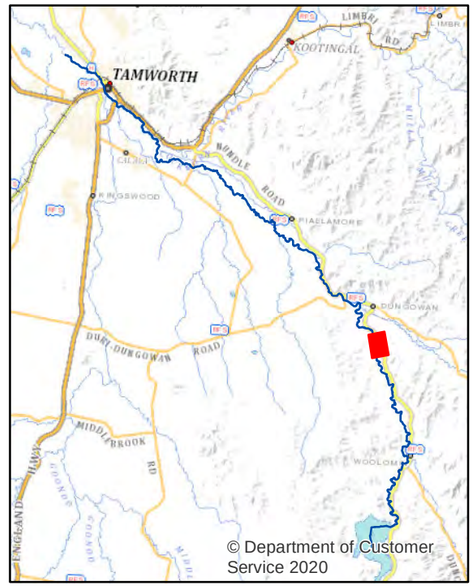
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Track-vehicular

Reach Number

- 18
- 19
- 20

Site suitability

- Suitable

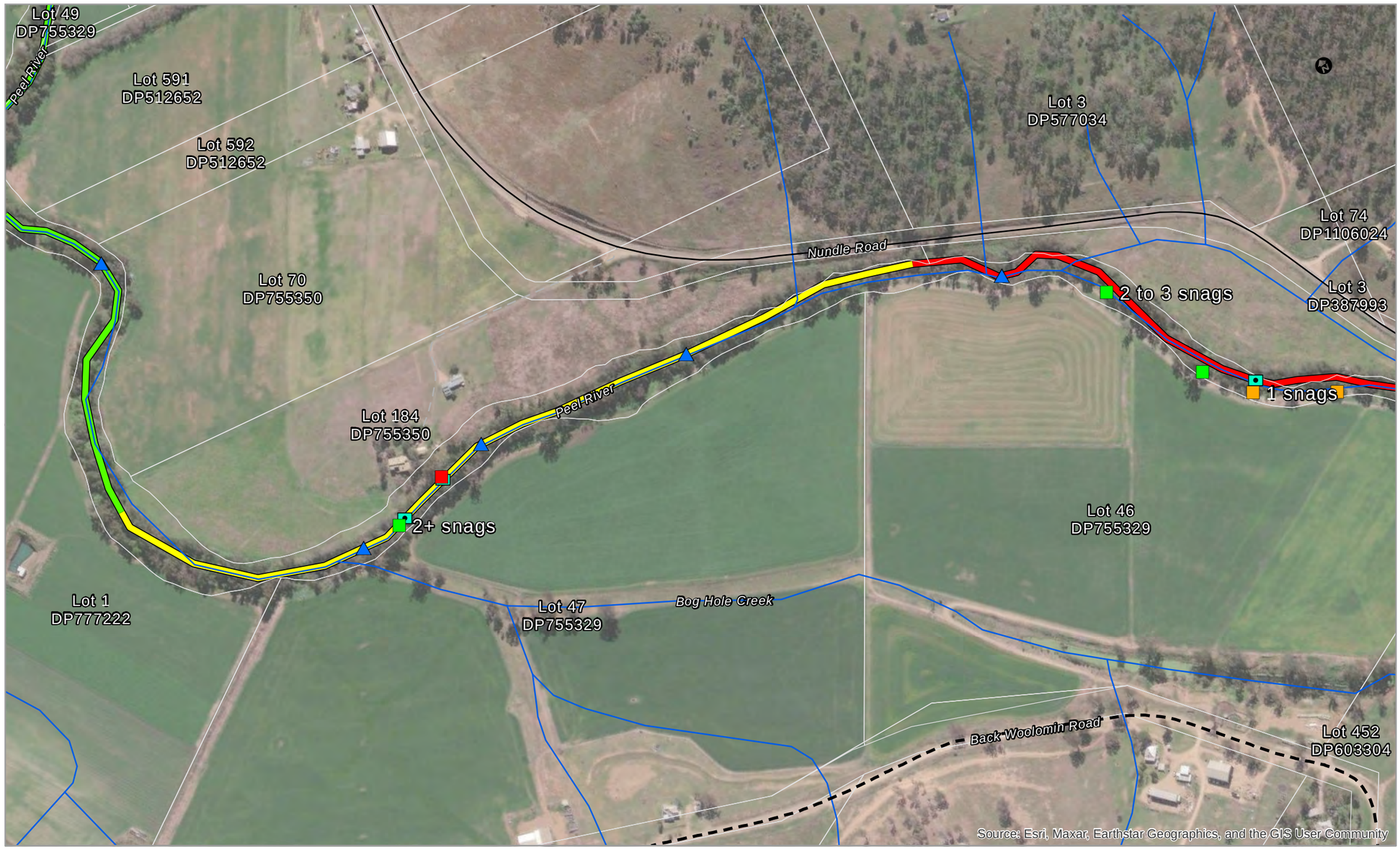
- Refuge
- Stock damage
- Pumpsite
- Erosion

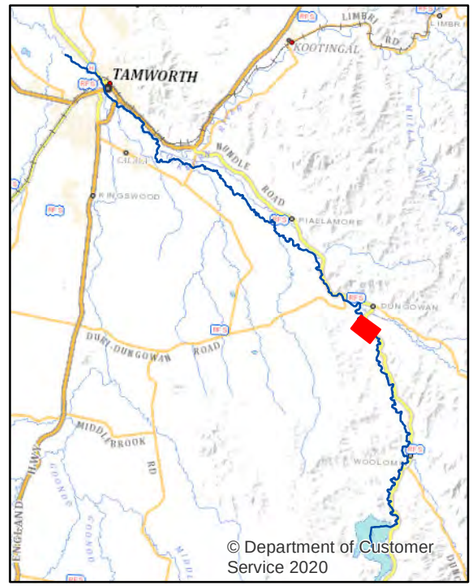
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Track-vehicular

Reach Number

- 20
- 21
- 22

Site suitability

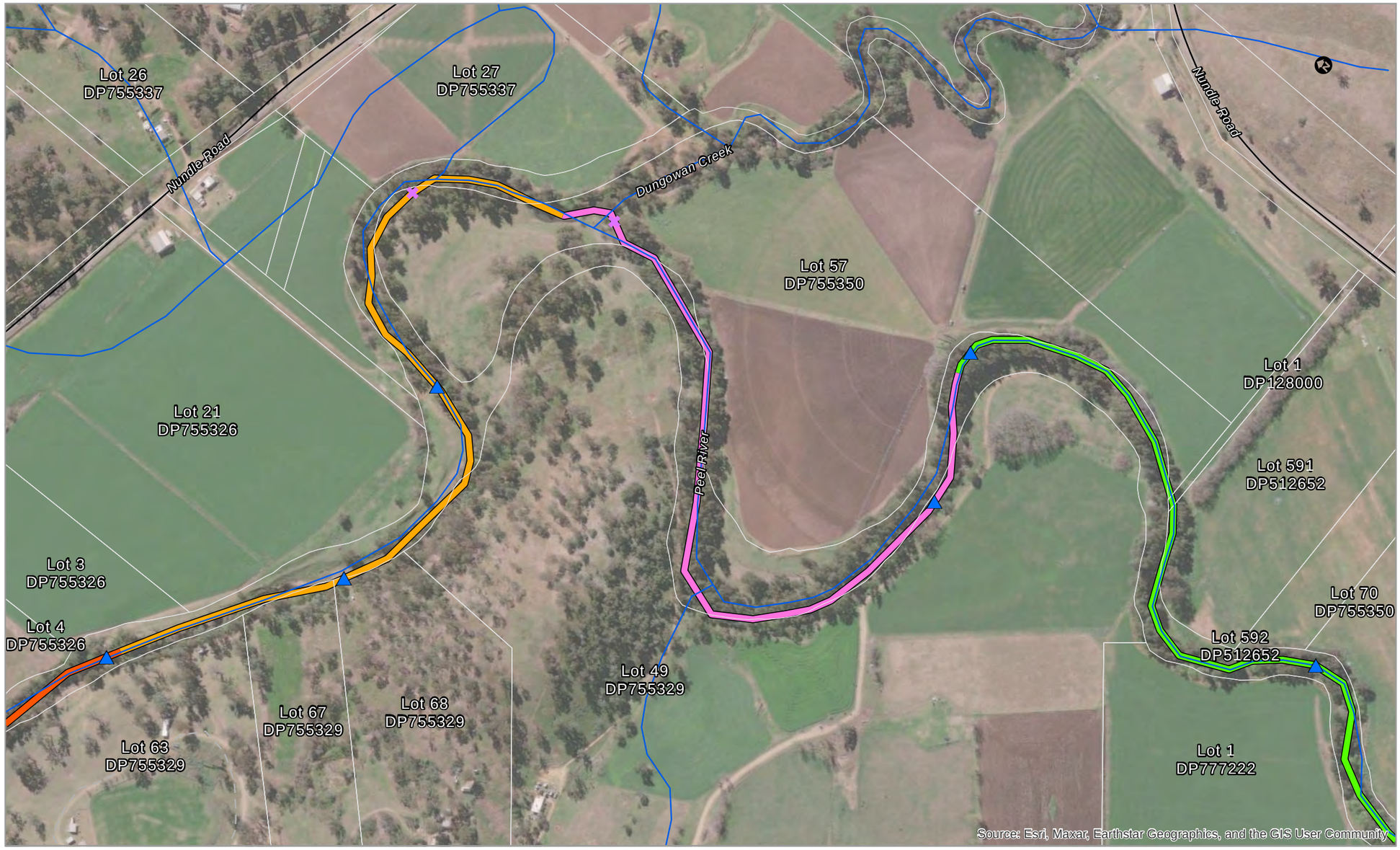
- Not suitable
- Suitable
- Ideal

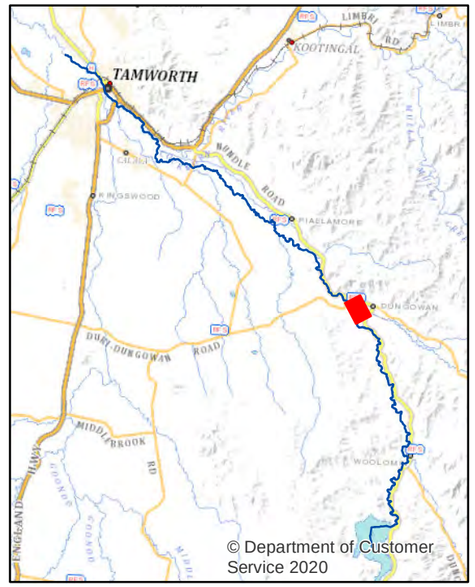
- Refuge
- Pumpsite

0 100 Metres

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Track-vehicular

Reach Number

- 22
- 23
- 24
- 25

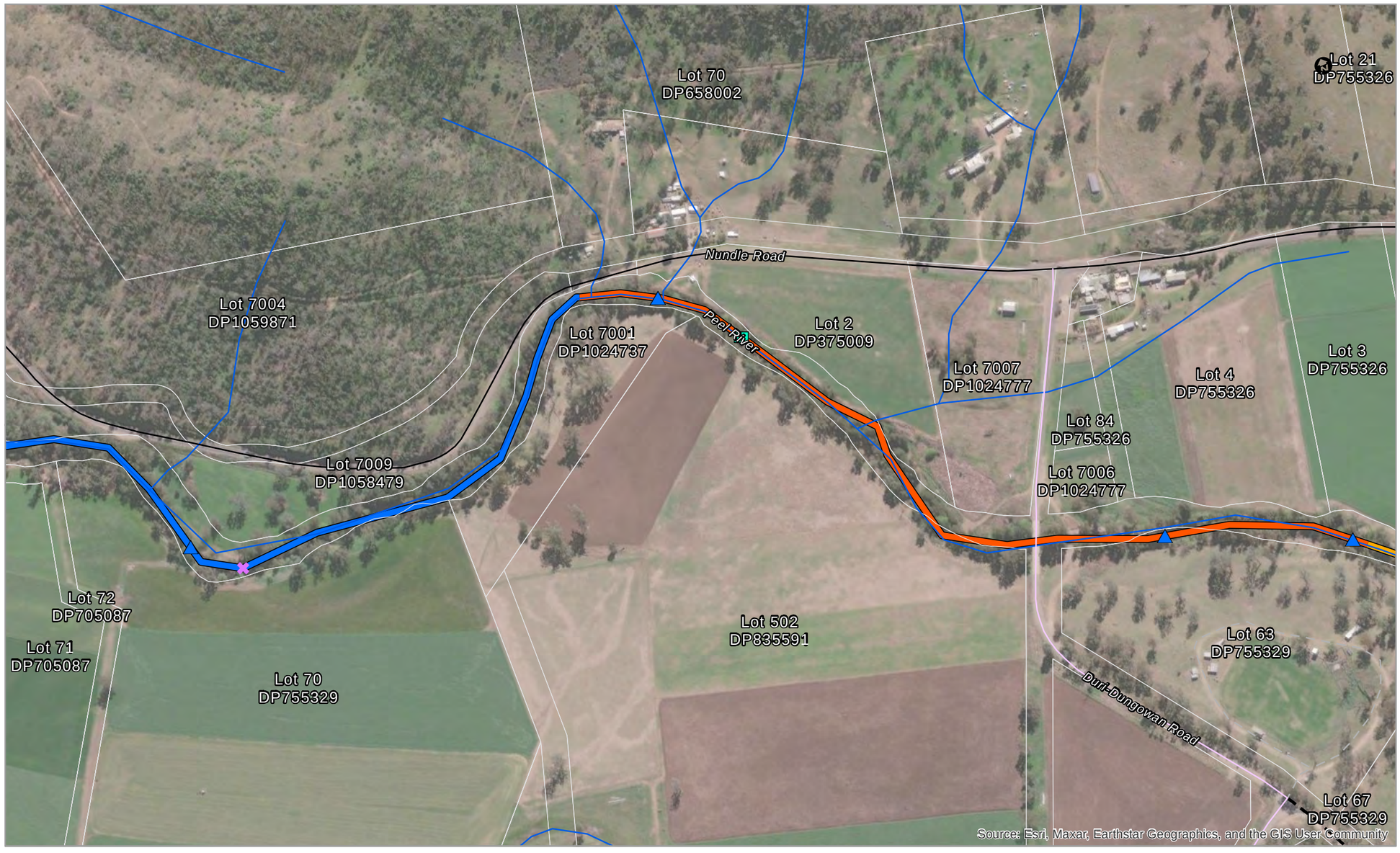
- Stock damage
- Pumpsite

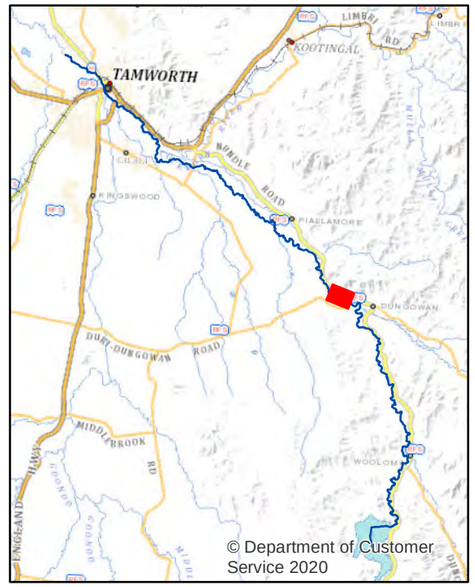
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Sub arterial road
- Track-vehicular

Reach Number

- 24
- 25
- 26

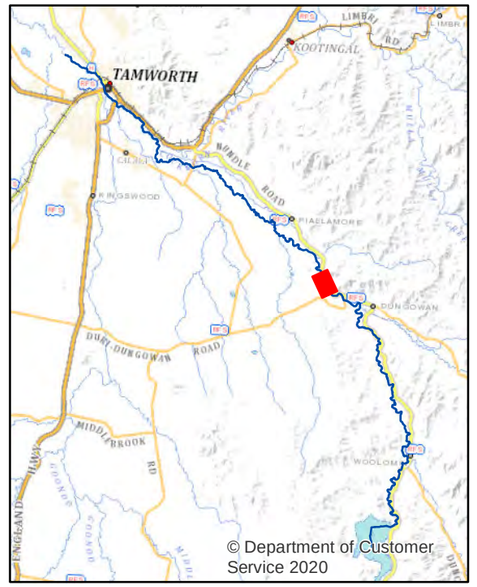
- Refuge
- Stock damage
- Pumpsite

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Track-vehicular

Reach Number

- 26
- 27
- 28

Site suitability

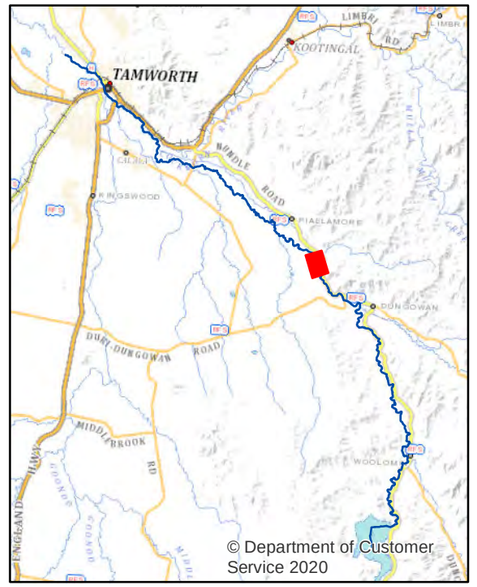
- Suitable

- Refuge
- Pumpsite

0 100 Metres

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Track-vehicular

Reach Number

- 28
- 29
- 30

Site suitability

- Suitable

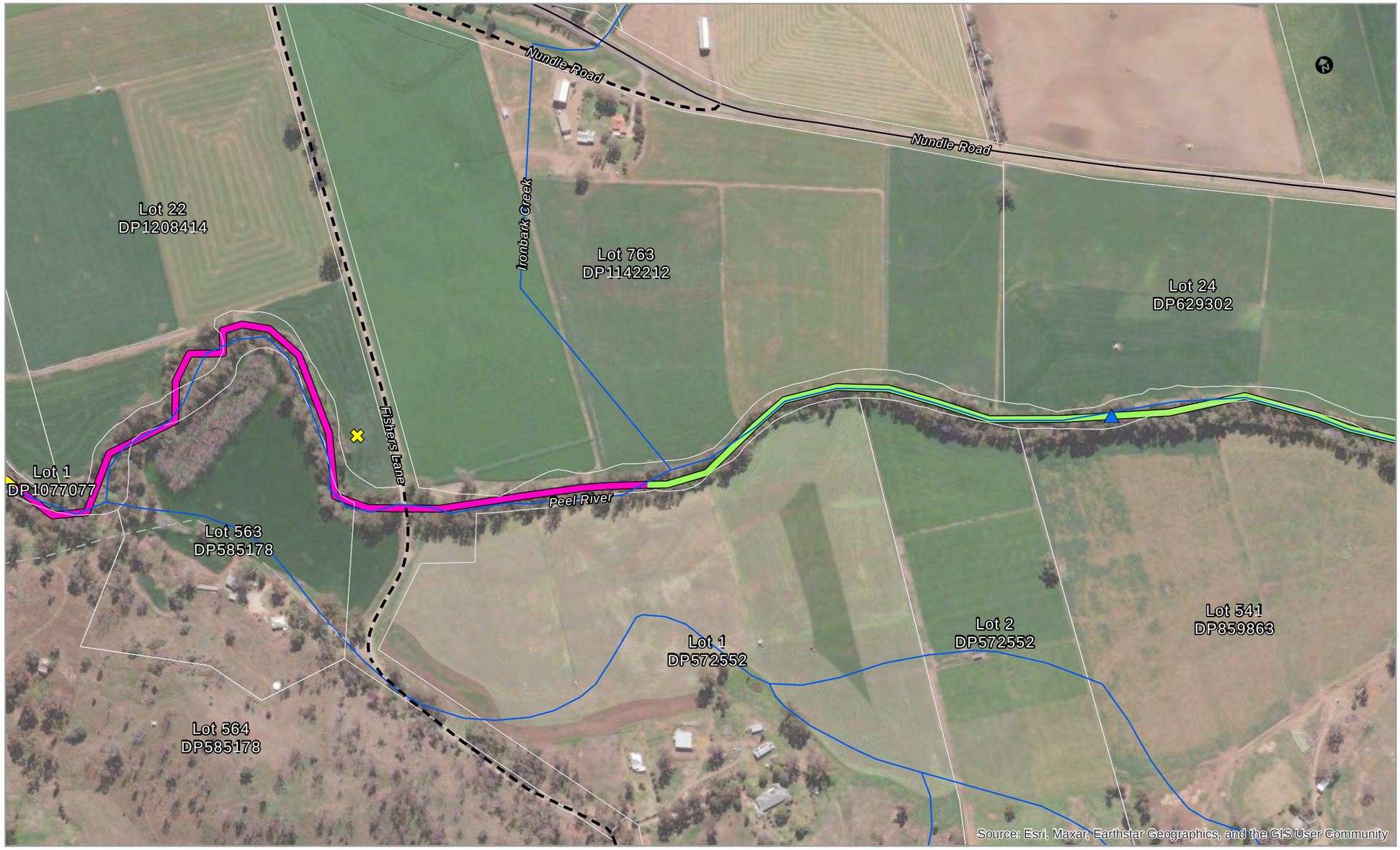
- Refuge

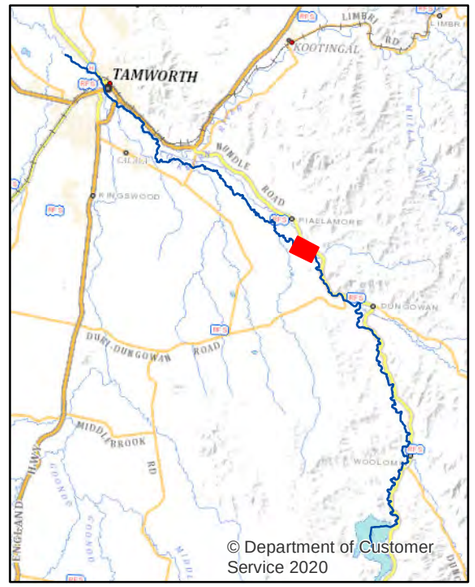
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Track-vehicular

Reach Number

- 30
- 31
- 32

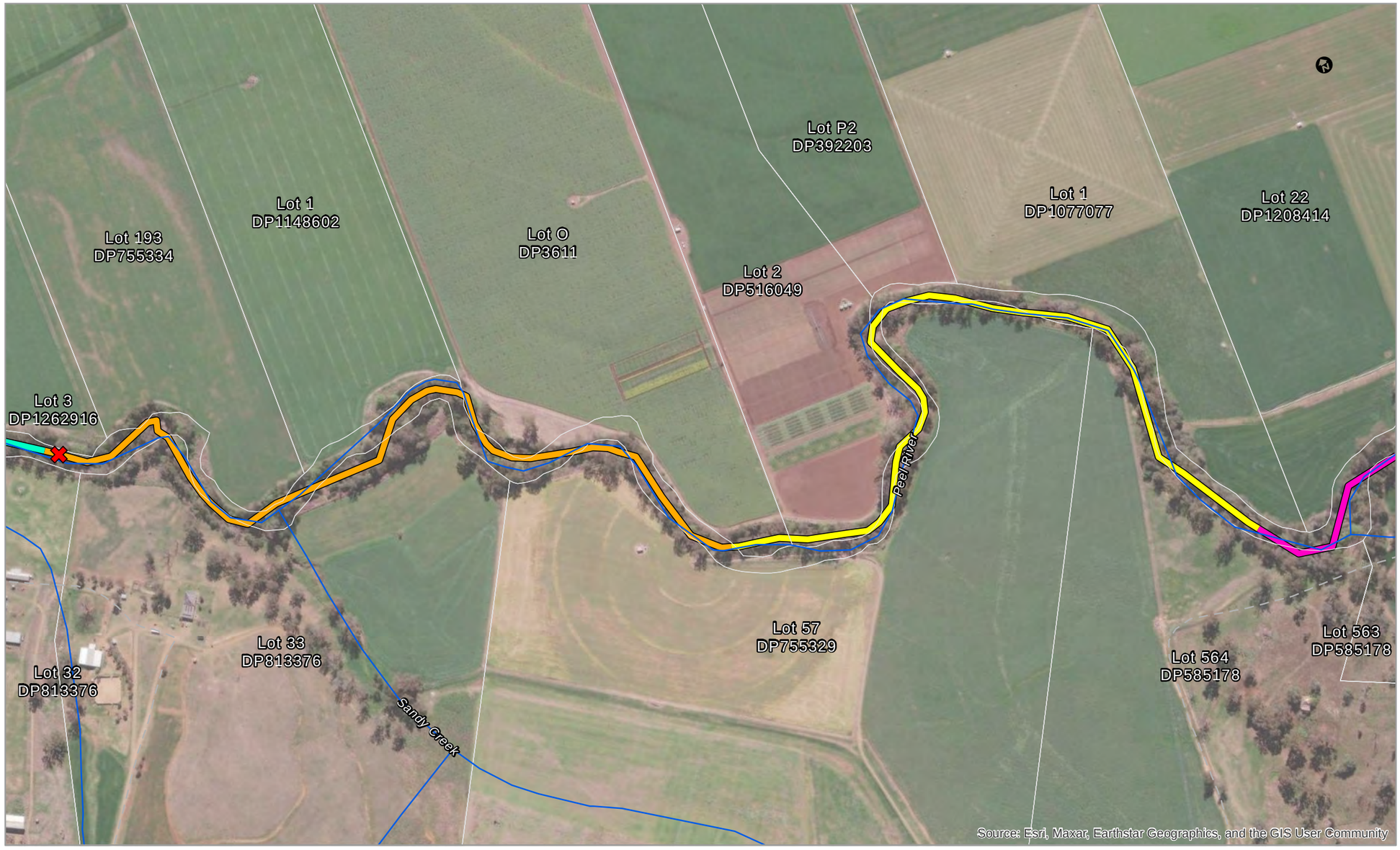
- Pumpsite
- Gauging station

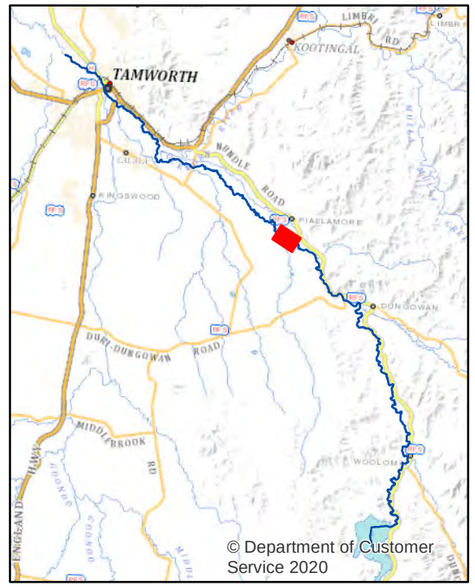
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Track-vehicular

Reach Number

- 31
- 32
- 33
- 34

- Erosion

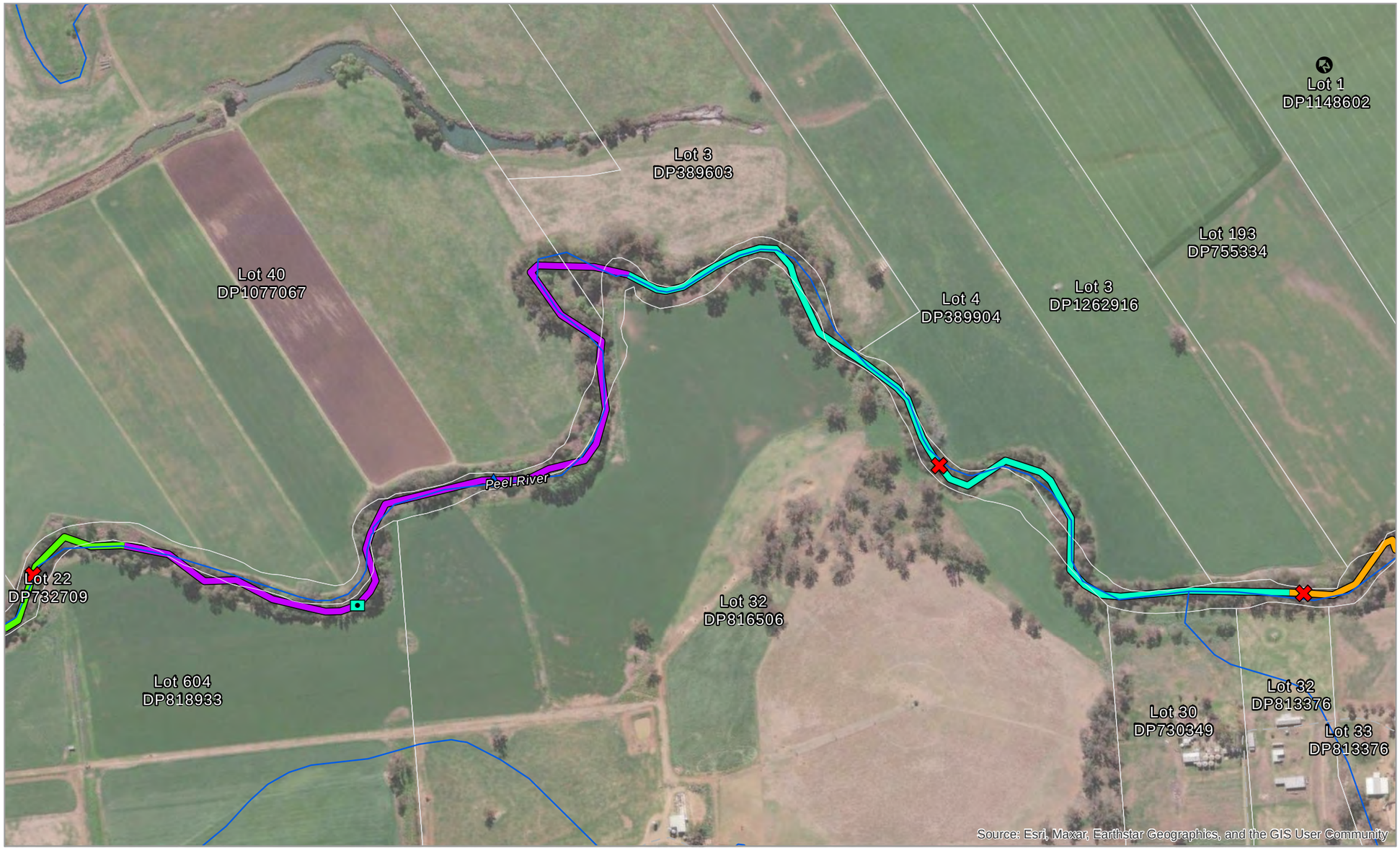
0 100 Metres

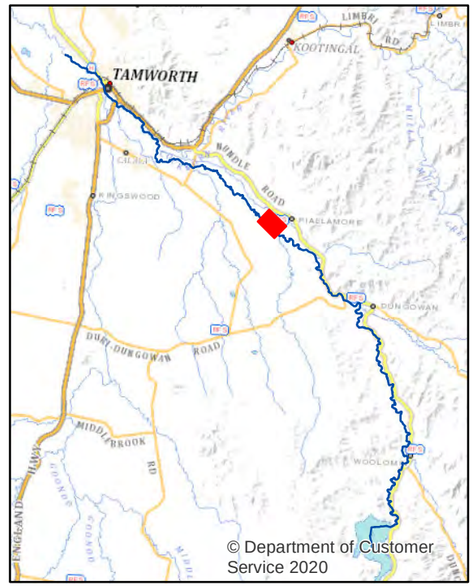
Appendix A - Reaches

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Track-vehicular

Reach Number

- 33
- 34
- 35
- 36

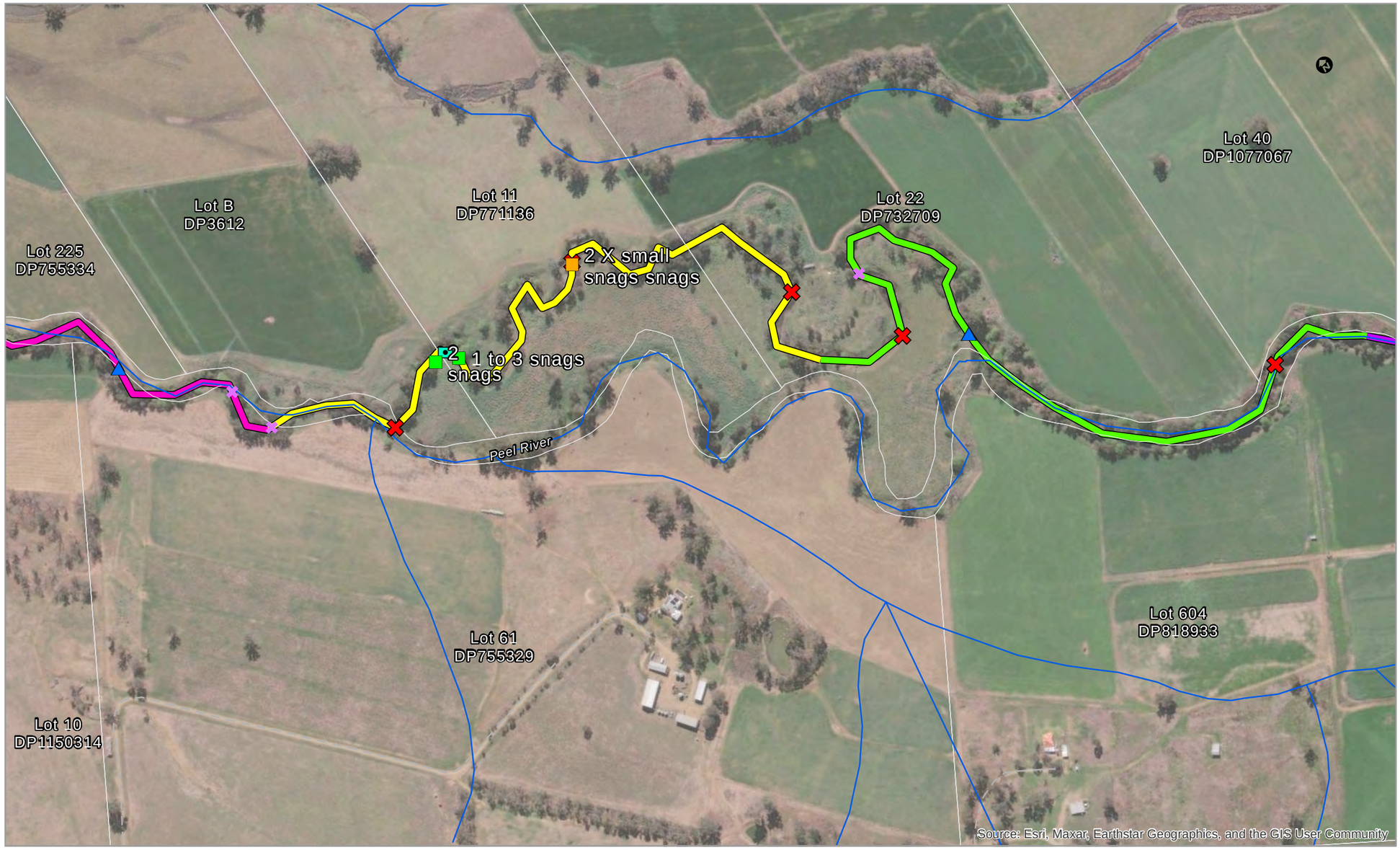
- Refuge
- Pumpsite
- Erosion

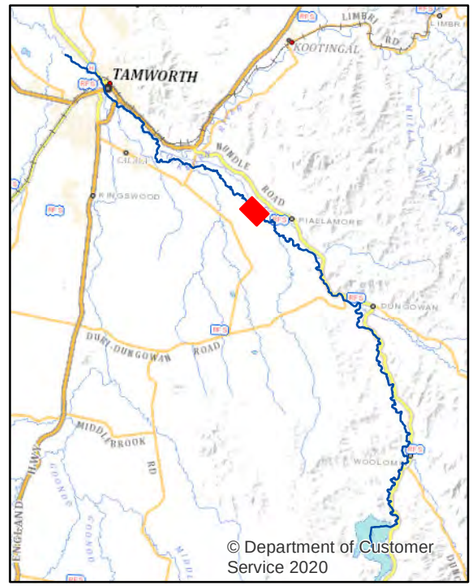
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Track-vehicular

Reach Number

- 35
- 36
- 37
- 38

Site suitability

- Suitable
- Ideal

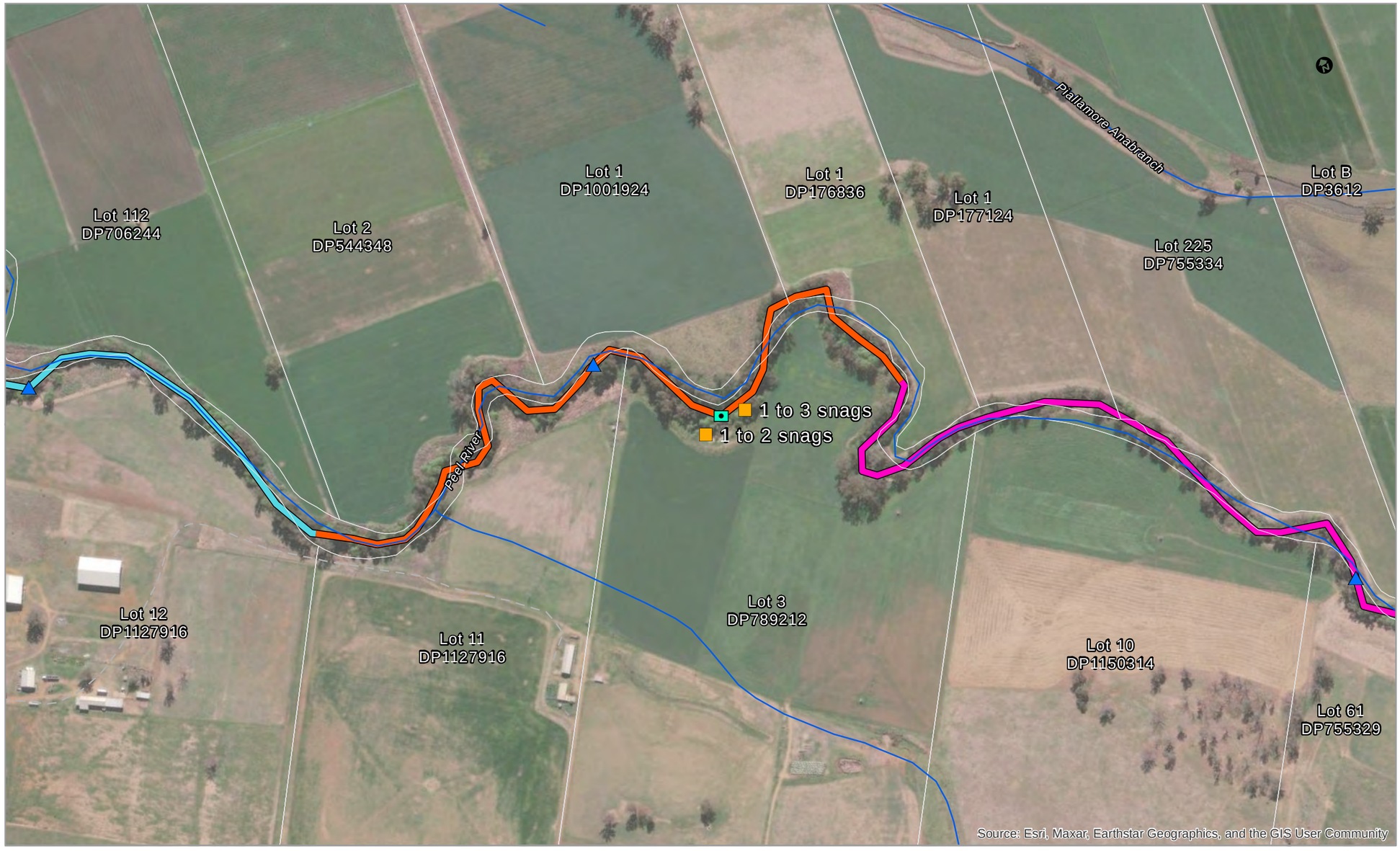
- Refuge
- Stock damage
- Pumpsite
- Erosion

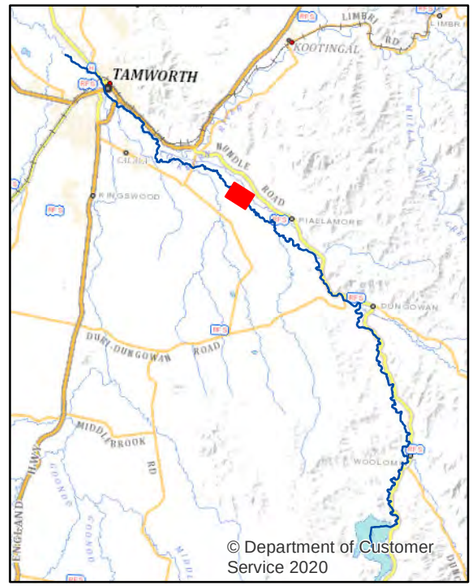
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

Cadastre
Watercourse
Track-vehicular

Reach Number
38
39
40

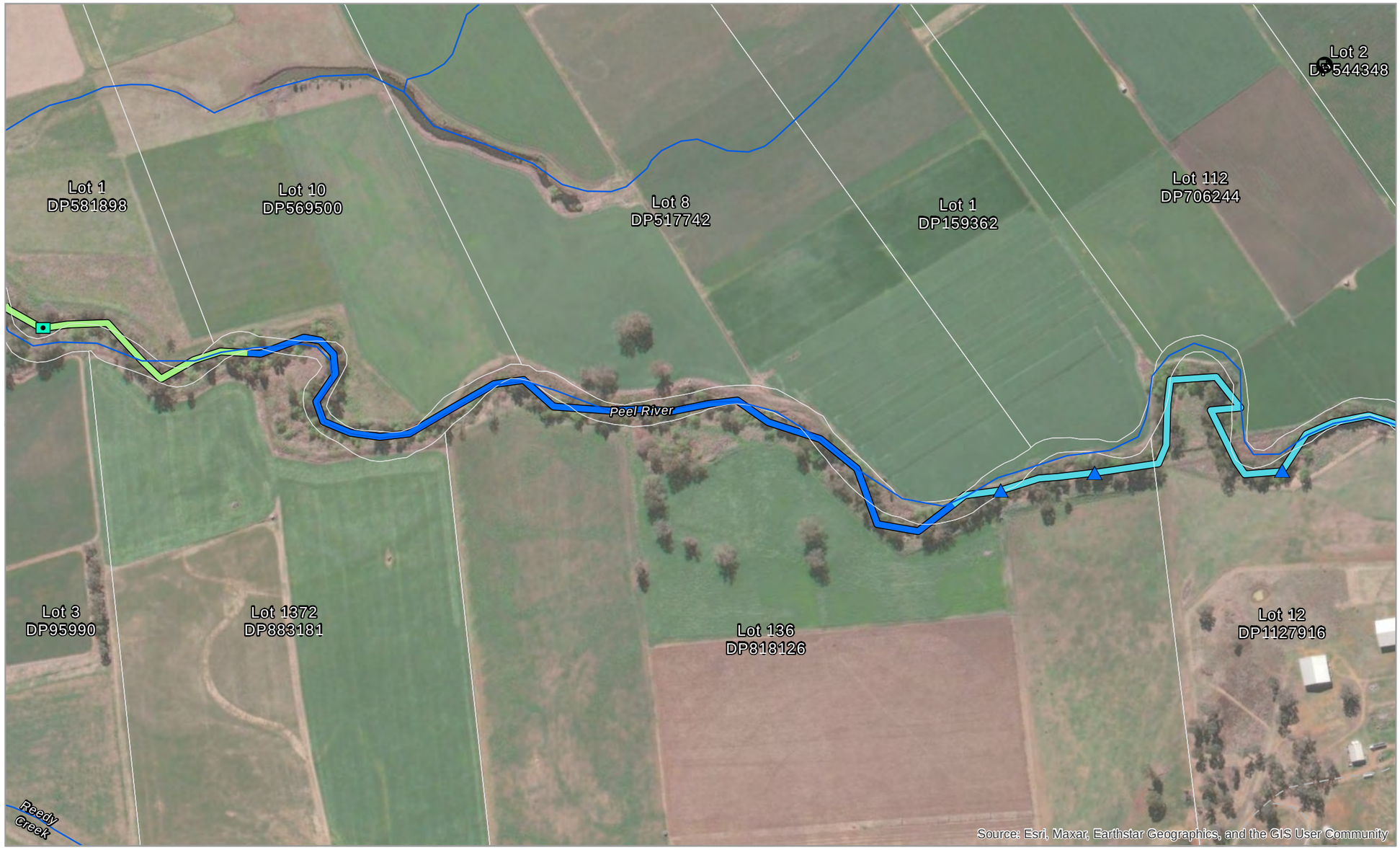
Site suitability
Suitable

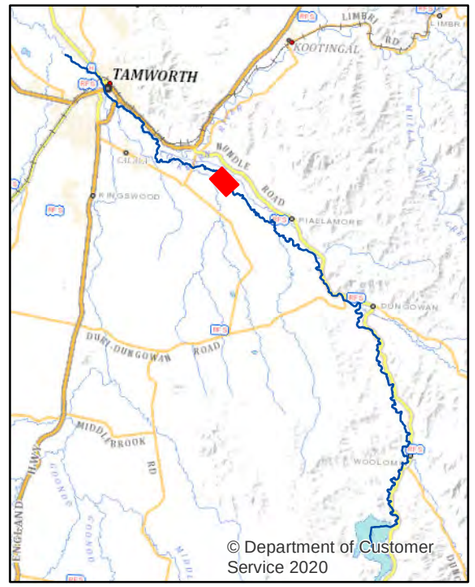
Refuge
Pumpsite

0 100 Metres

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Track-vehicular

Reach Number

- 40
- 41
- 42

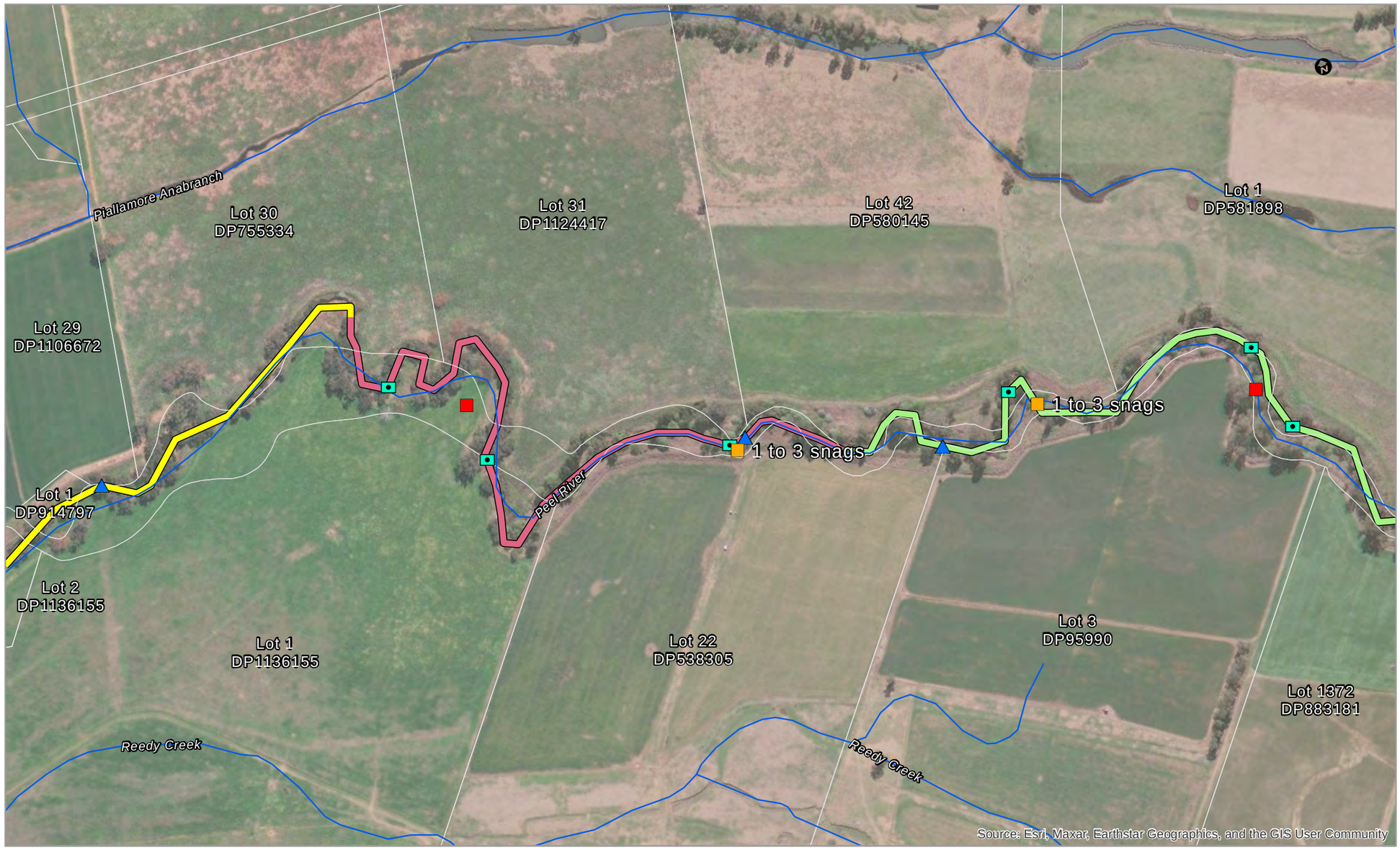
- Refuge
- Pumpsite

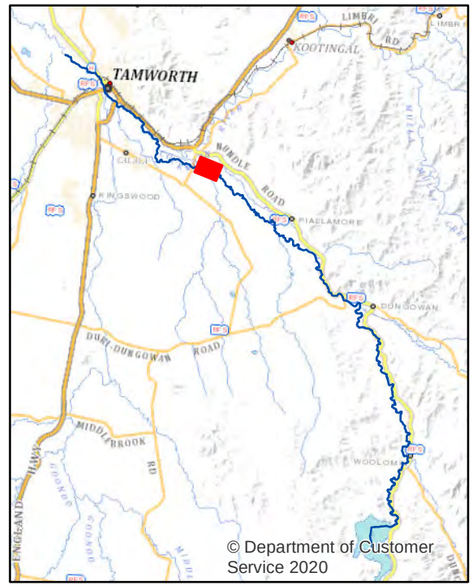
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Track-vehicular

Reach Number

- 42
- 43
- 44

Site suitability

- Not suitable
- Suitable

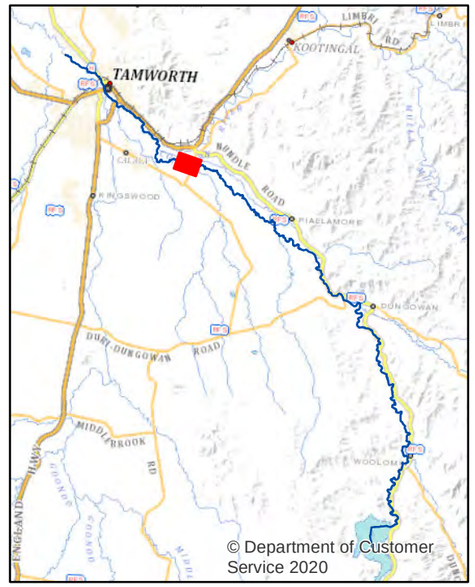
- Refuge
- Pumpsite

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Local road
- Sub arterial road
- Track-vehicular

Reach Number

- 44
- 45
- 46

Site suitability

- Suitable

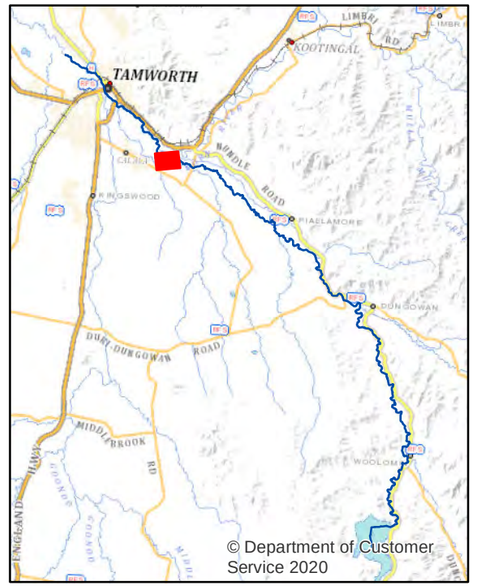
- Refuge
- Pumpsite

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Local road
- Sub arterial road
- Track-vehicular

Reach Number

- 46
- 47
- 48

Site suitability

- Suitable
- Ideal

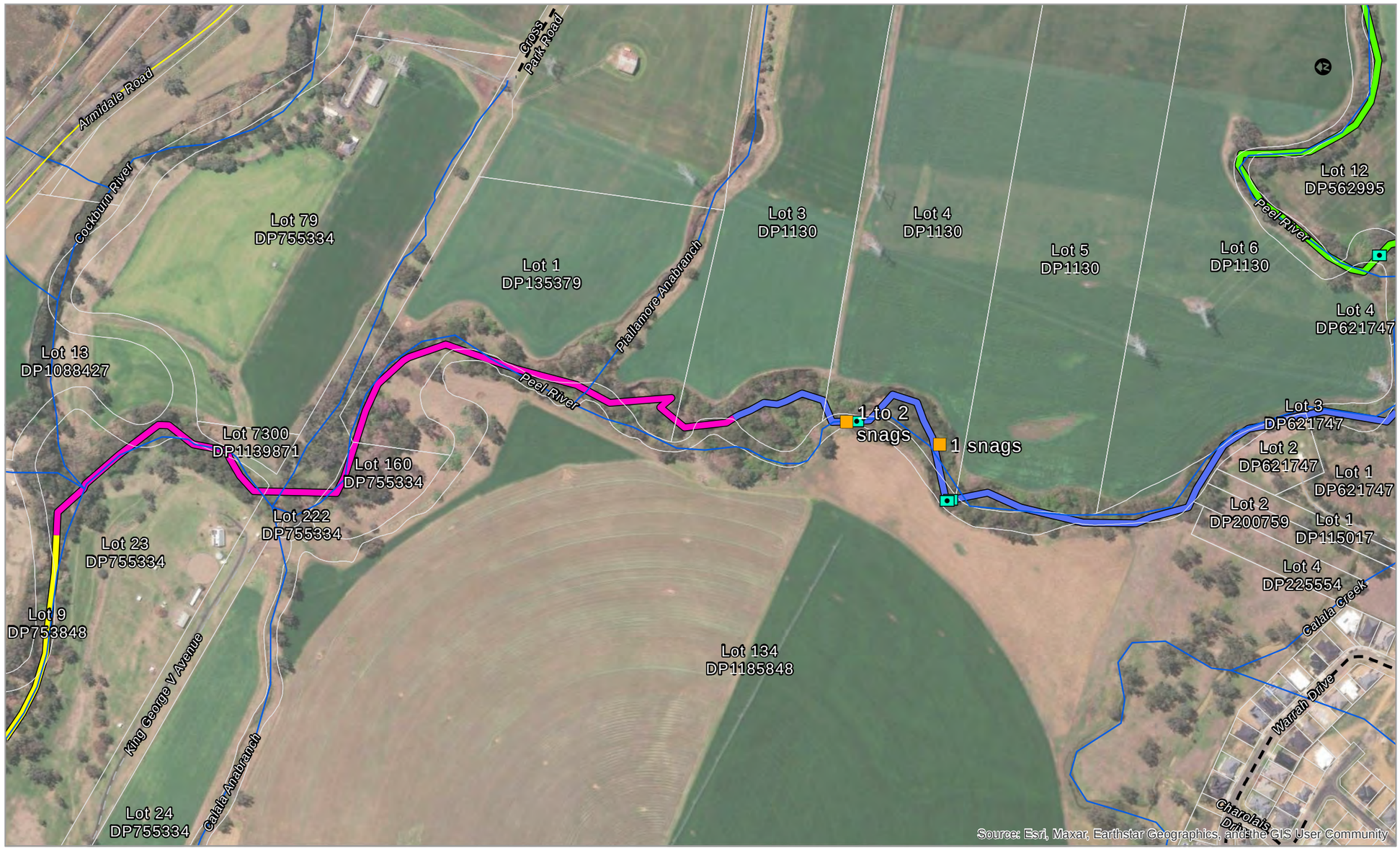
- Refuge
- Pumpsite
- Erosion
- Gauging station

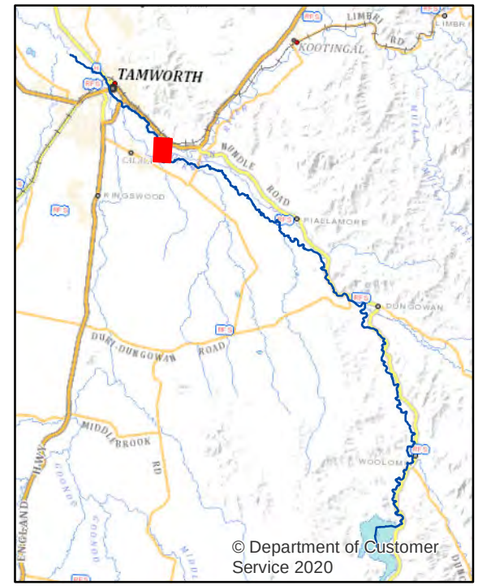
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Local road
- Primary road
- Track-vehicular

Reach Number

- 47
- 48
- 49
- 50

Site suitability

- Suitable
- Ideal

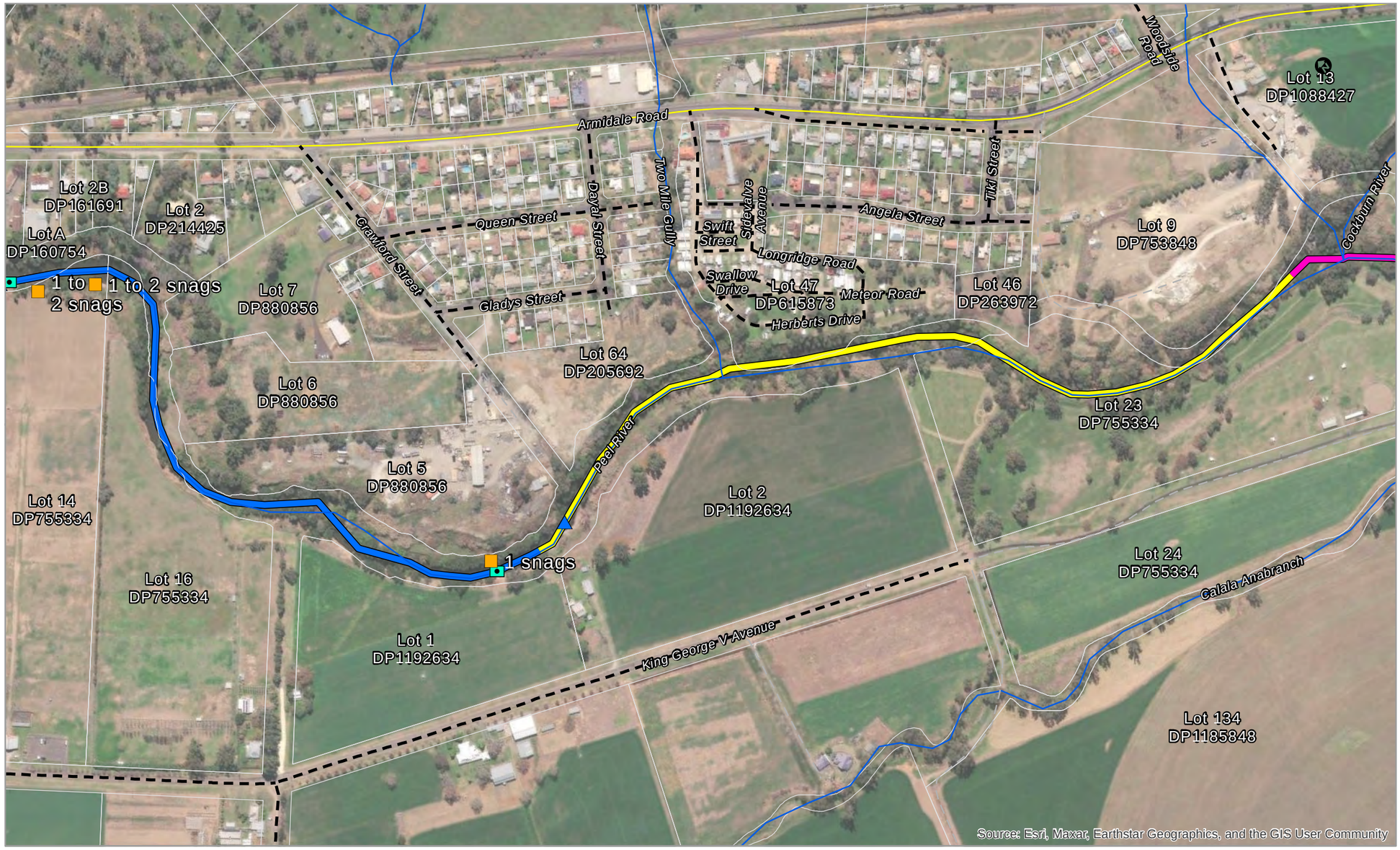
- Refuge

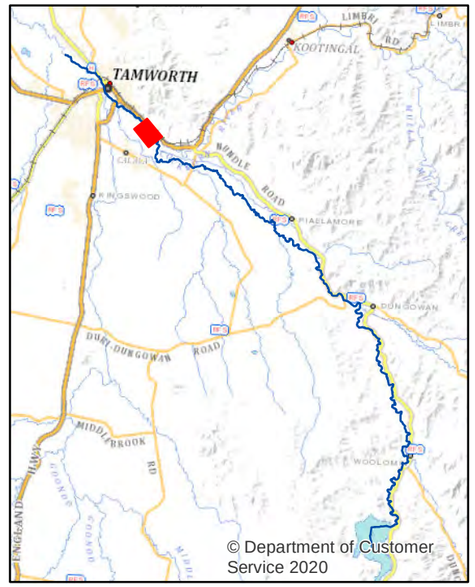
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Local road
- Primary road
- Track-vehicular

Reach Number

- 49
- 50
- 51

Site suitability

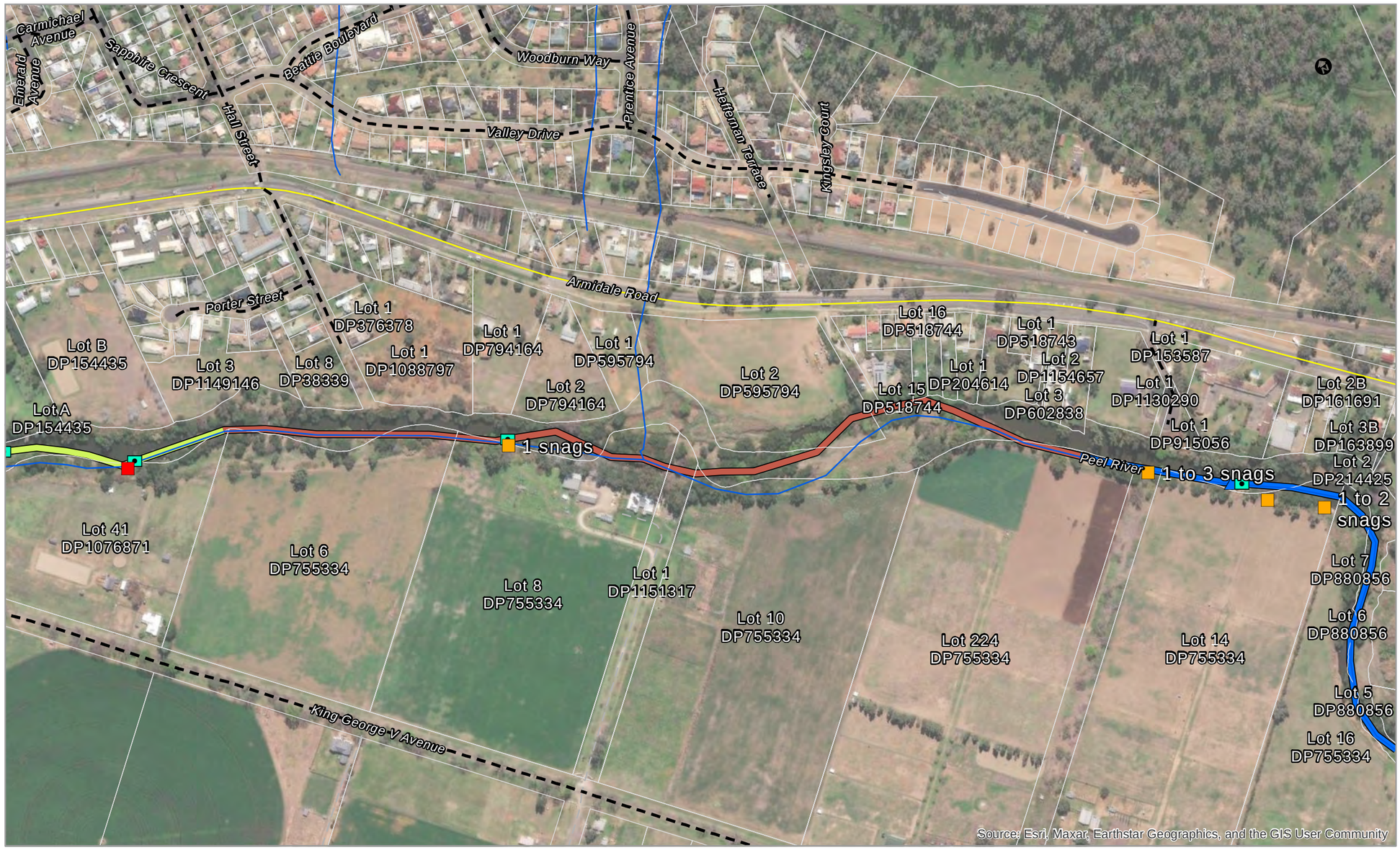
- Suitable

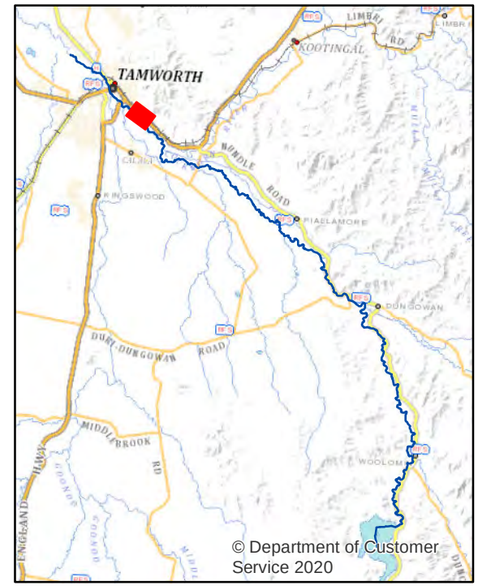
- Refuge
- Pumpsite

0 100 Metres

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Local road
- Primary road
- Track-vehicular

Reach Number

- 51
- 52
- 53

Site suitability

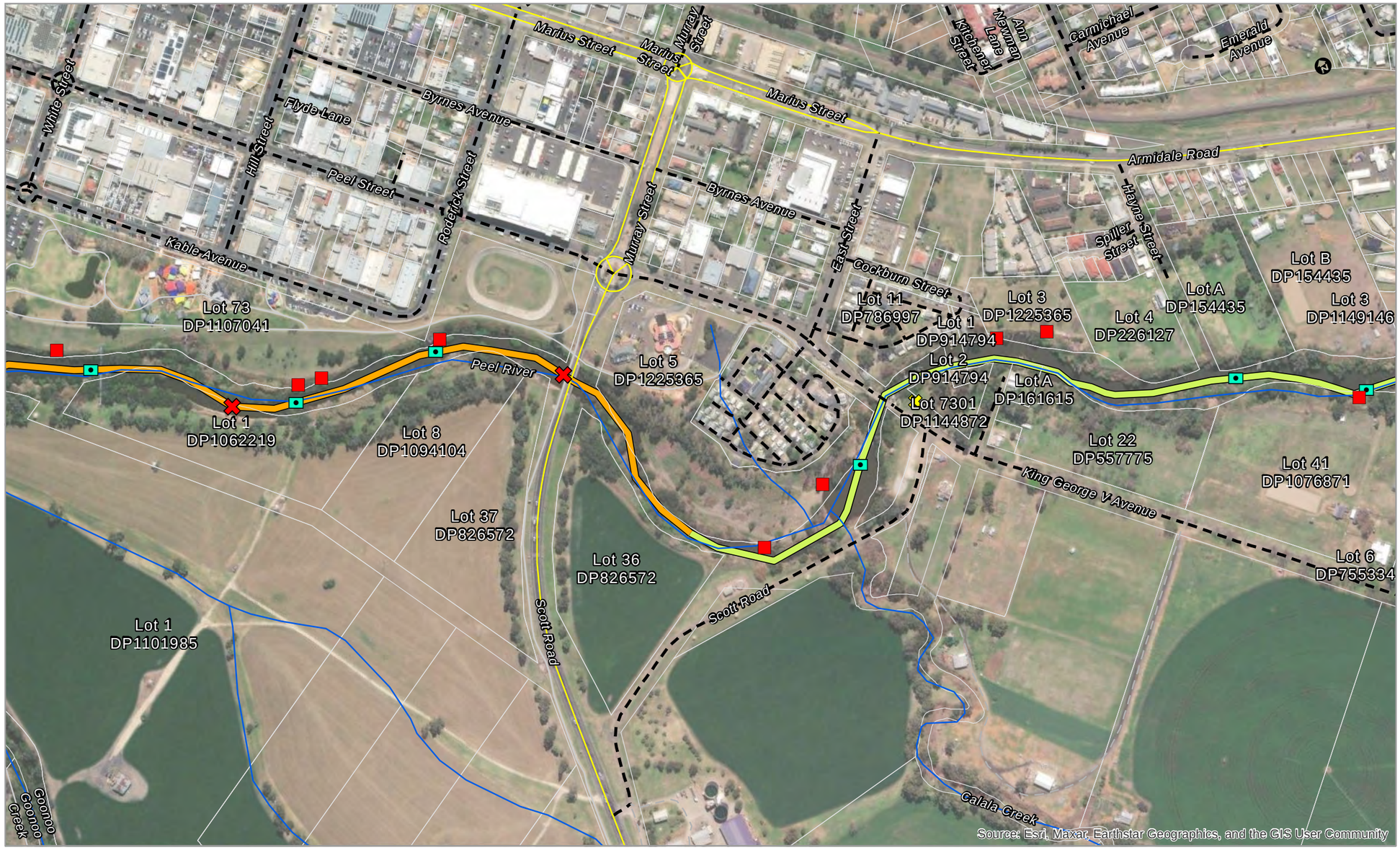
- Not suitable
- Suitable

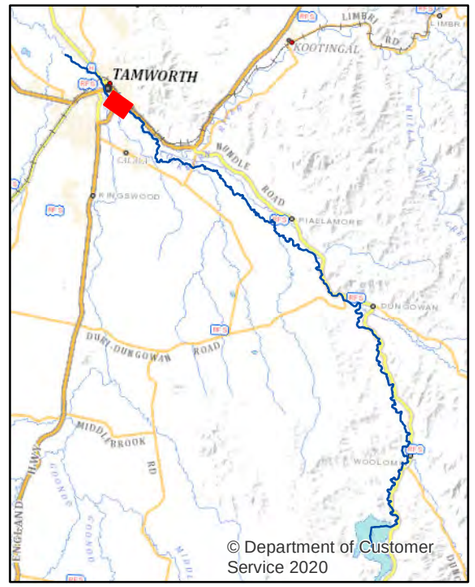
- Refuge
- Pumpsite

0 100 Metres

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Local road
- Path
- Primary road
- Track-vehicular

Reach Number

- 53
- 54

Site suitability

- Not suitable

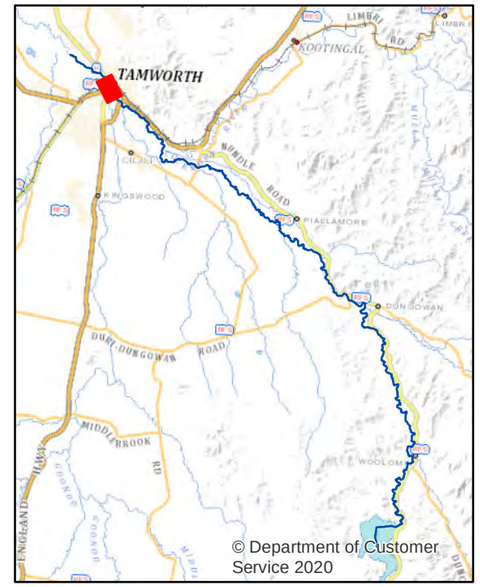
- Refuge
- Erosion
- Gauging station

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Path
- Primary road
- Track-vehicular

Reach Number

- 54
- 55
- 56

Site suitability

- Not suitable

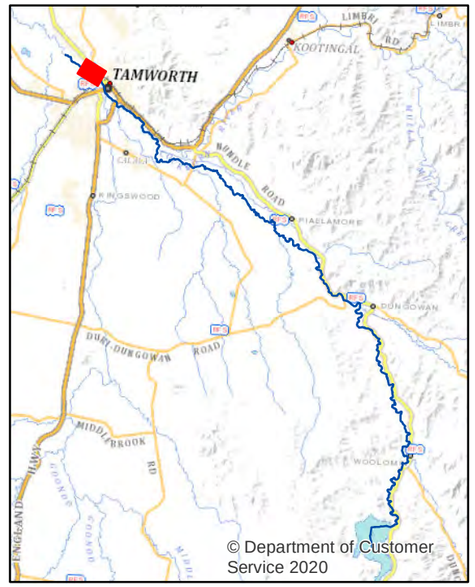
- Refuge
- Gauging station

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Arterial road
- Local road
- Path
- Sub arterial road
- Track-vehicular

Reach Number
- 56

Site suitability
- Not suitable

- Refuge

0 100 Metres

Peel River Re-snagging
4132-1010

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: AB Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022
Revision: A

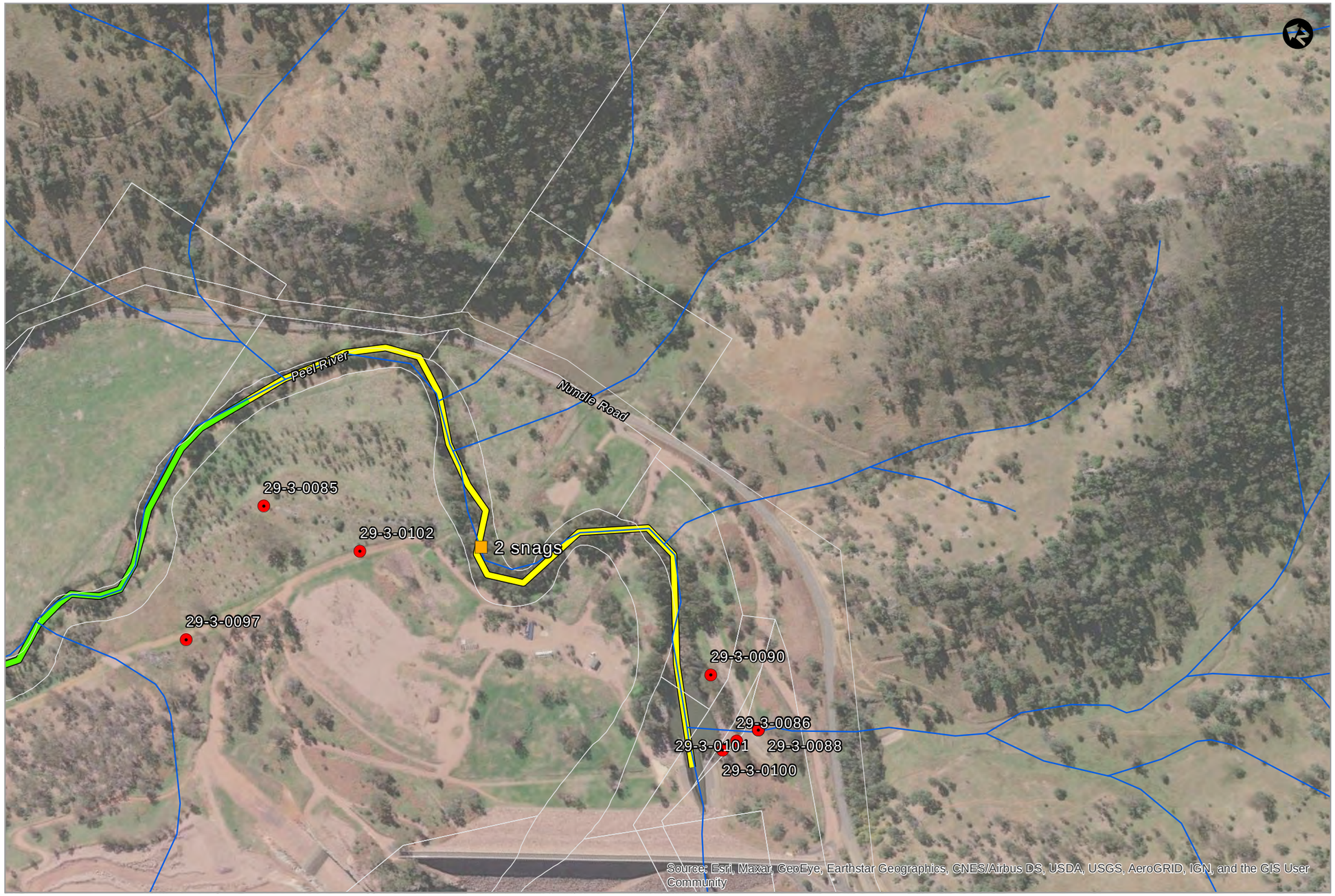
Appendix B

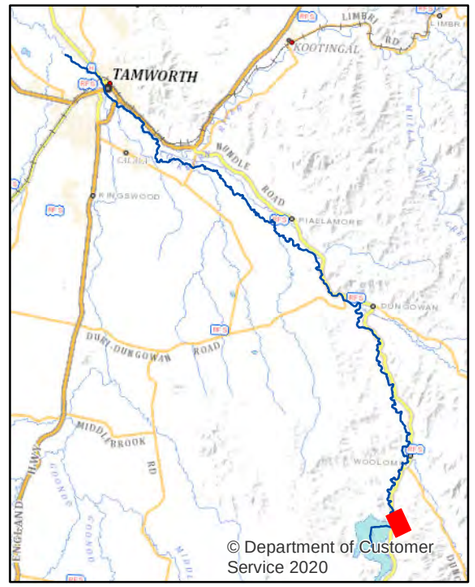
Site Inspection Summary

Available via **wetransfer link** **https://we.tl/t-pmL7lSuBS1**

Appendix C

AHIMS Sites





Map Sheet Location

LEGEND

Cadastre
Watercourse

Reach Number
1
2

Site suitability
Suitable

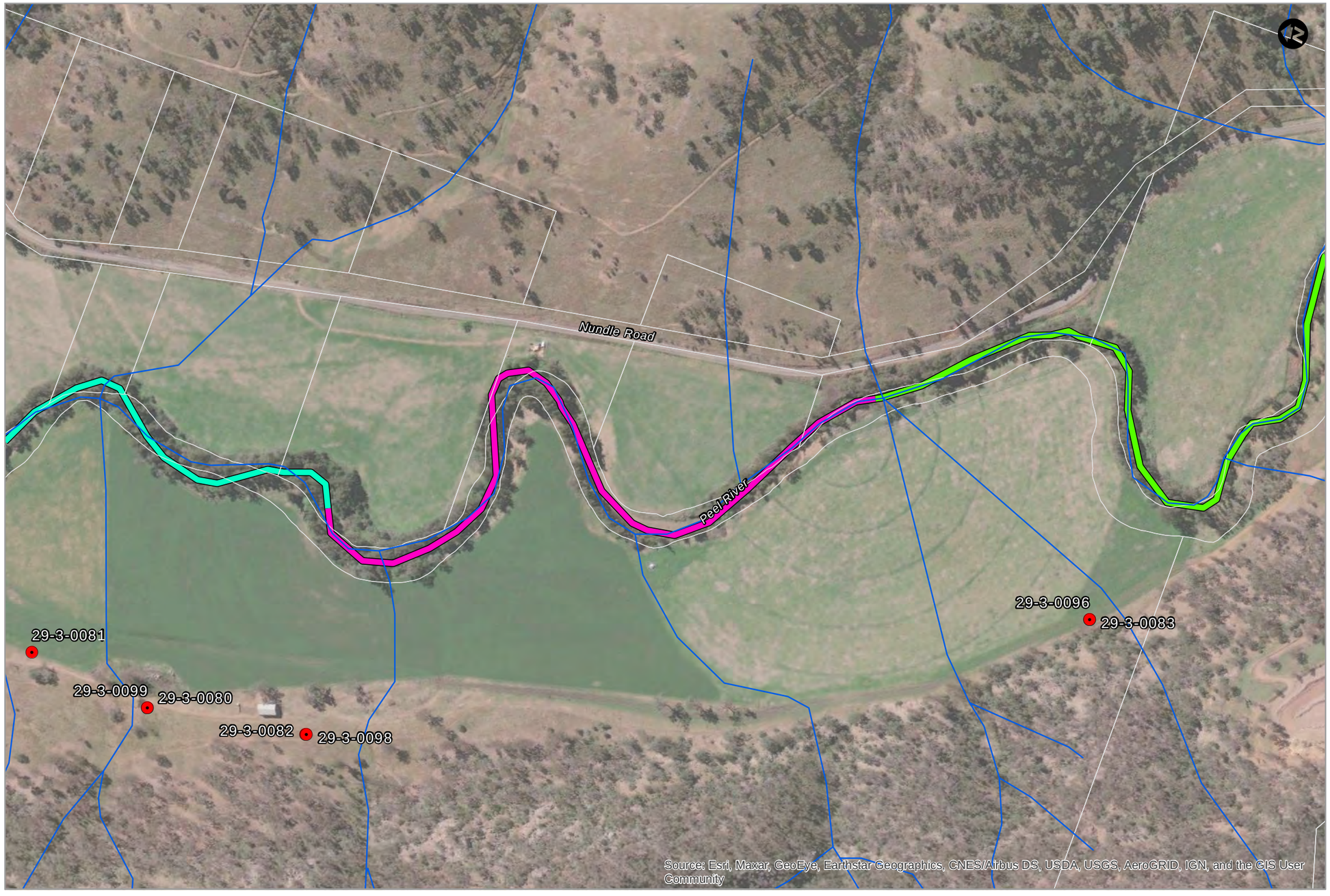
AHIMS record

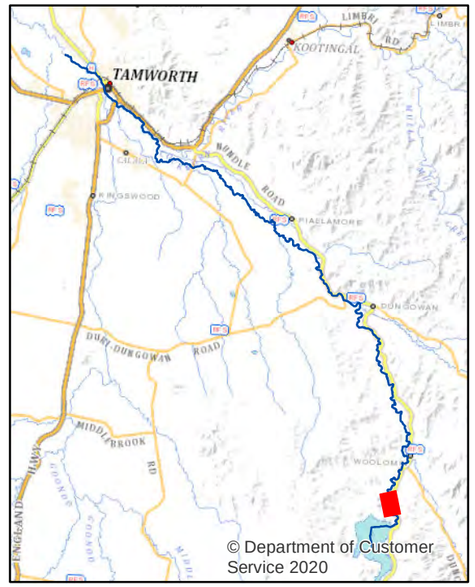
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1008

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 28/04/2022





Map Sheet Location

LEGEND

Cadastre
Watercourse

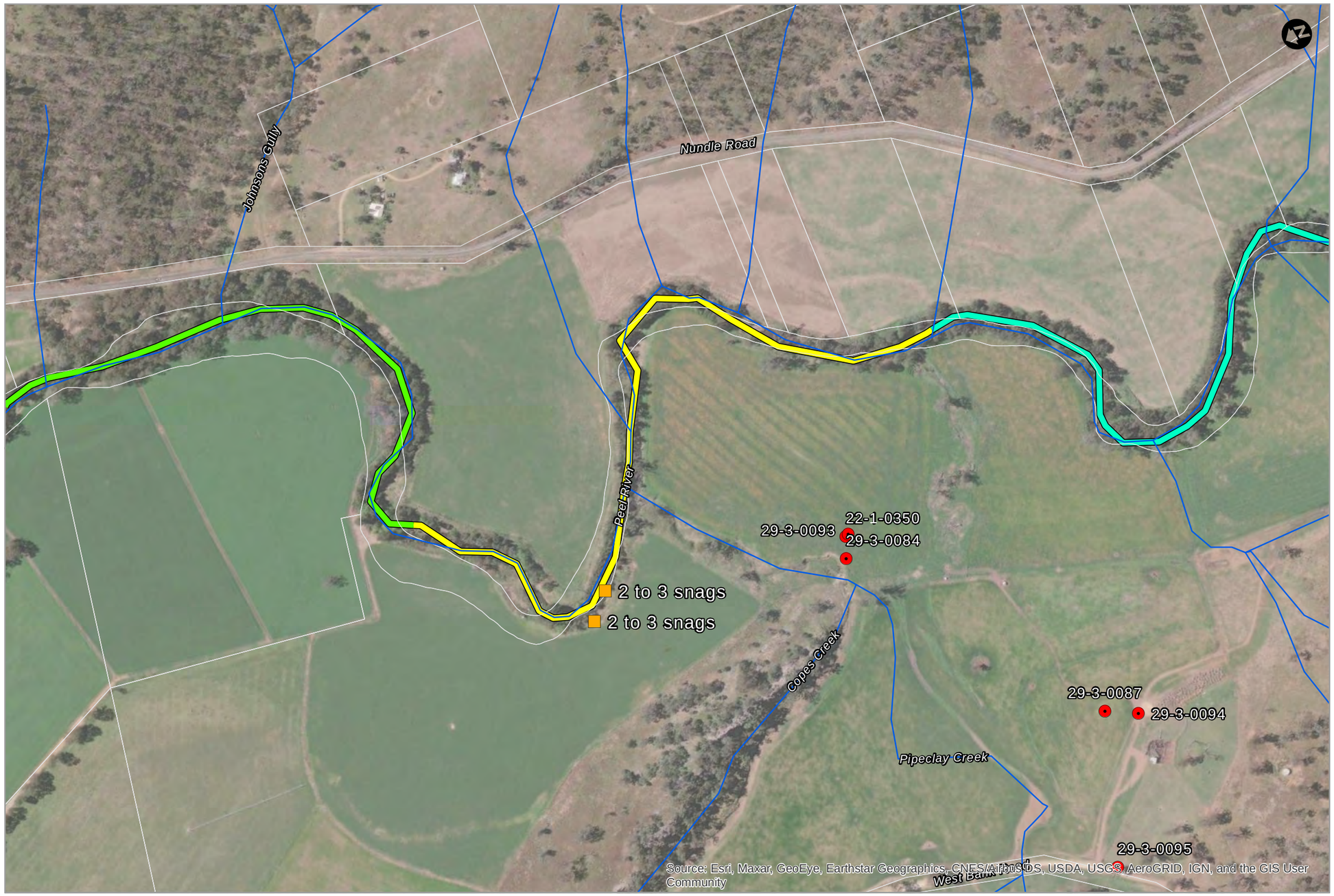
Reach Number
2
3
4

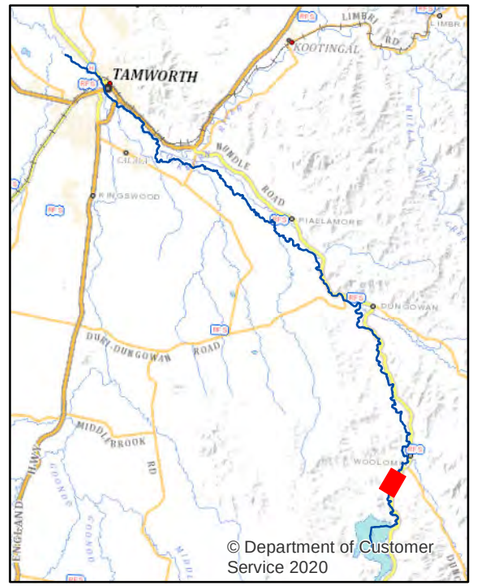
AHIMS record

0 100 Metres

Peel River Re-snagging
4132-1008

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 28/04/2022





Map Sheet Location

LEGEND

Cadastre
Watercourse

Reach Number
4
5
6

Site suitability
Suitable

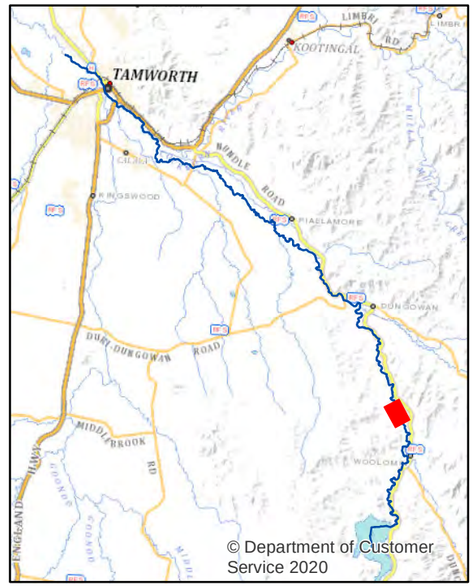
AHIMS record

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1008

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 28/04/2022



Map Sheet Location

LEGEND

Cadastre
Watercourse

Reach Number
11
12
13
14

Site suitability
Not suitable

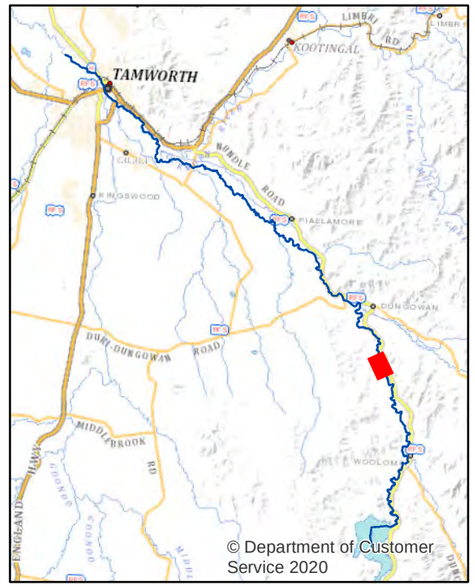
AHIMS record

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1008

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 28/04/2022



Map Sheet Location

LEGEND

Cadastre
Watercourse

Reach Number
16
17
18

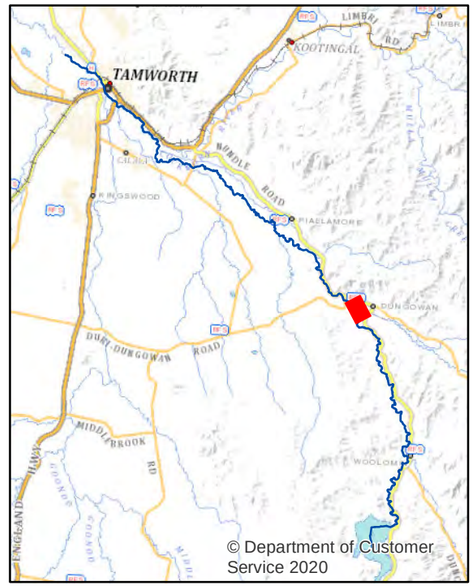
Site suitability
Suitable

AHIMS record

0 100 Metres

Peel River Re-snagging
4132-1008

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 28/04/2022



Map Sheet Location

LEGEND

Cadastre
Watercourse

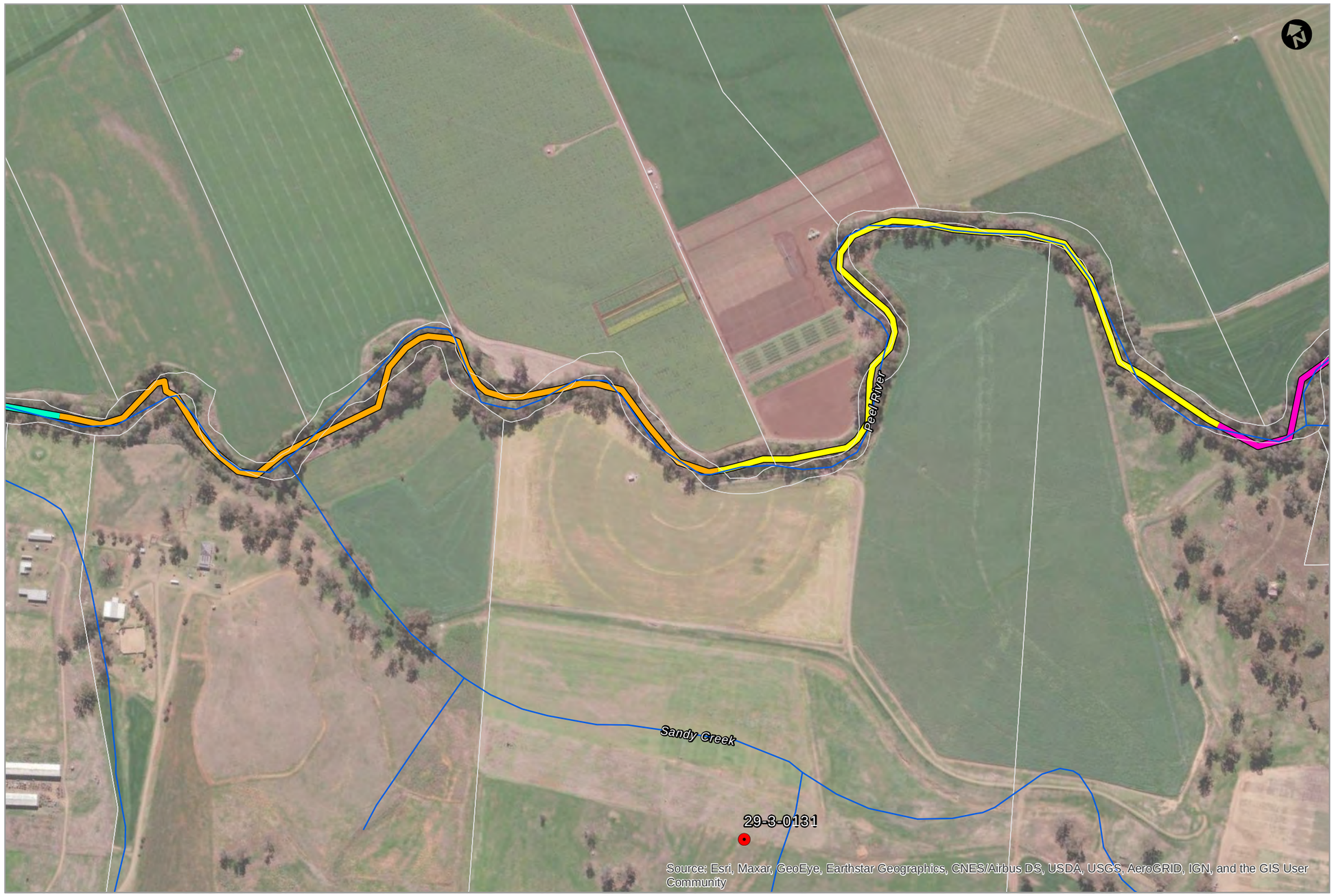
Reach Number
22
23
24
25

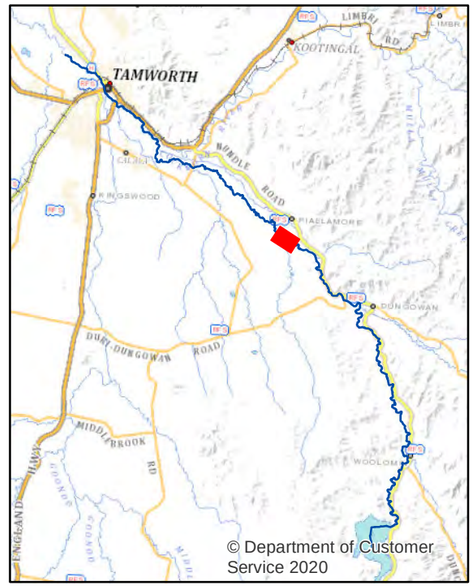
AHIMS record

0 100 Metres

Peel River Re-snagging
4132-1008

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 28/04/2022





Map Sheet Location

LEGEND

Cadastre
Watercourse

Reach Number
31
32
33
34

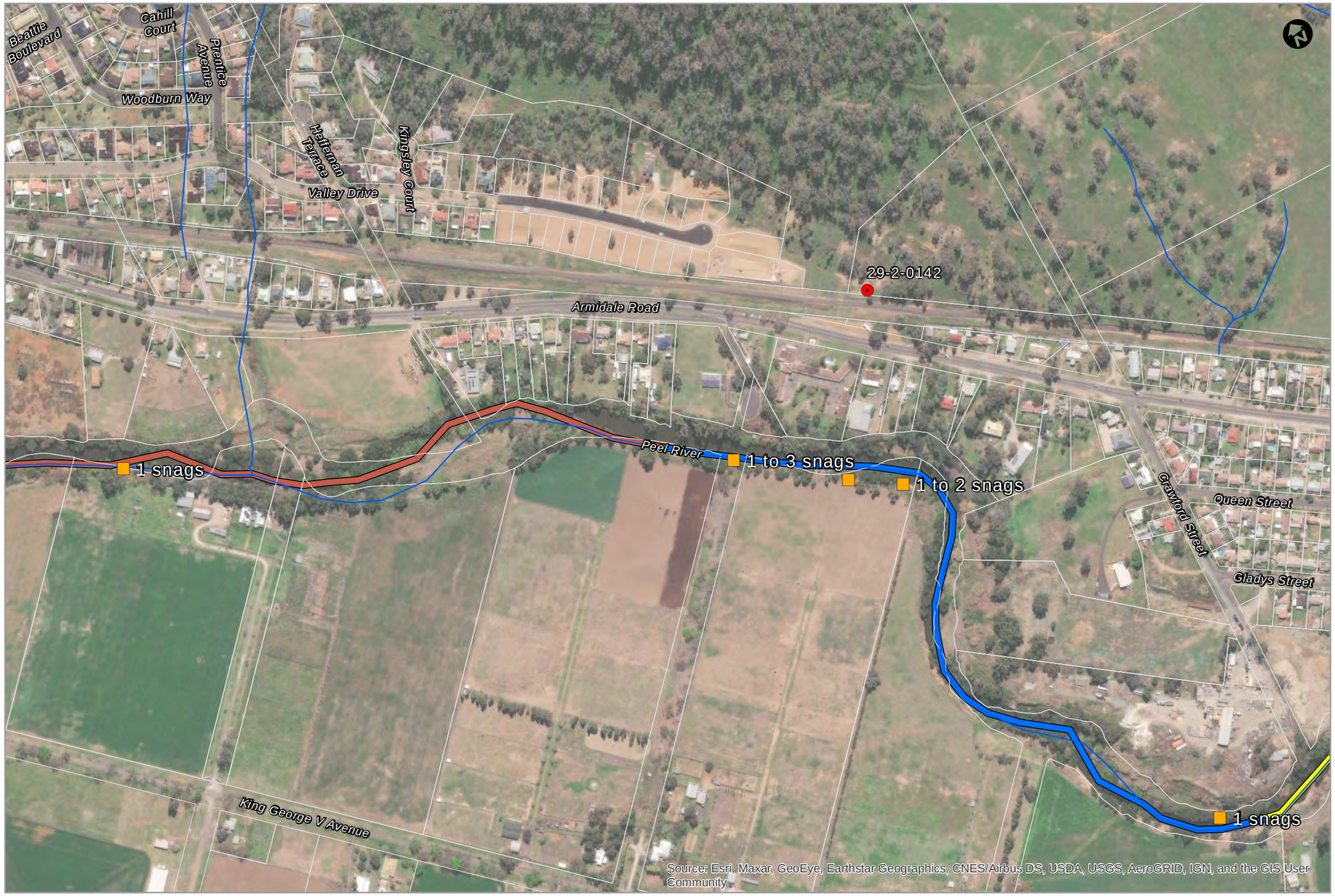
AHIMS record

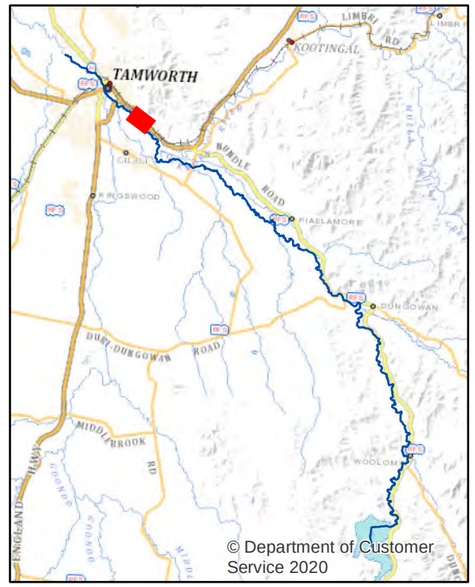
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1008

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 28/04/2022





Map Sheet Location

LEGEND

Cadastre
Watercourse

Reach Number
50
51
52

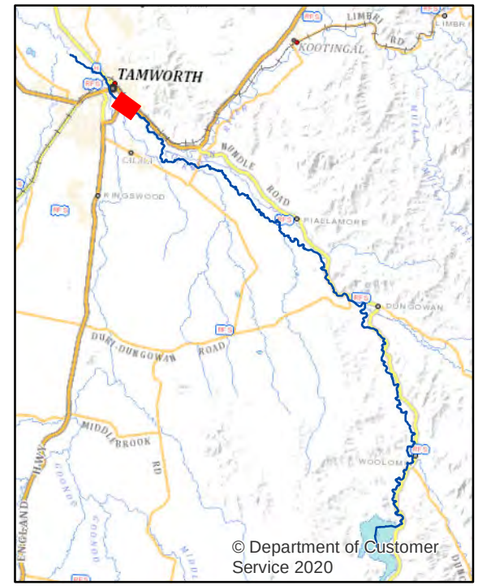
Site suitability
Suitable

AHIMS record

0 100 Metres

Peel River Re-snagging
4132-1008

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 28/04/2022



Map Sheet Location

LEGEND

Cadastre
Watercourse

Reach Number
52
53
54

Site suitability
Suitable
Ideal

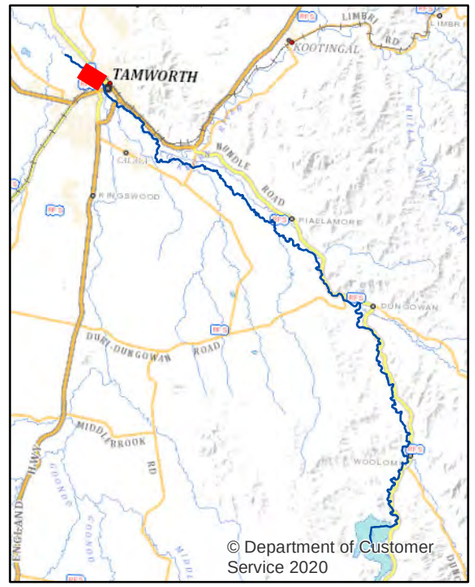
AHIMS record

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1008

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 28/04/2022



Map Sheet Location

LEGEND

Cadastre
Watercourse

Reach Number	Site suitability	
55	Suitable	AHIMS record
56	Ideal	

0 100 Metres

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 28/04/2022

Appendix D

Site Management Plan

Site Management Plans

Re-snagging Peel River - Chaffey Dam to Tamworth

Quality solutions. Sustainable future.

GeoLINK
environment | engineering | planning | design

GeoLINK Consulting Pty Ltd

PO Box 119
Lennox Head NSW 2478
T 02 6687 7666

PO Box 1446
Coffs Harbour NSW 2450
T 02 6651 7666

PO Box 1267
Armidale NSW 2350
T 02 6772 0454

PO Box 229
Lismore NSW 2480
T 02 6621 6677

info@geolink.net.au

Prepared for: WaterNSW

This document is in draft form. The contents, including any opinions, conclusions or recommendations contained in, or which may be implied from, this draft document must not be relied upon. GeoLINK reserves the right, at any time, without notice, to modify or retract any part or all of the draft document. To the maximum extent permitted by law, GeoLINK disclaims any responsibility or liability arising from or in connection with this draft document.

Certification
Delete if unnecessary

	Name	Signature	Date
Prepared by	David Howley		16/05/2022
Reviewed by			

UPR	Description	Issued By	Date Issued
4132-1014	Draft – First Issue	David Howley	31/05/2022

Table of Contents

1.2 Site Management Plan

This Site Management Plan (SMP) is a generic document to guide the implementation phase of the re-snagging of the Peel River between Chaffey Dam and Tamworth. It provides possible risks associated with the implementation of the project and possible mitigation measures for risk associated with safety, environment and quality. It is a guidance document that does not negate the need for site specific SWMS, EWMS and ITP's.

1.3 Key Work Health and Safety Risks and Controls

These are key work, health and safety risks and controls for this site. An overarching Safety Management Plan (SMP) will be developed along with site specific Safe Work Methods Statements. These are to be provided to and approved by the WaterNSW representative prior to commencing works.

1.3.1 Site access

The location for site access are shown on the Site Specific Management Plans refer to **Appendix E**.

1.3.2 Traffic and Transport

Speed limits will be obeyed as signed along public roads. Speeds along access tracks will not exceed 40km/h. Speed limits may be subject to change in active work areas. A traffic control plan will be prepared for all site works.

1.3.3 Working with Heavy Machinery

Standard safety equipment is required on all heavy machinery such as movement beepers, flashing lights, safety rails, cut-off switches and roll over protection. General considerations such as loading and unloading plant and equipment, working around trees, powerlines on steep and unstable ground all need to be considered and managed. SWMS's are to be provided for general heavy machinery operation.

1.3.4 Working Near and in Water

Working near the river will involve steep and unstable land. Riverbeds can be very unstable due to submerged logs that can collapse with machine weight and have potential to topple machines. A specific SWMS is to be provided for work near and within water. Machines are to have multiple egress locations out of a cab and a glass hammer is to be installed within machines as a minimum.

1.3.5 Working with Timber and Cabling

Lifting carrying and placing timber will have a number of safety risks that need to be controlled and managed. Using certified lifting devices and equipment and controlling the lifted object will be paramount. Cutting timber to suit requirements will also have to occur and again will require particular attention. People using chainsaws will have to demonstrate competency training. Working with metal cables, cutting and tying, will occur and has its associated safety risks. A specific SWMS will need to be provided to manage the risks associate with timber and metal cabling.

1.4 Key Environmental Risks and Controls

These are key environmental risks and controls for this site. An overarching Environmental Management Plan (EMP) will be developed along with site specific Environmental Work Methods. These are to be provided to and approved by the WaterNSW representative prior to commencing works.

1.4.1 Waste

All waste is to be removed from site and deposited in the appropriate bins provided at waste management facilities. There is no disposal onsite and burning of rubbish is not allowed. All work areas are to be kept tidy and free of litter each day. Waste includes large timber debris that may fall off logs or that were cut off logs or pins.

1.4.2 Potential Contamination and/or Spills

Ensure spill kits are in all vehicles and in Supervisor work vehicle. If a spill occurs or site contamination issues arise, follow the procedure for spills in the EMP and contact the WaterNSW representative. No refuelling to take place within 50m of a waterway.

1.4.3 Air Quality and Dust Management

The reduction of speed as vehicles enter property's, and travel to the river will be the main method that dust will be managed across sites. Vehicle movements are not anticipated to be high, thus dust generation will be infrequent. If landholders have concerns, then other controls may need to be implemented.

1.4.4 Flora and Fauna

The works will require working alongside native vegetation. Some vegetation may need to be trimmed or removed. Site specific plans show any vegetation and/or fauna specific requirements, refer to **Appendix A**. Specific areas to be protected are labelled 'no go zone' on each site plan.

1.4.5 Noxious Weed Species

All vehicles and plant should be cleaned and have a current weed and seed declaration or certificate prior to mobilising to site to prevent the spread of weeds. All plant and equipment used will be dry cleaned using shovels, and brooms, to remove soil/ mud off the plant and equipment prior to the plant and equipment leaving the area. Ensure weed and seed declarations are current and in each vehicle.

1.4.6 Waterways

Disturbance of the river bank and bed are likely to occur. Soil erosion and sediment control will be installed as per 1.1.2.7 as required. General methods of minimising vegetation disturbance will be enlisted and limiting movements of machines and vehicles that further disturb the ground. It is not anticipated sediment booms will be required. ESC measures are to be installed at the end of a day and prior to rain. The bed and banks of the river are to be reinstated as close to the profiles they had prior, to works occurring. Biodegradable erosion and sediment control measures may be used as a final remediation along with native vegetation plantings.

Topsoil and felled vegetation will be stockpiled a minimum of 20m from the waterway.

1.4.7 Soil and Water

Soil erosion and sedimentation will be managed via an erosion and sediment control plan as part of the EMP. Erosion and Sediment Controls that may be used in this site include (Refer to Appendix B Typical ESC Measures):

- Coir logs FR-01;
- Jute matting SD 5-2
- Sediment fence SD 6-8;
- Diversion berms SD 5-5.
- Stockpiles SD 4-1

1.4.8 Cultural Heritage

Cultural heritage sites form part of the 'no go zone' identified on each site plan. These sites are to be cordoned off and worked around if they are close to a work site. If there is an unexpected find during works, work will cease immediately, and an unexpected finds procedure will be implemented. This will be contained within EMP and kept onsite.

1.5 Key Quality Risks and Controls

These are key quality risks and controls for this site. An overarching Quality Management Plan (QMP) will be developed along with site specific Inspection Test Plans. These are to be provided to and approved by the WaterNSW representative prior to commencing works.

1.5.1 Stakeholder Management

Site is confirmed with the client and written landholder approval has been obtained.

1.5.2 Photo records

Photos to be taken pre, during and after the following:

- infrastructure to be disturbed or crossed (access tracks, fences, pipes etc).
- access down to river.
- works within river.

1.5.3 Log and Pin Quality/Sizing

Logs will be provided by WaterNSW. The contractor is to transport logs to site from the nominated stockpile area. A WaterNSW representative will select the logs for each site. Generally, logs will have a diameter of 0.5m to 1.2m and be a minimum 2.5m long including a root ball mass. Pins are to be installed around each log, a minimum of 4 pins per log. These are to be driven into the bed of the river with a grab or bucket. they will be driven in at alternating angles and sides of the log so as to secure the logs to the bed of the river. It is anticipated that a hammer will not be required. The pins are generally 150 to 250mm in diameter and 3 to 4m metres long, any excess will be cut off. These will be sourced from the stockpile area or from other sources as required.

1.5.4 Snag Number and Positioning

The snag number, positioning and orientation will be confirmed by a WaterNSW representative before commencement and after completion. Generally, logs will be positioned such that the root ball is against the bank at an angle of 20 to 45 degrees downstream. They will be located within pool reaches of the river. If multiple logs are to be combined to create one log complex then they may need to be wrapped tight into a bundle with a minimum 10mm galvanised wire rope to form a firm mass.

Logs will be positioned as far away from infrastructure such as pump or gauging sites. Particular attention will be paid to these snag locations and their securing will be highlighted.

1.5.5 Snag pinning and wrapping

The snag pinning and wrapping will be confirmed by a WaterNSW representative before commencement and after completion.

1.5.6 Site Remediation

Site remediation works will be determined by a WaterNSW representative before commencement and after completion. An aspect to this is that the landowner/manager is satisfied with the remediation works that have occurred on their land. Demobilisation cannot occur until all parties are satisfied with the works and the remediation efforts.

1.5.7 Monitoring

Site monitoring will principally be undertaken by WaterNSW. Photographic records are to be taken and provided to WaterNSW upon completion of a site, as per 1.1.3.2.

1.6 Illustrations

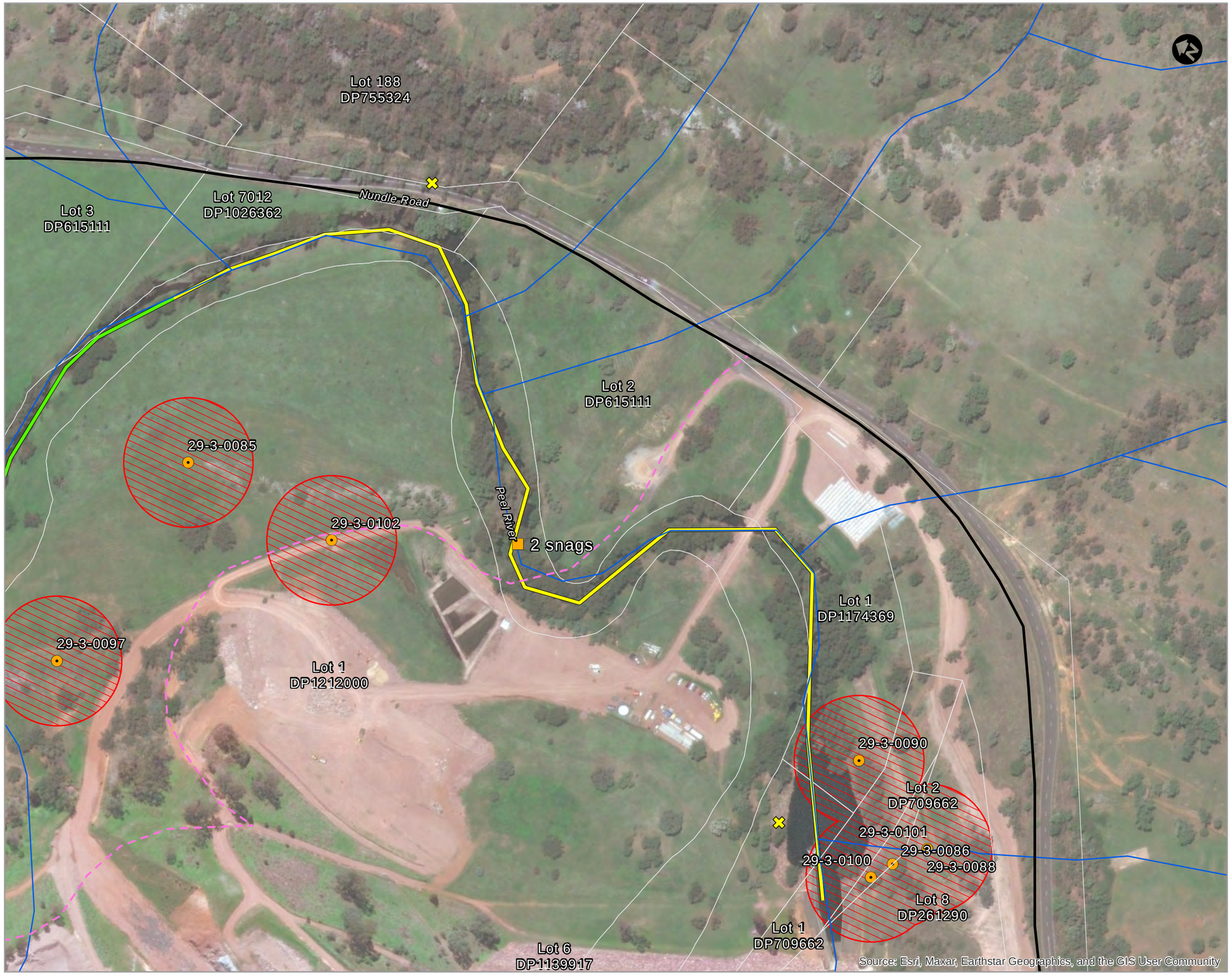
Refer to **Appendix E** Site Specific Management Plans and **Appendix F** Typical ESC Measures.

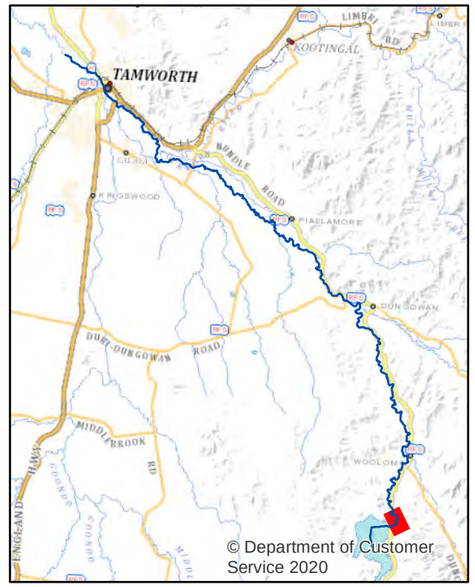
1.7 Site Contacts

Position	Name	Contact

Appendix E

Site Specific Management Plans





Map Sheet Location

LEGEND

- Cadastre
- No-Go zone
- Watercourse
- AHIMS record
- Gauging station

Reach Number

- 1
- 2

Site suitability

- Suitable

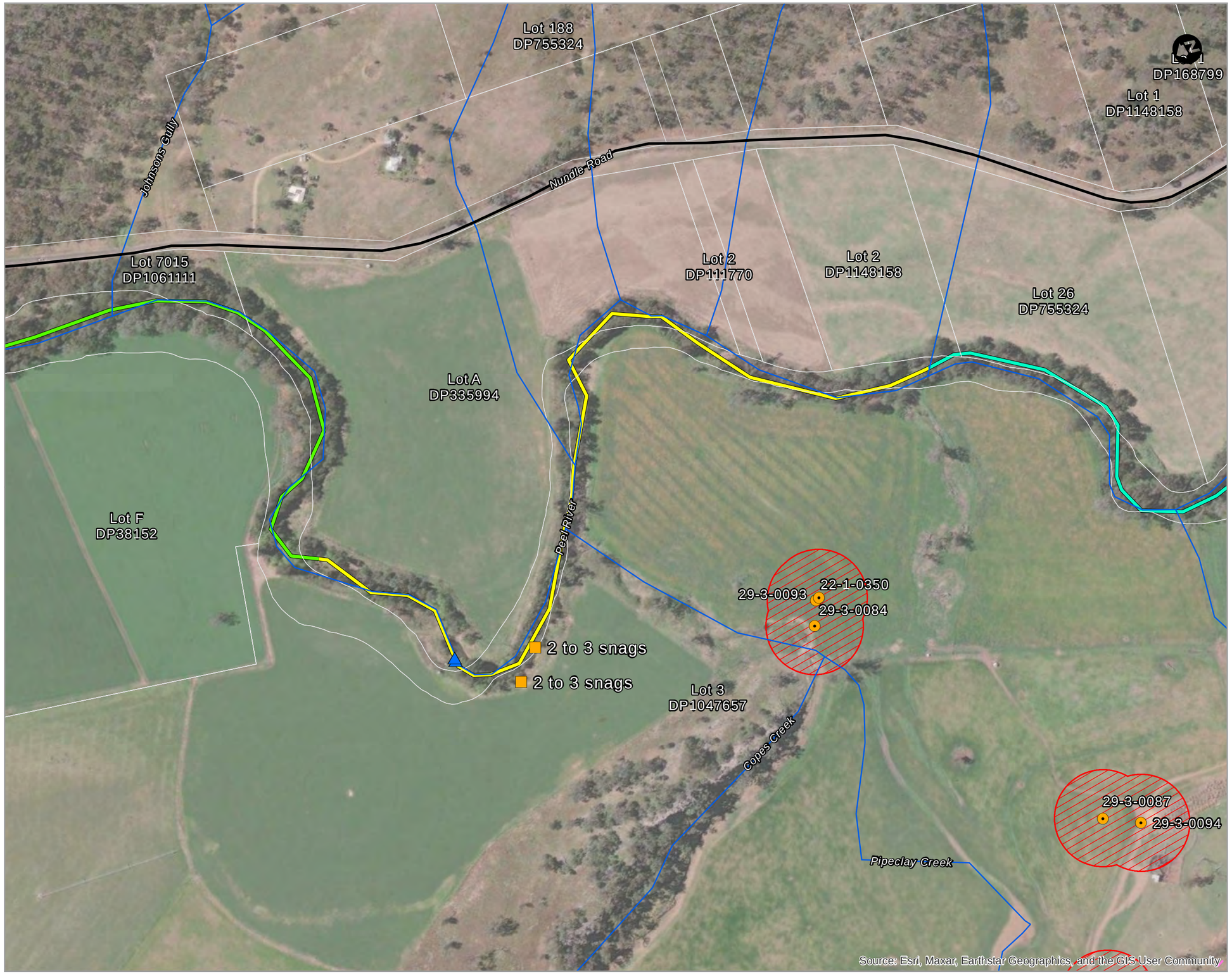
Access

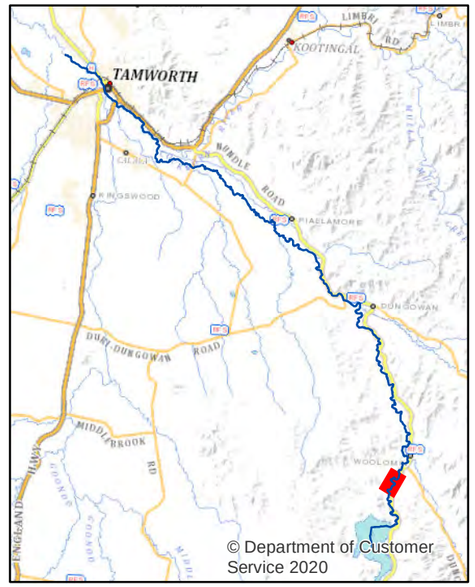
- Arterial road
- Track-vehicular

0 60 Metres

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022





Map Sheet Location

LEGEND

- Cadastre
- No-Go zone
- Watercourse
- AHIMS record
- Pumpsite

Reach Number

- 4
- 5
- 6

Site suitability

- Suitable

Access

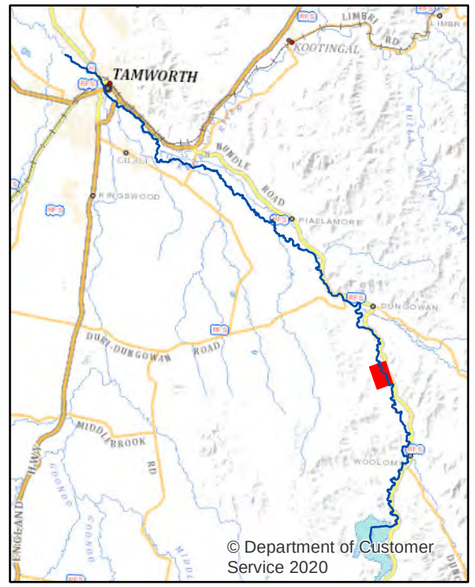
- Arterial road
- Track-vehicular

0 80 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022



Map Sheet Location

LEGEND

- Cadastre
- No-Go zone
- Watercourse
- AHIMS record
- Pumpsite

Reach Number

- 15
- 16
- 17

Site suitability

- Suitable

Access

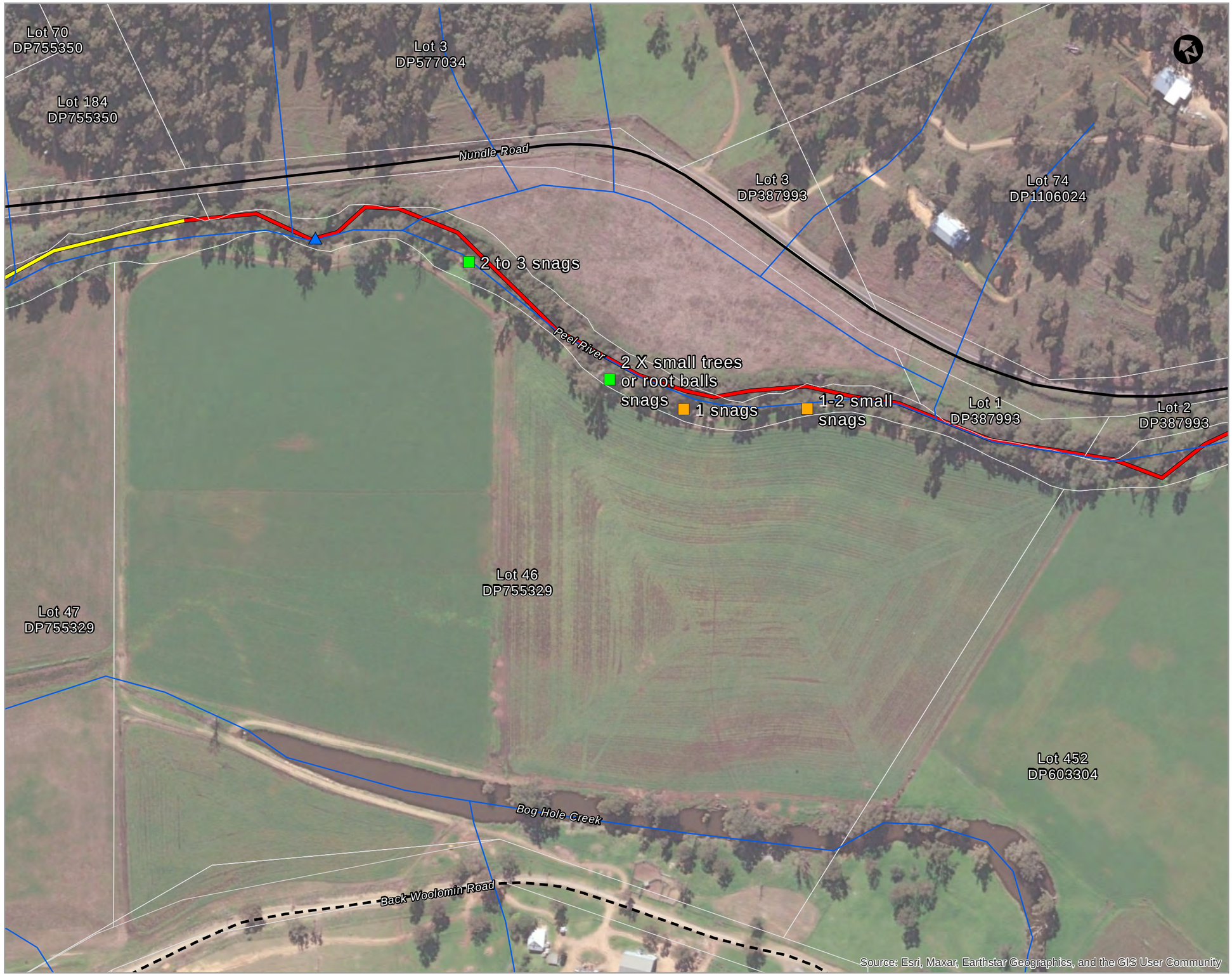
- Arterial road
- Local road
- Track-vehicular

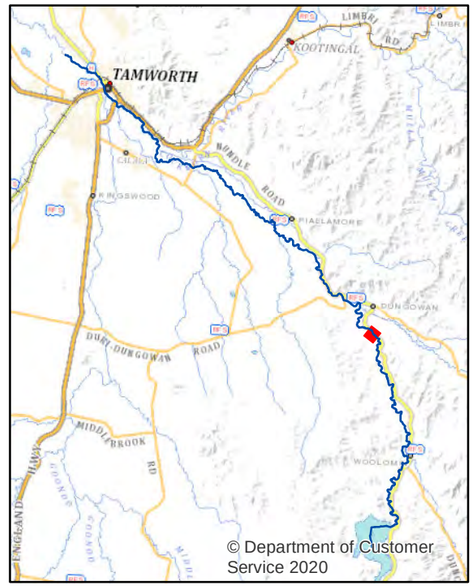
0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Pumpsite

Reach Number

- 20
- 21

Site suitability

- Suitable
- Ideal

Access

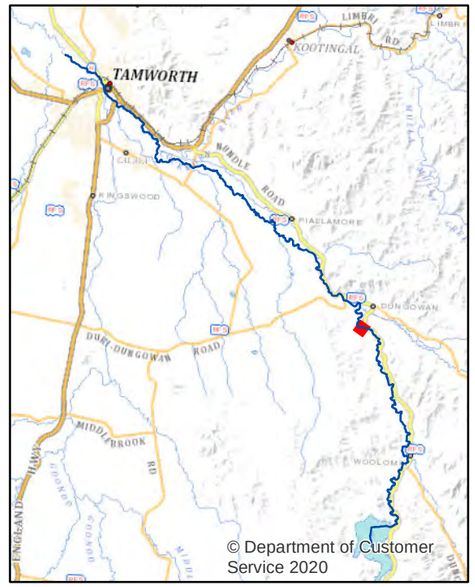
- Arterial road
- Local road

0 60 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Pumpsite

Reach Number

- 20
- 21
- 22

Site suitability

- Not suitable
- Ideal

Access

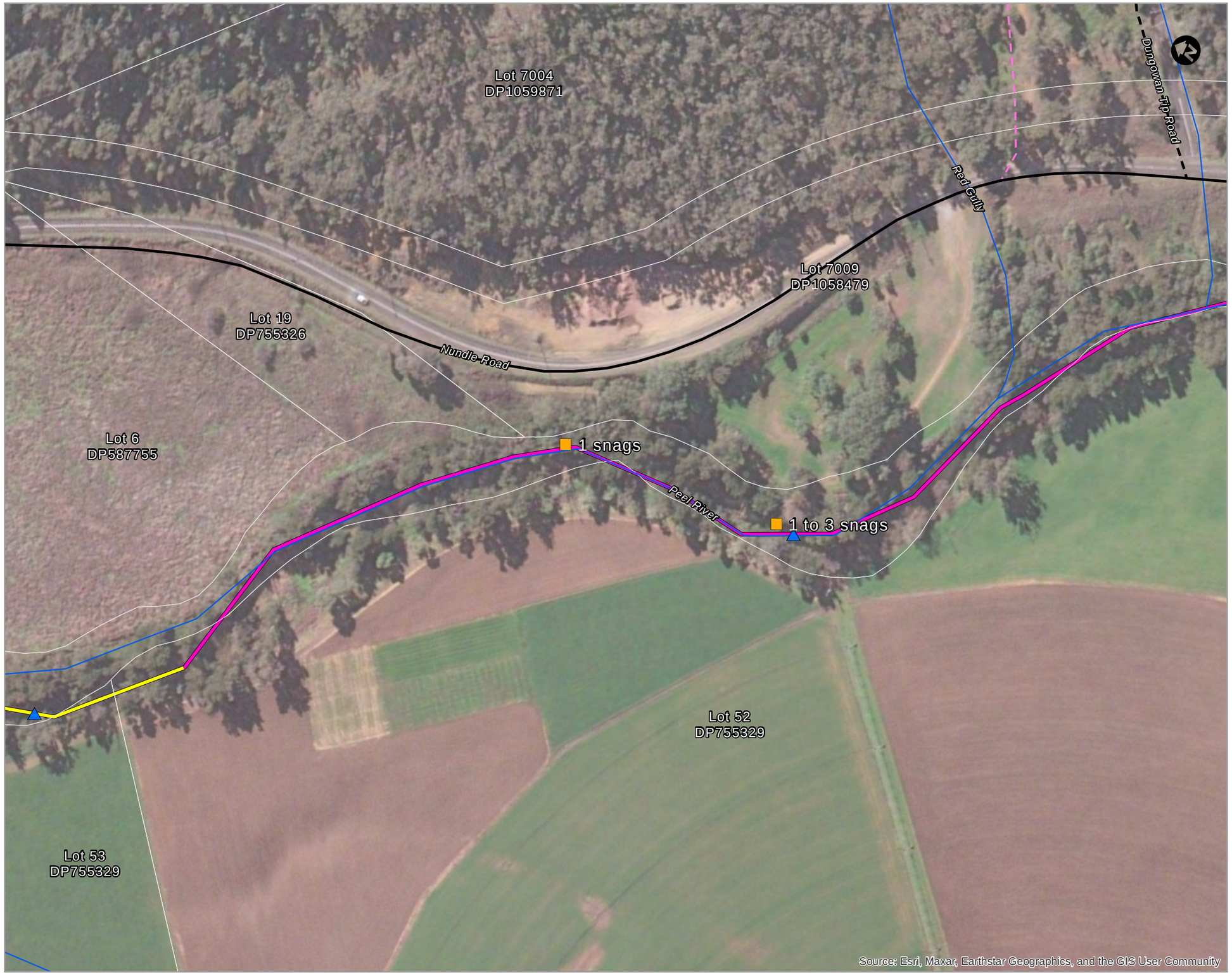
- Arterial road
- Local road
- Track-vehicular

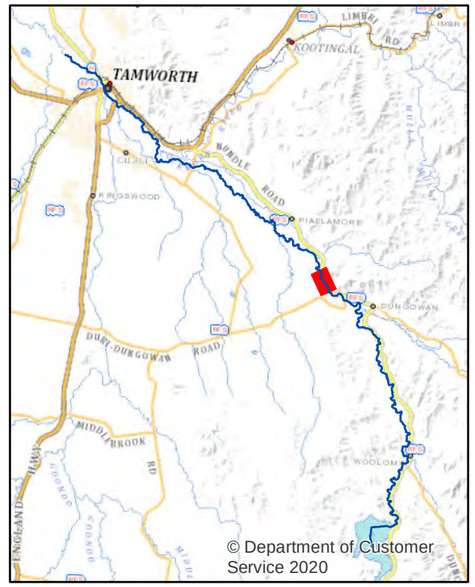
0 80 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022





Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Pumpsite

Reach Number

- 27
- 28

Site suitability

- Suitable

Access

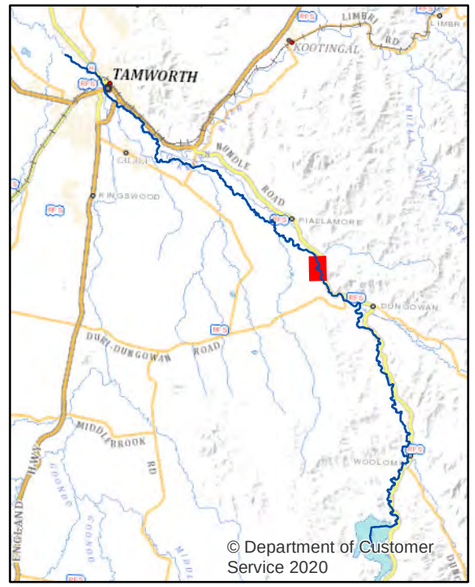
- Arterial road
- Local road
- Track-vehicular

0 40 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022



Map Sheet Location

LEGEND

- Cadastre
- Watercourse

Reach Number

- 28
- 29

Site suitability

- Suitable

Access

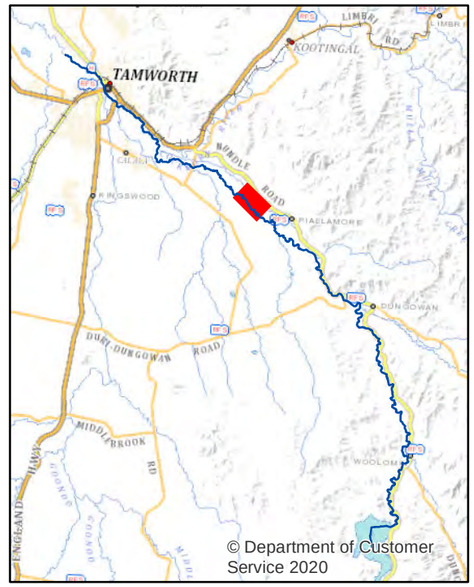
- Arterial road
- Track-vehicular

0 80 Metres

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022

Nundle Road
Piallamore Creek
Piallamore Anabranch
Peel River
Lot 1 DP177124
Lot 225 DP755334
Lot 1 DP176836
Lot B DP3612
Lot 40 DP1077067
Lot 11 DP771136
Lot 1 DP1001924
Lot 22 DP732709
Lot 2 DP544348
1 to 3 snags
1 to 2 snags
2 X small snags snags
2 1 to 3 snags snags
Lot 3 DP789212
Lot 10 DP1150314
Lot 11 DP1127916
Lot 61 DP755329
Lot 604 DP818933
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Pumpsite

Reach Number

- 36
- 37
- 38
- 39

Site suitability

- Suitable
- Ideal

Access

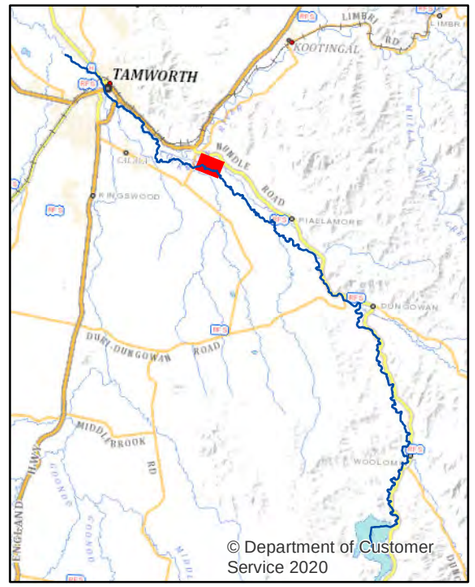
- Arterial road
- Track-vehicular

0 150 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Pumpsite

Reach Number

- 41
- 42
- 43
- 44
- 45

Site suitability

- Not suitable
- Suitable

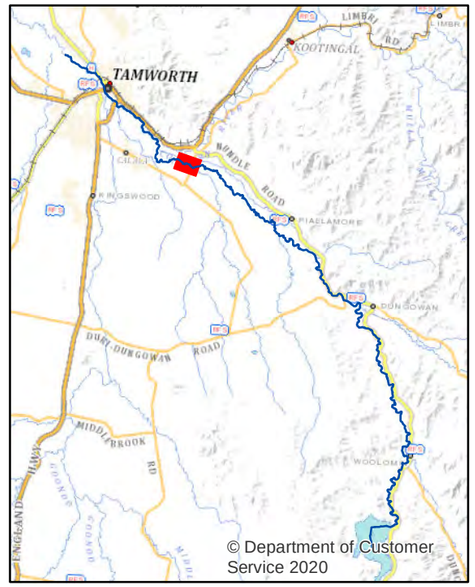
Access

- Arterial road
- Local road
- Sub arterial road
- Track-vehicular

0 150 Metres

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022



Map Sheet Location

LEGEND

- Cadastre
- Watercourse
- Pumpsite

Reach Number

- 44
- 45
- 46

Site suitability

- Suitable

Access

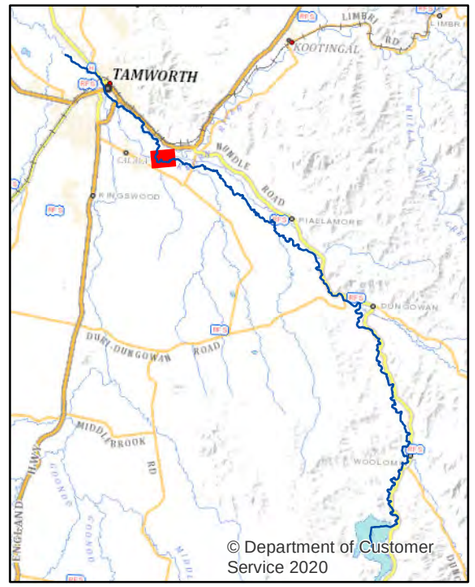
- Local road
- Sub arterial road
- Track-vehicular

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022



Map Sheet Location

LEGEND

- Cadastre
- No-Go zone
- Watercourse
- AHIMS record
- Pumpsite
- Gauging station

Reach Number

- 45
- 46
- 47
- 48
- 49

Site suitability

- Suitable
- Ideal

Access

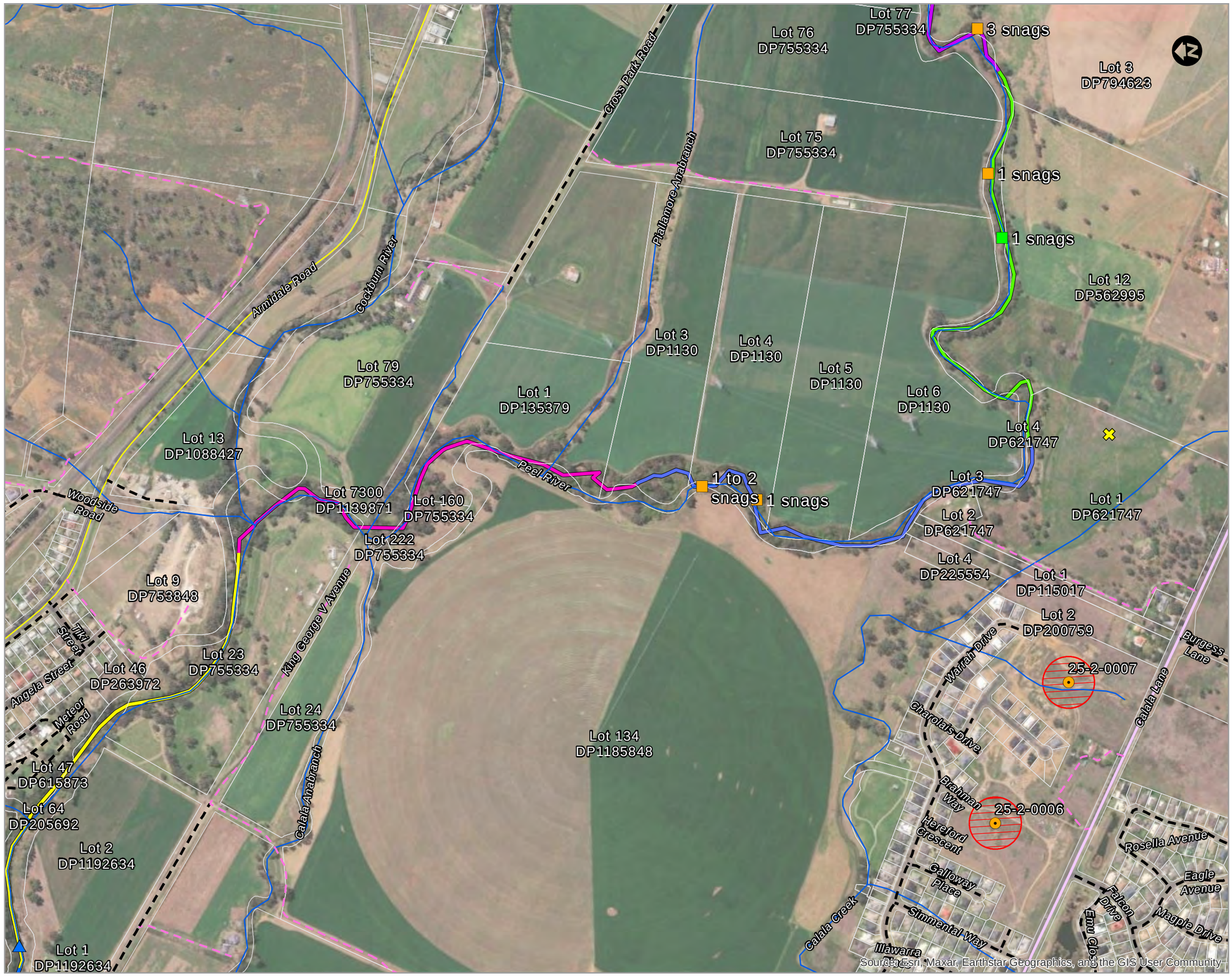
- Local road
- Sub arterial road
- Track-vehicular

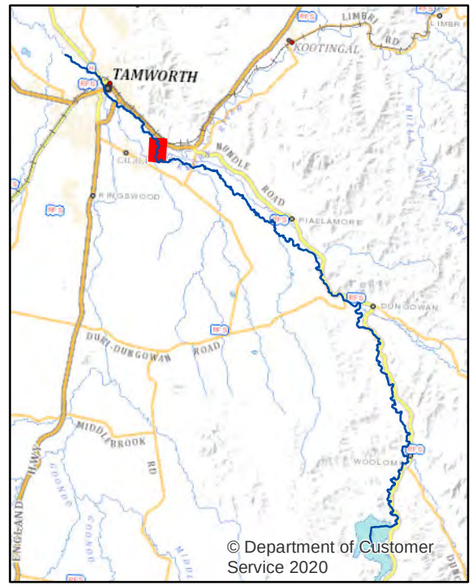
0 150 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022





Map Sheet Location

LEGEND

- Cadastre
- No-Go zone
- Watercourse
- AHIMS record
- Pumpsite
- Gauging station

Reach Number

- 46
- 47
- 48
- 49
- 50
- 51

Site suitability

- Suitable
- Ideal

Access

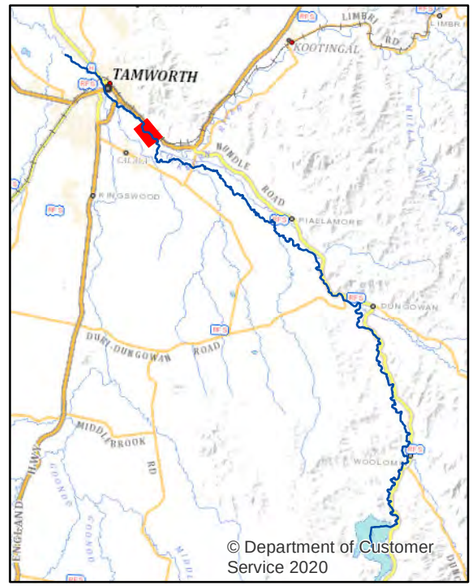
- Local road
- Primary road
- Sub arterial road
- Track-vehicular

0 150 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022



Map Sheet Location

LEGEND

- Cadastre
- No-Go zone
- Watercourse
- AHIMS record
- Pumpsite

Reach Number

- 49
- 50
- 51

Site suitability

- Suitable

Access

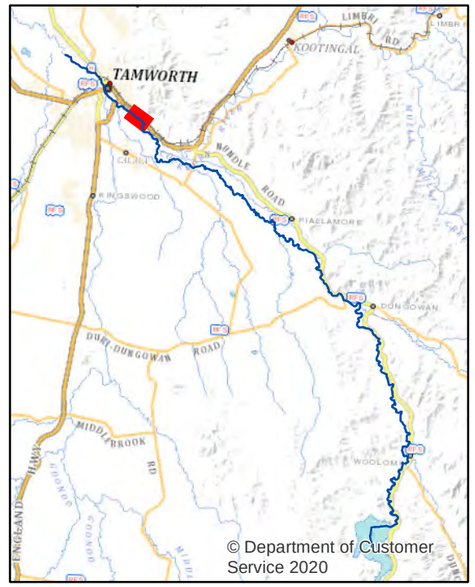
- Local road
- Primary road
- Track-vehicular

0 125 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022



Map Sheet Location

LEGEND

- Cadastre
- No-Go zone
- Watercourse
- AHIMS record
- Pumpsite

Reach Number

- 51
- 52

Site suitability

- Suitable

Access

- Local road
- Path
- Primary road
- Track-vehicular

0 100 Metres

GeoLINK environmental management and design

Peel River Re-snagging
4132-1015

Information shown is for illustrative purposes only
Drawn by: AB Reviewed by: TJC Checked by: DJH
Source of base data: ESRI World Imagery
Date: 30/05/2022

Appendix F

Typical ESC Measures

MATERIALS

FIBRE ROLLS: TYPICALLY 200 TO 250mm JUTE, COIR OR STRAW ROLL TIED WITH SYNTHETIC OR BIODEGRADABLE MESH.

STAKES: MINIMUM 25 x 25mm TIMBER STAKES.

INSTALLATION

1. REFER TO APPROVED PLANS FOR LOCATION AND INSTALLATION DETAILS. IF THERE ARE QUESTIONS OR PROBLEMS WITH THE LOCATION, DIMENSIONS OR METHOD OF INSTALLATION CONTACT THE ENGINEER OR RESPONSIBLE ON-SITE OFFICER FOR ASSISTANCE.

2. WHEN PLACED ACROSS NON-VEGETATED OR NEWLY SEEDED SLOPES, THE ROLLS MUST BE PLACED ALONG THE CONTOUR.

3. IF PLACED ON OPEN OR LOOSE SOIL, ENSURE THE FIBRE ROLLS ARE TRENCHED 75 TO 125mm IN SANDY SOILS AND 50 TO 75mm IN CLAYEY SOILS.

4. ENSURE THE OUTER MOST ENDS OF THE FIBRE ROLL ARE TURNED UP THE SLOPE TO ALLOW WATER TO ADEQUATELY POND UP-SLOPE OF THE ROLL, AND TO MINIMISE FLOW BYPASSING.

5. WHEN PLACED ACROSS THE INVERT OF MINOR DRAINS, ENSURE THE SOCKS ARE PLACED SUCH THAT:

(i) THE CREST OF THE DOWNSTREAM ROLL IS LEVEL WITH THE CHANNEL INVERT AT THE IMMEDIATE UPSTREAM SOCK (IF ANY);

(ii) EACH ROLL EXTENDS UP THE CHANNEL BANKS SUCH THAT THE CREST OF THE FIBRE ROLL AT ITS LOWEST POINT IS LOWER THAN THE GROUND LEVEL AT EITHER END OF THE ROLL.

6. ENSURE THE ANCHORING STAKES ARE DRIVEN INTO THE END OF EACH ROLL AND ALONG THE LENGTH OF EACH ROLL AT A SPACING NOT EXCEEDING 1.2m OR SIX TIMES THE ROLL DIAMETER, WHICHEVER IS THE LESSER. A MAXIMUM STAKE SPACING OF 0.3m APPLIES WHEN USED TO FORM CHECK DAMS.

7. ADJOINING ROLL MUST BE OVERLAP AT LEAST 450mm, NOT ABUTTED.

MAINTENANCE

1. INSPECT ALL FIBRE ROLLS PRIOR TO FORECAST RAIN, DAILY DURING EXTENDED PERIODS OF RAINFALL, AFTER SIGNIFICANT RUNOFF PRODUCING STORMS OR OTHERWISE AT WEEKLY INTERVALS.

2. REPAIR OR REPLACE DAMAGED FIBRE ROLLS.

3. REMOVE COLLECTED SEDIMENT AND DISPOSE OF IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

REMOVAL

1. ALL EXCESSIVE SEDIMENT TRAPPED BY THE ROLLS MUST BE REMOVED FROM THE DRAIN OR SLOPE IF SUCH SEDIMENT IS LIKELY TO BE WASHED AWAY BY EXPECTED FLOWS.

2. DISPOSE OF COLLECTED SEDIMENT IN A SUITABLE MANNER THAT WILL NOT CAUSE AN EROSION OR POLLUTION HAZARD.

3. THE BIODEGRADABLE CONTENT OF THE STRAW ROLLS MAY NOT NECESSARILY NEED TO BE REMOVED FROM THE SITE.

4. ALL SYNTHETIC (PLASTIC) MESH OR OTHER NON READILY BIODEGRADABLE MATERIAL MUST BE REMOVED FROM THE SITE ONCE THE SLOPE OR DRAIN IS STABILISED, OR THE ROLLS HAVE DETERIORATED TO A POINT WHERE THEY ARE NO LONGER PROVIDING THEIR INTENDED DRAINAGE OR SEDIMENT CONTROL FUNCTION.

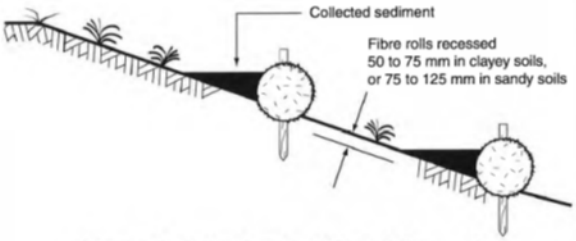
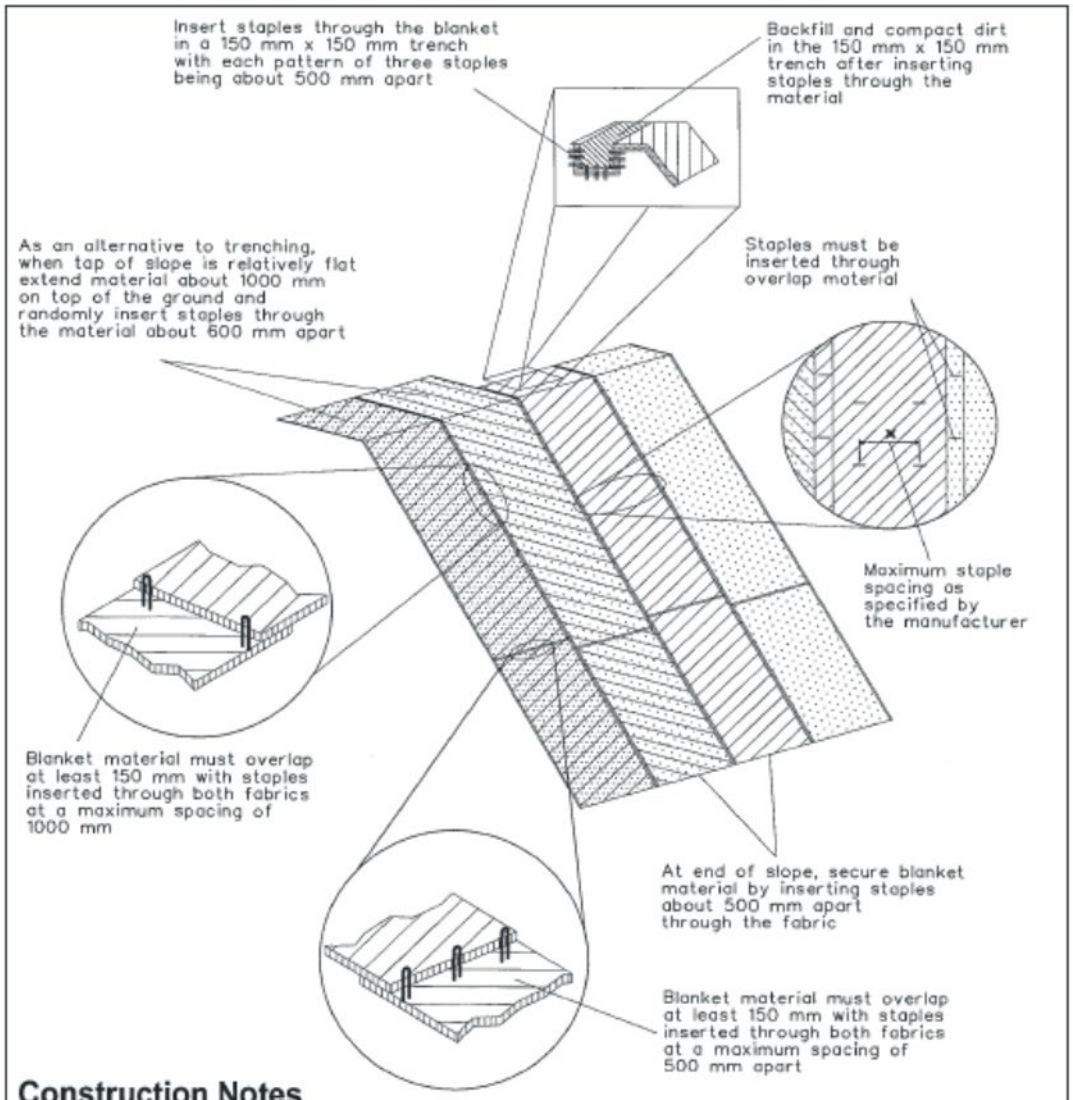


Figure 1 - Typical installation of fibre rolls

Drawn:	Date:		
GMW	Apr-10	Fibre Rolls	FR-01

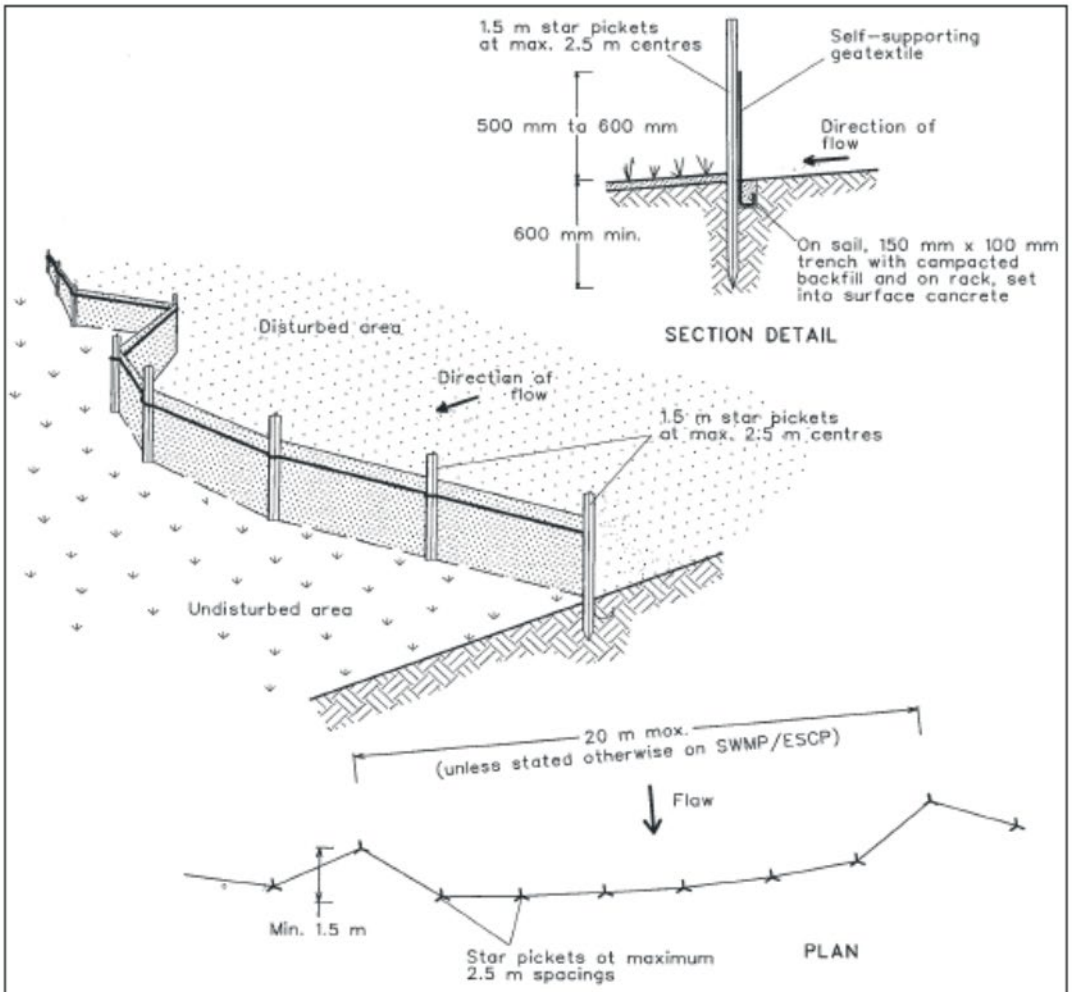
Landcare Research & Design Pty Ltd



Construction Notes

1. Remove any rocks, clods, sticks or grass from the ground surface before laying the matting.
2. Spread topsoil to at least 75 mm depth.
3. Where appropriate, complete fertilising and seeding on a properly prepared seedbed (Standard Drawing 7-1) before laying the matting.
4. Ensure the fabric can be continuously in contact with the soil by grading the surface carefully first.
5. Lay the matting in "shingle-fashion" with the ends of each upstream roll overlapping the next roll downslope.
6. Ensure sufficient staples are used to maintain a good contact between the soil and the matting.

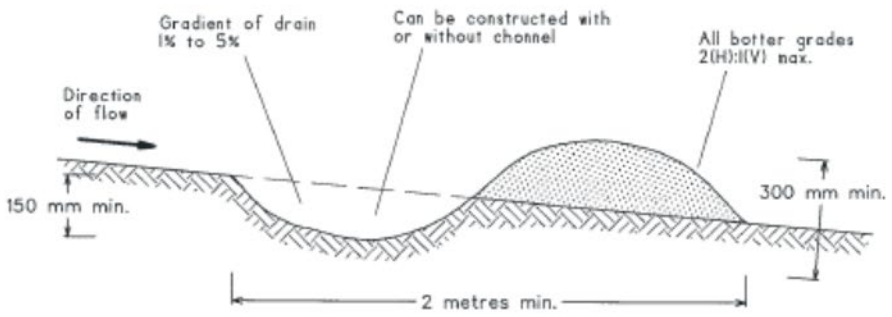
RECP : SHEET FLOW **SD 5-2**



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE **SD 6-8**

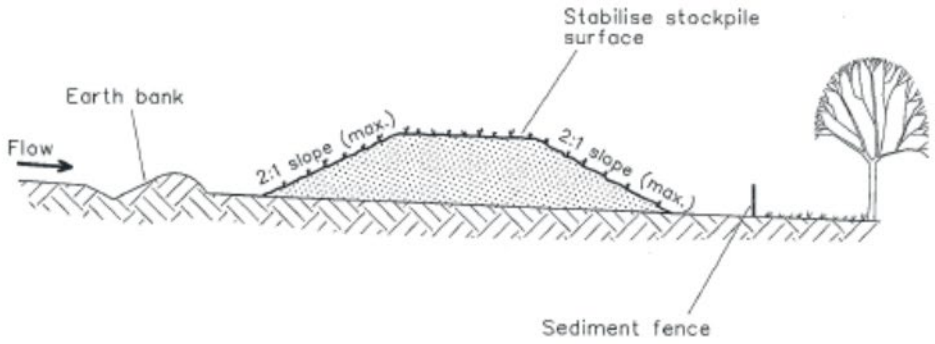


NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

EARTH BANK (LOW FLOW) **SD 5-5**



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

STOCKPILES **SD 4-1**